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Out Of Place: Stone Architecture And Pastoral Nomadism In Prehistoric Inner Asia

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Abstract
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To do so, it draws on the archaeological record of stone architecture in the Bortala River Valley of Xinjiang Uyghur Autonomous Region, an area where pastoral nomadism developed in the second and first millennia BCE. With data collected from survey and excavation, this study employs GIS, statistics, and 3D photogrammetry to examine the environment and building patterns of these stone structures on three spatial scales. Built in simple geometric forms recurring in space and time, they correspond typologically to different epochs of human habitation, funerary and ritual activities. Instead of approaching the material typologically, however, this study questions the connection between site selection and architectural design and how the prehistoric landscape of Western Tian Shan was shaped.

Three characteristics of place-making and space use are identified. First, the significance of these sites is reinforced through recurring access of specific locations and the adherence to certain building codes. Second, the aggregation of building components over time, like the symbolisms they carry, is cumulative and continuously reconfigured. Third, spatial knowledge is communal. It is anchored to a cartographic palimpsest comprising diverse forms of architecture and art. These preliminary observations form the basis for further modeling, in future research, the logistics of building and cultures of space use among early pastoral societies in Inner Asia on more explicit timescales and in more defined spatial forms.

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OUT OF PLACE:
STONE ARCHITECTURE AND PASTORAL NOMADISM IN PREHISTORIC INNER ASIA

Annie Chan

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OUT OF PLACE:

STONE ARCHITECTURE AND PASTORAL NOMADISM

IN PREHISTORIC INNER ASIA

In memory of my granny who put me in place

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ABSTRACT

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STONE ARCHITECTURE AND PASTORAL NOMADISM
IN PREHISTORIC INNER ASIA

Annie Chan
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How architecture reflects the configuration of physical and social spaces among prehistoric pastoral nomads is a topic scarcely explored in the archaeology of Inner Asia, not least because the common preconception is that structural remains are not in keeping with the mobile lifestyle. Yet, juxtaposing these two seemingly contrasting strategies of human subsistence forms an interesting paradox that underlies precisely the nature of nomadism. Accordingly, this study questions how pastoral nomads relate to stationary structures and the idea of a locale.

To do so, it draws on the archaeological record of stone architecture in the Bortala River Valley of Xinjiang Uyghur Autonomous Region, an area where pastoral nomadism was practiced in the second and first millennia BCE. With data collected from survey and excavation, this study employs GIS, statistics, and 3D photogrammetry to examine the environment and building patterns of these stone structures on three spatial scales. Built in simple geometric forms recurring in space and time, they correspond typologically to different epochs of human habitation, funerary and ritual activities. Instead of approaching the material typologically, however, this study questions the connection between site selection and architectural design and how the prehistoric landscape of Western Tian Shan was shaped.

Three characteristics of place-making and space use are identified. First, the significance of these sites is reinforced through recurrent access of specific locations and the adherence to certain building codes. Second, the aggregation of building components over time, like the symbolisms they carry, is cumulative and continuously reconfigured. Third, spatial knowledge is communal. It is anchored to a cartographic palimpsest comprising diverse forms of architecture and art in stone. These preliminary deductions provide the basis for further modeling, in future research, the logistics of building and cultures of space use among early pastoral societies in Inner Asia on more explicit timescales and in more defined spatial terms.

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Introduction

Early Chinese historical texts record one of the most emblematic traits of pastoral nomads, “逐水草遷徙”, to migrate in pursuit of water and grass. It captures the three most carefully scrutinized subjects in Central Asian steppe archaeology today - water, grass, and mobility, the fundamental elements of a livelihood dependent principally on livestock husbandry. But the meaning of this passage from 史記 *Shiji* (*Records of the Grand Historian*) is often taken amiss. In a frequently cited translation, “to migrate in pursuit of” is translated as “to move about in search of” (Watson 1993, Brosseder and Miller 2011), which, when read with the rest of the translation, may be taken as somewhat of a debasing description. Iconic phrases like this have come to represent for many archaeologists of Inner Asia one of the incentives to dispel the fallacy of the wandering pastoral nomad (see, for example, Frachetti and Maksudov 2014, Spengler et al. 2014a, Wright and Makarewicz 2015), which has in turn propelled a targeted field of studies in anthropology, archaeology, and environmental sciences.

Successful as this progress has been in characterizing the activities and behavior of pastoral nomads in ancient history, it remains tethered to eristic arguments that presuppose a binary construct between nomads and their sedentary neighbors, as discussed most recently by Di Cosmo (2015). The result of this rhetoric is a growing interest in categorically framing nomads as agents of change *vis-à-vis* core civilizations by highlighting their self-reliance through subsidiary economies and their ability to move across large distances. The study of ancient nomads gained centrality, but its discourse

has not escaped the binary. The archaeological research on nomads might be further stimulated by disconnecting its suppositions from historical observations because identifying the stereotyping of nomads in history is useful, but not without addressing the narrative idiosyncrasies of the historiographical process (Yang 2016).

This thesis shifts the focus from a dichotomy-driven perspective and seeks an alternative vantage point to draw attention to the notion of residential stability, an understudied aspect of human behavior in the nomadic discourse. It posits that the relation of nomads to architecture and the built environment is, despite their movement-centric subsistence, fundamental to charting patterns of migration and other patterns of behavior that may help provide context to these historiographical descriptions.

In the passage that follows the text from *Shiji* cited above, the author elaborates on the lifestyle of "to migrate in pursuit of water and grass", stating that, "毋城郭常處耕田之業，然亦各有分地" (they do not have city walls, a stable abode, or undertakings of agriculture, yet they each have their territory) (*Shiji* 110). Here, the text negates the presence of three components of residential stability - city wall, permanent abode, and agriculture, all of which demands the occupation of an abiding locale. At the same time, it stresses the presence of the notion of territory.

By all accounts, it is easy to challenge the veracity of this description by arguing that parts of it are incongruous with results from archaeological and ethnographic studies: research has shown that agriculture is practiced among pastoral nomads and there is considerable variability in the types and patterns of activity in which they have been engaged (see **Chapter 1**); we also have learned that while seasonal mobility is a strategy

for effectively procuring resources for subsistence, many nomads nevertheless sojourn extensively in villages and partake of sedentary forms of economy (**Chapter 1**).

Whether the historical text reflects the archaeological reality is, however, far less relevant than why it does not. A question like this may be explored historically by tracing locational politics defined by early Chinese religious, political, philosophical and social constructs - that one's civility is contingent on one's position relative to the source of political and ritual power. But what makes an interesting case study for archaeology are the three qualities of residential stability - city wall, permanent abode, and agriculture - whose absence is used to distinguish pastoral nomads.

How did pastoral nomads relate to stationary structures and the idea of a locale? What makes their relationship to the built environment categorically different? The title "Out of place" posits a hypothetical paradox with which to juxtapose two seemingly contrasting strategies of human subsistence: the building and use of stationary structures; and the practice of mobility. It argues that while a stationary place appears at odds with the necessary movements pastoral nomadism behooves, it is inherent in the space syntax of movement (Hillier and Hansen 1984) and therefore could be considered a critical component that affected various social, symbolic, and economic aspects of nomadic livelihood (**Chapter 4**). The thesis focuses on the locations (points of reference) around which movement and other aspects of human behavior are pivoted, rather than the logistics of migration.

This study examines a selected corpus of ancient architectural structures primarily in present day Xinjiang and its contiguous regions. The data are presented in **Chapters 2** and **3**. In **Chapter 2**, I provide an overview of the archaeological materials that have

formed our current understanding of the Inner Asian steppe in the Bronze Age (mid-second to early first millennium BCE). Then, I set the focus on archaeological materials from Xinjiang, specifically ceramics, metal objects and architectural structures. I critique the extent to which the Andronovo typology, a prevailing system of cultural classification, has lent to archaeological interpretation. This approach is disfavored by Western anthropological archaeology, which rests on hard science and critical theories. Harnessing this typology, however, is necessary for any preliminary study of Xinjiang material to, if nothing else, grapple with the implications of the unevenness of the local archaeological data in both quality and resolution.

Chapter 3 presents field data I collected from an archaeological survey and excavation project in Bortala Mongol Autonmous Prefecture in Xinjiang Uyghur Autonomous Region in China directed by the Institute of Archaeology, Chinese Academy of Social Sciences (IA, CASS). Hereafter, in three levels of analysis that incorporate statistical and geospatial methods, it examines where ancient stone structures are located relative to other structures and certain aspects of the physical environment, such as altitude. It focuses on the distribution and structural design of a form of slab enclosure that has been dated by excavation to between the 16th and 13th centuries BCE. The dates are corroborated by the features of its associated ceramic finds and burials which suggest a feasible affiliation with the Bronze Age Andronovo Culture (second millennium BCE). By identifying common characteristics that define the structures' environment and layout, the analysis aims to deduce the conditions that engendered these constructions.

The discussion of the primary and secondary archaeological data are explored on two theoretical fronts in **Chapter 1** and **Chapter 4**.

In **Chapter 1**, I assemble data from core studies in archaeology, ethnography and anthropology that have defined trends of inquiry into pastoral nomads in Inner Asian history and prehistory. I note how progress has been made toward a broadened understanding of the spectrums of herding and mobility through more targeted methods in archaeology and ethnography. On this basis, I examine the implications for understanding the connection between pastoral nomads and architecture, and the extent to which their relationship is discernible in the archaeological record.

Chapter 4 outlines an alternative, interactive dimension of architecture and the built environment. I study these ancient structures not simply technically, that is, assessing their physical components and functions, but use them to deduce human behavior. I contextualize the data presented in the preceding chapters by questioning how the stone structures shape the broader physical and social landscapes. Specifically, I consider how these structural properties manifest in spatial and temporal dimensions that could be outlined by measures of visibility, tradition, symbolism, and monumentality. In doing so, I propose ways of incorporating the structures into a spatial system of reference that may offer useful proxies for tracing the evolution of pastoral landscapes.

In sum, to return to the opening statement, this research posits that while "water" and "grass" are what the nomads pursue, their mobility was also dependent on static points of spatial reference that might have been imperceptible by sedentary peoples, as the historical text shows. These could well have been locations with permanent structures.

Chapter 1

Pastoral Nomadism in the Archaeology of Central Asia

Introduction

Debates surrounding pastoral nomadism/ nomadic pastoralism have become arguably the hallmark of Central Asian archaeology of the 4th millennium BCE and after. Hence, it seems only fitting to begin the enquiry at its crux. This chapter lays the foundation for examining the thesis - "out of place" - in its proper contexts. It peruses the definitions of "nomadism" and "pastoralism" in the theory and practice of historical, archaeological and ethno-archaeological research, and highlights the pertinent questions and interpretations effecting research output in this area of study. It consists of four sections that bring a gradually narrowing focus on the subject of study.

First, I review the history of the research and introduce the most seminal works and ideas. Next, I center on two pronounced aspects - economy and relation to the state - that are most implicated in defining the range of behaviors pastoral nomadism encompasses. To make clear what is and may be known from the archaeological record, I then address the scope and visibility of material evidence, as well as methods of investigation that have been applied to locating and categorizing pastoral nomads. I end with a focus on the forms and functions of architecture (structures and built spaces) commonly associated with pastoral nomads. Here, I also introduce another important variable - location - that will be the central theme of investigation in chapters 3 and 4, which deal respectively with the archaeological evidence of architecture in Bortala Prefecture, (Xinjiang, China),

a locus of pastoral nomadism in the second and first millennia BCE, and the meaning and effect of these structures in spatial and diachronic extents.

1.1 The Current Discourse

For reasons beyond their amorphous and unorthodox nature, nomads have held an enduring fascination for historians, social scientists, and anthropologists alike. In the earliest accounts of their existence in Greek and Chinese historiographies, they were often labelled as the 'others', the culturally indecorous by default. Without indigenous historical records, nomads in Central Asia in the early and medieval historical periods were subjugated to the prejudiced vantage point of agricultural states that consistently identified them with disruptive military campaigns, overland trade networks and large scale migrations in written histories.

As European powers relinquished their colonial campaigns in the early 20th century, interests in research on nomads spiked with the production of momentous works such as Owen Lattimore's *Inner Asian Frontiers of China* (1940) and Evan-Pritchard's ethnographic research of the Nuer (1940). But systematic studies of nomads in anthropology did not gain traction until the 1970s when the proliferation of direct field observations of modern day nomads in the Middle East, Africa, and Oceania (e.g. Barth 1961, Dyson-Hudson 1966, Salzman 1972, Irons 1975, Beck 1991) prompted attempts at more integrated theoretical approaches and standards for data collection (Dyson-Hudson 1972: 5, 8). Dyson-Hudson chronicles, in multiple reviews (e.g. Dyson-Hudson 1972; Dyson-Hudson and Dyson-Hudson 1980), theoretical models of human behavior that

have driven the ebb-and-flow of the anthropology of nomads since the late 19th century, highlighting for example, the repudiation of structural functionalism in favor of more empirical methods of investigation, what he dubs the 'Malinowskian impulse' (Dyson-Hudson 1972: 7). Kradin (2008: 107) notes, however, that nomads were still left out of discussions of influential paradigms of the twentieth century for the evolution of societies, namely modernization theory, civilizational approach, and neo-evolutionism.

Notwithstanding efforts to bring nomadic studies into focus, research in the first decades of the 20th century was hampered by competing constructs of analysis straddling human ecology, sociology, anthropology, and archaeology although theories and methods for addressing nomadism in archaeology made large strides. The introduction of middle-range theory to archaeology by Lewis Binford (1978) and the proposition of the secondary products revolution (SPR) model (Sherratt 1983; Sasson and Greenfield 2014) revealed the possibility of gaining important insights through ethnography into what may be learned about human-animal relationships from faunal remains. The 80s saw the production of defining works such as Khazanov's *Nomads and the Outside World* (1986) and Cribb's *Nomads in Archaeology* (1991) that, albeit premised on ethnographic observations, still strongly influence the archaeological study of nomads today. On the other hand, there remains considerable contention regarding the definition and behaviors of nomadism, which encompasses two intersecting aspects - the herding of animals and mobility.

What resulted was a redirected focus on the *modi operandi* of nomadic pastoralism and its archaeological signatures. Because of the scarcity of structural remains in past pastoral nomadic societies, research was carried out primarily in the fields of

zooarchaeology and activity area studies. Research targeted the use of quantitative methods of identifying and categorizing data, which include the study of taxonomic abundance by way of MNI (Minimum Number of Individuals) and NISP (Number of Individual SPecimens) (e.g. Watson 1979), patterns of attrition and pathologies, the modeling of bone utility based on butchering behavior and transportation issues from ethnographic and actualistic studies (Perkins and Daly 1968, Binford 1978, Blumenschine 1986, Grayson 1989), and has more recently incorporated an array of analytical methods based on biochemical signatures, such as isotope analysis on teeth (e.g. Liu et al. 2010, Murphy et al. 2013), analysis of non-bone residues from animals such as lipid (e.g. Outram et al. 2012, Yang et al. 2014) and other collagen-based materials (e.g. Rao et al. 2015).

Although the increased capacity to identify, recover and analyze relevant archaeological remains has enriched our understanding of pastoral practices, it has equally, if not further, exposed the limits of what we know. Concerns that were raised some forty years ago on the assumptions of uniformitarianism (Watson 1980) and the effects of taphonomy on the interpretation of the archaeological record still apply to aspects of research design today (e.g. Bendrey 2011).

Despite efforts to spotlight the distinctive characters of nomadism, the focus of pastoral studies was, as Chang and Koster lament (1986: 97), biased toward the Neolithic and underplaying developments in later periods, due to a predominating interest in incipient processes of animal domestication (Honeychurch and Makarewicz 2016: 343). It is not unwarranted to argue that Khazanov's *Nomads and the Outside World* set the tone for the anthropology of nomads in the decades following given that research has

remained till this day, in varying degrees, contingent on the modeling of agrarian civilizations for the economy of production and the development of statehood (e.g. Barfield 1990, Kradin 2008). Nevertheless, there is concurrently a conscious departure from the binary interpretation of nomadism vs. sedentism, and pastoralism vs. agriculture, or even a binary measure of pasture quality (Wright and Makarewicz 2015) as new archaeological data shed light on broad spatial patterns of settlement and affiliated material cultures in the Central Asian steppes (e.g. Hanks and Linduff (eds.) 2009, Jia et al. 2011, Honeychurch 2015) a more chequered economic and cultural landscape is gradually brought to light. Below, I describe definitions, methods of enquiry, and categories of archaeological evidence for nomadic existence that have emerged in the most recent discourse.

1.1.1 Defining nomadism and pastoralism

The difficulty of studying pastoral nomads of the Central Asian steppes is encountered primarily in three interconnected axes of research: 1) what "nomadism" encompasses, 2) the disputable juxtaposition of nomads with settled populations, and 3) the lack of archaeological criteria for recognizing a nomadic way of life.

The etymological root of "nomad" is *nomas* in Greek, derived from the verb *nemein* "to pasture". Thus, the word originally conveys the necessary implications of mobility that arise from the pasturing of animals. The meaning has been broadened to a description of a lifestyle without permanent abode, thus including social groups who do not practice animal husbandry; in the anthropological studies, this would include hunter-gatherers, seafaring populations, and people in peripatetic professions. Since

"nomad" is a word almost synonymous to mobile existence, it becomes, as Wendrich and Barnard recognize (2008: 6), incumbent to specify the "variations of mobility" nomadism encompasses that are visible in the archaeological record. By dispensing with the connotations of pastoralism in "nomadism" and replacing it with a simpler definition of "mobility" as the "capacity and need for movement from place to place" (Wendrich and Barnard 2008: 6), they were able to put into comparative perspectives different ranges of mobility and motivations for mobility in their edited volume.

Khazanov (1984: 7) chooses to focus on the mode of food production, stating that nomadism is "a distinct form of food-producing economy in which extensive mobile pastoralism is the predominant activity and in which the majority of the population is drawn into periodic pastoral migrations." Cribb (1991: fig. 2.1) adopts a similar meaning, attributing the variability of nomadic pastoralism to the "interaction between mobility and mode of subsistence". Dyson-Hudson (1972: 8-9) has cautioned earlier, however, the risk of scrutinizing the semantics of nomadism and generalizing nomadic behavior at the expense of cultivating working models that allow for assumptions of variability, contingency, and individuality.

"More than anything, it is the essentialist case of so much thought about nomads (including, as I shall suggest later, the concept of 'nomadism' itself) which is responsible for the otherwise paradoxically slow development of studies in nomadic behavior. For if movement is treated as an absolute quality of particular human groups, rather than being relative and dependent on other factors, then our most profitable questions about spatial mobility are preempted. We settle too readily for categories which do not so much explain as explain away the realities of nomadic behavior."

It is a stance with which recent research would concur - that grounds for mobility in pastoralism are far from direct and easily deduced. The route, frequency and distance of movement are often decisions made on the basis of a wide range of factors connected in varied degrees to environmental conditions, the physiology of animals, social relations, and political constraints. With regard to the first two aspects, Bendrey's (2011) study is effective in illustrating the influence of climate and topography on herd composition across the Eurasian steppe. By collating data from archaeological bone assemblages and historic accounts, he identifies a few general trends, namely, cattle are more common in the western steppe due to higher precipitation; goat population increases relative to sheep with rising aridity and altitude; horses also increase in proportion because they are better adapted to the cold and snow where they can still forage (Bendrey 2011: 10-12). Álvarez's (2013) research speaks to the third and forth aspects. It shows the co-existence of three different systems of pastoralism within an area *ca.* 200 km E-W in the Asturian Mountains in Spain, where schedules of movement are determined by local by-laws and with consideration of village tenures.

Di Cosmo's (2015) critique of predominant approaches in the study of Inner Asian steppe empires also echoes the sentiments expressed in multiple essays by Dyson-Hudson. He calls into question the tendency to generalize about nomadic lifeways through history on account of clichéd readings of historiographical descriptions and contends that, "it is not in generic similarities but rather in the departures from stereotypes and analogies that we can possibly identify the specific 'signature' of each nomadic people and extract observational elements that come from direct or indirect experience" (Di Cosmo 2015: 53). It appears that a similar understanding has also been

reached in archaeology to steer clear of generalizations of pastoral nomadism, given its varied schemes of production and modes of cultural expression (elaborated in 1.1.1). A recent definition by William Honeychurch (2015: 57) places emphasis on *range*, stating that the "many expressions" of pastoralism is accorded the "capacity" for residential mobility by nomadism to produce "a regime of human-animal and human-human relationships over time".

Honeychurch and Makarewicz (2016) would contend that "multi-resource" pastoralism - a composite economy comprising pastoralism and a subsidiary but complementary means of subsistence - constitutes one of these "many expressions". As they elaborate, drawing attention to the existence of this kind of mixed livelihood, which includes agriculture and fishing among others, is arguably the principal focus of the prehistoric archaeology of Central Asia in the past decade. One might ask, however, with this broadening definition, are we still effectively addressing variability within pastoral nomadism or have the data taken us beyond? What is pastoral nomadism *not*? This may be an ontological question to be explored in future research with respect to semantics and the history of nomadism in Central Asia.

1.1.2 The economy of pastoral nomadism

The complexity of modeling nomadic behavior while accounting for variability rests largely on two areas of research interests - mode of production and political structure.

The first concerns the acquisition of resources and the degree of mobility. Pastoral subsistence has been described as an economic alternative to agriculture that develops on

the ecologically less fertile periphery of an agrarian state (Bates and Lees 1977, Hole 1978, Salzman 1980). Theories abound as to how the earliest nomadic pastoralism developed, but it remains a perplexing issue since pastoralism bears different features in different regions of ancient occupation and its development might be attributed to a multiplicity of incentives including changing environmental conditions, sociopolitical pressure, increased specialization of food production, etc. Various anthropological studies have postulated that in the ancient Near East, early pastoralism was practiced in tandem with cereal crop cultivation but branched off to play in the role of facilitating trade between center and periphery (Chang and Koster 1986: 105, Flannery 1969, Bates and Lee 1977, Abdi 2003).

The kind of economic dependency on agriculturalists suggested by theories of early development of pastoralism is explored at length by Anatoly Khazanov with reference to ethnographic data. He emphasizes "the ratio of pastoralism and agriculture in an economic system" (Khazanov 1984: 19) and distinguishes two basic forms of pastoralism: pastoral nomadism proper and semi-nomadic pastoralism, which are determined by, first, the presence or absence of agricultural products in the food supply, and second, the distance and seasonality of movement to economize the use of pastures in areas such as the Central Asian steppes where natural vegetation is not conducive to year-round herding. Based on spatial and social patterns of resource acquisition and resource sharing between nomadic and settled groups of population, Wendrich and Barnard (2008: 8) identify three types of nomadism, namely tethered nomadism, enclosed nomadism, and peripheral nomadism, all of which suggest varying degrees of nomad-sedentary people interaction. Though some (Ekvall 1968?, Jacobs 1975, for

example, Cribb 1991) claim the presence of “pastoral nomadism proper” or so-called “pure pastoralism”, many have contended that they are historically nonexistent (Salzman 1972, Spooner 1973) or even if they do exist, are ethnographically challenging to observe and archaeologically very difficult to discern (Chang and Koster 1986: 98).

That said, ethnographic studies are invaluable in showcasing the spectrums of pastoral lifeway that might have existed in the past. As Watson (1980) synthesizes from the perspective of Near Eastern archaeology, they provide important data on demography, herd composition, crop yields and patterns of food consumption that could aid the interpretation of archaeological assemblages, given that the assumptions of uniformitarianism are recognized. Comparative data provided by historical accounts allow Bendrey (2011) to identify the degree of correlation between environment, livestock species and range and seasonality of mobility. Herding decisions are to a large extent contingent on species best adapted to local conditions (Bendrey 2011). In a subsequent collaborative field research, Bendrey and his co-authors tested this hypothesis with a case study of herding and farming practices in a Kurdish village in Bestansur in Iraq (Bendrey et al. 2016). Their research, based on field observations and semi-structured interviews, offers an emic understanding of how pastoral communities in the Zagros Mountains adapt their animal husbandry and plant management practices to climatic fluctuations, animal physiology, resource accessibility and availability, and long-standing social traditions. It offers a critical insight into the seasonality of animal husbandry, with respect to land use, schedule of food production and herding logistics.

Assuming, however, herding logistics are always planned in the name of maximizing livestock productivity and ensuring long-term pasture sustainability would

be an oversight in designing testable models such as Bendrey's (2011). As Wright and Makarewicz (2015: 264) caution, herding decisions are not simply based on a binary perception of pasture quality as "useful" or "depleted", but are made in the interest of a suite of social and political factors that may not be congruent with productivity targets (more on that in the following paragraphs).

Álvarez's (2013) study in the Asturian Mountains shows the presence of "different settlement patterns and residential mobility systems" in a small geographical area. Herding strategies are devised to capitalize on the diverse adjoining ecological niches while taking into account the feeding needs of different species of livestock and residential arrangements. An unexpected pattern of mobility was also noted by Houle in his zooarchaeological and ethnographic research in the Khanuy Valley in the Mongolian steppe. His findings show that contrary to popular belief, mobility in this region is restricted to a 2-4 seasonal movement of no more than a few kilometers, both in the Bronze Age and at present.

Salzman's (1972) "multi-resource pastoralism" approach is more widely favored; it allows "the degree of multi-resource exploitation" to be measured by the degree of dependence on pastoral and non-pastoral products and production in both absolute and relative terms by drawing largely from quantitative analyses of the type and amount of food being produced, which vary according to herd composition and the level of dependency on agricultural products. According to Murphy et al.'s (2013) study of dental paleopathology in Early Iron Age populations of the Minusinsk Basin, stable carbon and nitrogen isotope values from the teeth of show that their diet relied heavily on millet and freshwater fish. The authors found low-moderate level of caries and very high

frequencies of calculus from remains retrieved from two Early Iron Age cemetery populations, which suggests a high level of animal protein consumption supplemented by considerable carbohydrate intake.

Confining the variance of pastoral economy to stringent categories may risk understating the fluidity of nomadic societies. As Spooner (1973: 3) explains, “there are no features of culture or of social organization that are common to all nomads or even that are found exclusively among nomads”. He suggests that the fluctuating availability of resources behooves a fluid social organization that is unique to nomadic sociology; he places particular emphasis on the implications of nomad-ecology relationship on intra-group dynamics, which he terms the systematics of “cultural ecology” (Spooner 1972: 130). R. Dyson-Hudson (1972) also refrains from applying categorical labels in her study of the Karimojoing, in which she describes their social practices and movement patterns as a mixed response to ecology and changing political conditions. From a historical perspective, Di Cosmo (2015: 53) has argued that the various nomadic empires of Central Asia - Xiongnu, Türks, Mongols - may not necessarily be analogous even if they all belong to the ethnographic or anthropological category of “steppe nomads”.

In these regards, Wright and Makarewicz (2016)’s recent paper mirrors Spooner’s and Dyson-Hudson’s views; it also makes for a fitting response to David and Kramer’s (2001: 136-7) concern that ethnography as a method has not paid sufficient attention to explicating the extent to which cultural practices affect subsistence methods because of its general preoccupation with subsistence strategies. Wright and Makarewicz contend that herding strategies are not dependent on pasture quality alone, nor is it always feasible to make a prudent decision that guarantees maximal returns and safeguards the long-term

sustainability of pastures. Their ethnographic and archaeological research in Mongolia, in particular, shows how strong social skills and network support could facilitate mobility. The success of long-range moves, for instance, is determined to a larger degree by favorable social landscapes than shrewd logistical technicalities (Wright and Makarewicz 2016: 268).

1.1.3 Nomads and the state

Another significant area of debate influencing nomadic studies concerns how best to describe nomadic societies as a political entity. A Marxist view considers early nomads (until mid-first millennium A.D.) "pre-state, early-class or early-feudal societies" (Kradin 2008: 108). In Eastern Central Asia, nomadic confederations rose to power in the late first millennium BCE, the first of which was the Xiongnu whose frequent invasions of the Chinese border marks a historical watershed in the balance of power between nomads and the sedentary population. Archaeology provides strong evidence for the preconditions for this development in the preceding millennium. Transition to nomadism from agriculture took place in the steppes following climate change, the domestication of horses (Levine et al. 2000, Olsen 2006, Outram et al. 2009), "a growing demand for livestock, security concerns, and new technologies" (Golden 2011: 11) sometime after the third millennium BCE. These developments offered the nomads enhanced mobility and military supremacy over their sedentary neighbors. By gaining a means of subsistence through transhumance herding and control of long-distance trade routes, the nomads became a serious contender in steppe politics.

The degree to which these confederate nomadic groups meet the qualifications of statehood is disputable. The prevalent theory suggests otherwise, however. On a social evolutionary spectrum, the social organization of nomadic societies might be most comparable to that of chiefdoms or complex chiefdoms, or so-called "inchoate early states" (Khazanov 1984: 296, Kradin, 2008) that are characterized by supra-local communities and the presence of regional social hierarchy; power and prestige are held by the elite but living standards between households in the community have little variation (Drennan et al. 2011); administrative networks are lacking since the population is sparsely distributed and highly mobile (Di Cosmo 1999).

Theories concerning the evolution of pastoral nomads hinge heavily on the interpretation of the relationship between the steppe and the sown in early Central Asian history and analogies drawn from ethnographic studies of the relationship between nomads and the state in the modern era. There are essentially two sides to this debate - the theory of external dependence *vs* the theory of nomadic autonomy (Kradin 2008: 109). Lattimore (1940) posits that there was no necessity to develop a state among the nomads because the nomadic lifeway does not call for the implementation of an institutionalized hierarchy (Kradin 2008: 109). The impetus for forming a hierarchical social organization therefore arises from their *need* to trade with agriculturalists (Khazanov 1984, Salzman 2000). Golden (2011: 15) suggests that nomadic groups did not attain statehood as the sedentary powers did, but the economic benefits of statehood were a "lure" and could explain the means by which nomads in the Mongolian steppes were formed into empires (Golden 2001).

Although it is incontrovertible that cultural and commercial exchanges between the sedentary powers across the Asian landmass were largely mediated by nomads, it cannot be overstated that the workings of the nomadic economy and political organization were incentivized by nomads' relations with the sedentary states. Di Cosmo (2015) contends that explaining away the mechanisms of nomadic state formation with their simple "need" to level with the sedentary states politically and economically is an unfounded approach that is incongruent with current historical and archaeological evidence. In fact, this "need" may be internally derived. In many instances, power struggles internal to nomadic empires such as the Xiongnu, the Türk, and the Mongol and "ideological claims derived from the Inner Asian tradition" revealed the need to create a super tribal, confederate, or imperial organization that went hand in hand with the structuring of armed forces and the election of a military leader (Di Cosmo 1999, 2015: 58). It is possible that, as adherents (Krader 1968, Di Cosmo 2015) of the theory of nomadic autonomy would argue, a consanguineal state could have been established independent of external influences (Kradin 2008: 110).

Di Cosmo (2015: 50-51) also points out that theories of state formation among early nomads are premised on a faulty presupposition of a rigid dichotomy between nomads and the sedentary states. He explains that it is the very focus on the liminality of a physical and symbolic frontier where the economic and political differential between two groups of people supposedly took shape that limits our understanding of how nomadic empires came to be organized. It is erroneous to envision the steppe and sedentary powers "as two mechanically interlocked forces acting upon each other as

cogwheels of a single mechanism", thereby assuming "a 'synchronicity' between the rise and fall of nomadic empires and sedentary empires." (Di Cosmo 2015: 52, 58).

It is unrealistic, however, to completely dislodge steppe nomads from the evolutionary trajectory of a neighboring sedentary state, or *vice versa*. It may be that a balance ought to be sought between the theories of 'dependency' and 'autonomy" by first recognizing the historicity of nomadic stereotypes while liberating the current rhetoric from these historiographical constraints; second, appreciating that the variability of nomadic behavior is partially inherent and may not be the result of external influences, and third, the degree and nature of interface between steppe nomads and the sedentary states is not consistent through history and should be reviewed in light of individual sociopolitical and environmental contexts.

1.2 The Archaeology of Nomads

In moving forward with the study of "pastoral nomadism", the two terms may need to be conceptually separated (Salzman 1972) since they each encompass a different set of variables pertaining to human and animal behaviors and their relations to the environment. If we limit nomadism to simply a measure of mobility, then pastoral nomadism can be understood as a set of herd-centric activities on which mobility is incumbent. The combined term does not, however, represent the full spectrums of what each of the concepts encompasses, since "[n]omadism can be associated with several different types of resources, as in hunting and gathering, cultivation, labor sale, and of course pastoralism" and "[p]astoralism can be associated with the entire range of

movement, from none at all to continuous movement" (Salzman 1972: 67). Pastoral nomadism is therefore just one of the many permutations of pastoralism and nomadism.

Nevertheless, even separately, the exposition of these two terms is far from categorical. The origins of pastoralism remain largely speculative (Spooner 1972, Lees and Bates 1974, Khazanov 1984) and the idea of pure pastoralism is open to debate. The development of pastoralism as an independent/ dependent economic system is predicated on a multiplicity of human and ecological factors, which include human and animal behavioral ecology, herd composition, demography, resource use, and other sociocultural variants, and not the least its association with the agrarian economy (Khazanov 1984). Nomads are not simply mobile entities, rather, the trappings of nomadism carry heavy political and cultural connotations derivative of the cumulative histories of nomads as the antithesis of sedentary states. Thus, in considering the range of material evidence indicative of the practice of pastoral nomadism in the ancient past, it pays to focus on the "many subtle and gross variations" (Salzman 1972: 67) that may be present in each conceptual paradigm rather than working within the bounds of an ideal-typical framework of pastoral nomadism, especially when considering the ancient nomads of Central Asia who are of diverse ethnic, linguistic, religious and political identities.

In the next section, I discuss two aspects of the archaeological study of pastoral nomads. First, I explain a fundamental problem in studying nomads in archaeology, namely the availability and visibility of material remains. Second, I evaluate the use of ethnographic analogies for the analysis of archaeological remains.

1.2.1 Availability and Visibility

As Cribb retraces in his book *Nomads in Archaeology* (1991), the difficulty of identifying nomadic sites in archaeology is a longstanding problem. It has been widely acknowledged that archaeological indications of nomads are indistinct and ill-defined, which makes it first, difficult to identify, and second, easily confused with village or hunter-gatherer sites which may also share similar temporality, artifact inventory (Chang and Koster 1986: 115) and occupational patterns. It "raises the possibility that nomad sites *have* been discovered but not recognized as such" (Cribb 1991: 67). Conversely, it is also possible that they be wrongly attributed to sites with "sudden appearance of a new culture in an area" or "anomalies in settlement evidence" (Cribb 1991: 66) simply because nomadic settlements leave minimal or no traces due to their transitory nature, which itself is a problematic assumption based often on ethnographic observations of absence of modern nomadic remains. Nomadic pastoralists have, in fact, been known, to use fixed structures built of permanent materials. There is extensive documentation of the use of permanent village structures by nomadic pastoralists among, for example, seasonally transhumant pastoralists who reside in the village of Baghestan in northeastern Iran (Horne 1994) and the *vaqueiros d'alzada* who spend nine months of the year in summer villages (Álvarez's 2013). Issues of using ethnographic analogies to substantiate the association of artifact scarcity with nomadic presence will be further explored below.

On that note, Houle's (2016) research in the Khanuy Valley in Mongolia has discovered that there is not always a direct relationship between mobility and absence of structures. By comparing faunal remains to material traits of modern seasonal campsites, he discovered that the range of movement is more restricted than previously thought. He

was able to identify, in the absence of above ground structures, twenty-three Late Bronze Age and Iron Age habitation sites through intensive survey and probing. Results from his zooarchaeologcial analysis establish that movement between seasonal campsites was restricted to between 5 and 7 km, which is consistent with the mobility pattern today. Because the pastoralists move their transport their dwellings with them when they relocate, there are no permanent vernacular structures.

At the same time Houle (2016) questions how reliable is the lack of architectural remains an indicator of the range of mobility, Steadman's (2015: 86, 88) argument follows that the presence of more permanent structures may suggest a "partially stationary" architectural strategy, which likely denotes "the intention on the part of a mobile group to return to the same location, and, second, that once there, they may have remained for some time".

There is then the question of the comparability of architectural traits between hunter-gatherers and pastoralists, who are both groups that practice mobility as a strategy for procuring animal resources. David and Kramer (2001) provide a neat synthesis of the most significant research (by Hole (1978), Cribb (1991), Gamble and Boismier (1991)) on this subject, which can be summarized as: 1) nomadic campsites show a more distinct preference for a sunny aspect, easy water access and wind shelter; 2) their settlements are likely larger in scale; and 3) occasionally, their structures include more durable building materials, such as stone tent footings, that would allow for repeated occupations over time whereas hunter-gatherers are more readily associated with perishable structures that are unlikely reused upon their return to the location.

All things considered, the absence of evidence or the lack of distinct criteria to identify nomadic presence was not considered by Cribb (1991) to be the primary obstacle to studying nomads in archaeology. He explains: “On a practical level there is a need to develop appropriate techniques for the location of such sites.” (Cribb 1991: 68). He stresses the importance of a better understanding of site formation processes that is “grounded in explicit definitions of concepts such as ‘nomadism’ and ‘pastoralism’,...with operational definitions of ‘nomadic campsites’, ‘pastoral camp’” (Cribb 1991: 68, 83).

Environmental modeling using geospatial software (e.g. ArcGIS) has emerged as an important approach for mapping mobile landscapes, and has been extensively applied in recent years to the study of pastoral nomadism in Central Asian prehistory (e.g. Frachetti 2008; Seitsonen et al. 2014). Wright’s (2017) pastoral campsite location modeling employs a series of variables gleaned from ecological studies, ethnography and archaeology to map and predict the location of pastoral campsites, which comprise multiple components that are often artifact-less locales. These include corrals, burials and ritual areas and other off-site areas (Seitsonen et al. 2014, Honeychurch and Makarewicz 2015). Wright’s model is premised on pull, rather than push, factors - that pastoralists are drawn to locations that are favorable in terms of slope, hydrology, wind, and vegetation.

1.2.2 On the use of ethnographic analogies

Because criteria for identifying ancient nomadic sites are scant and far from unequivocal, what we know about nomad material culture is heavily derived from ethnohistorical accounts of pastoral nomads and their material cultures. Extensive field

studies have provided detailed accounts of the inventories of nomadic impedimenta (see refs in Cribb 1991: 70-73), seasonality of migration, the internal structure of nomadic encampments (e.g. Simms 1988, Kroll and Price ch.3 and ch.4), herding practices (e.g. Beck 1991, Fijn 2011), dietary cultures, construction technologies (e.g. Saidel 2008), labor and resource division (e.g. Dawson 2002), and intangible aspects of nomadic life, such as community organization, kinship systems, social conventions, religious practices, and militant tendencies.

A fundamental question remains whether ethnographic data collected from these modern communities could be considered analogous to archaeological signatures of pastoral nomadism. Although observations of nomadic culture 'on display' (Cribb 1991: 69-73) could provide a general indication of what the possessions of an average pastoral nomadic household constitute, there is significant variability in the abundance and type of objects that may be discovered at nomadic sites in different geographical regions through history. In areas where material ownership is minimal due to the uniform scarcity of resources, nomadic inventories may even be comparable to commodities of frugal village residents (Cribb 1991: 74). Given the multiplicity of ecological and geopolitical factors that could influence the mechanisms of pastoral nomadism (as discussed in the previous section), it is difficult to argue that ethnographic descriptions of nomadic material culture are a reliable benchmark for archaeological analyses without first addressing the ethnographic data in respective behavioral and environmental contexts (Gamble 1991: 5). Considering the potential changes in the environment between the archaeological past and the recent past, extrapolating ethnographic data to archaeological patterns would require a judicious use of comparative attributes (David and Kramer 2001: 241).

With the right approach, however, ethnographic data can provide an essential "emic" understanding of pastoral activities (see also discussion in section 1.1.2). If we form criteria of comparison based simply on what intrinsic qualities undergird the concepts of nomadism and pastoralism, thereby identifying patterns of material cultures that would be unique and universal to operating mechanisms of nomadic societies, we might be in a position to maximize ethnographic data for the interpretation of the archaeological record. Instead of generalizing material cultures into what might have been "nomadic types", we would, as Dyson-Hudson (1972: 9) explains, harness our recognition of "the existential flexibility of the pastoralist's activities" to "cultivate assumptions of variability rather than invariance, of contingency rather than of regularity, of individuality rather than typicality".

Cribb's conception of the organization of nomad material culture offers one functional approach. He posits three key dimensions of nomad material culture - the amount of fixtures vs. portables, the presence of perishables vs. durables, and the value of the items ("measured in terms of the difficulty or cost of acquiring or replacing them" (Cribb 1991: 68)). Considering that the inventory of an ancient nomadic camp, before the advent of technologies such as glass and plastic and the mechanization of metal production, would comprise items made of ceramics, animal by-products (such as leather, felt, textile), wood, and plant-based objects such as basketry, items that would most likely survive in the archaeological record would be fixtures and items that are durable and expendable. These material remains may be reminiscent of sedentary sites but differences may be detected in the disproportionate paucity of items of portability and value and a reduced variety of objects representative of daily activities.

Another important measure, as Cribb (1991: 133) points out, is the distribution pattern of material remains which in the case of nomadic culture, would be more dispersed and in reduced densities. This hypothesis underlies many of ethnographic and archaeological studies on site use and activity areas at pastoral nomadic sites. Kent's (1991) comparison of two ethnic groups inhabiting an identical environment concurrently shows how anticipated mobility, rather than actual mobility, has a more significant impact on the size and structure of huts at the site and the types of material (grass or mud brick) used to build them. She compares the case of mud brick huts at Site 31, "where the inhabitants had anticipated a stay of 6 months or longer but moved after only 3 weeks" to the grass huts at Site 2 "where the inhabitants had anticipated a short occupation of fewer than 3 months, but actually stayed for 6 months" (Kent 1991: 42). Though this ethnographically observed principle of spatial patterning would be helpful for developing predictive models of the past, Kent (1991: 56) warns however, of its limitations in helping to discern archaeological site patterns because "anticipated and actual length of occupation usually coincide" and are difficult to distinguish in the archaeological record.

Another common method of site structure analysis considers the pattern of refuse disposal in modern mobile populations and the implications for delineating activities areas at archaeological sites. Simms' (1988) study draws on ethnoarchaeological research of refuse disposal patterns in hunter-gatherer populations to study the archaeological remains of a semi-nomadic pastoral settlement of the Bedul Bedouin in the Petra area of Jordan. He considers the distribution of hearths, secondary areas of refuse disposal, stone features, and burned food debris in comparison with principles of spatial organization from ethnoarchaeological studies of hunter-gatherer site structures.

Statistical modeling of ethnographically documented bone disposal patterns and butchery patterns play a strong role in elucidating the archaeological signatures of a mobile economy based on the harvest of animal products for subsistence. Binford's (1978) ethnographic study of Nunamiut caribou hunters in northern Alaska, for example, establishes animal body-part utility indices for measuring the economic utility for each bone, which include bone, fat, and marrow, to help understand discard patterns. When general utility models for animal consumption are considered alongside osteological analysis of actual bone preservation condition and age/sex profiles at archaeological sites, morphological and sociological implications of animal domestication can be better understood. Houle's (2016) study in the Khanuy Valley, as mentioned earlier, is an example of how ethnography may complement zooarchaeological analysis in studies of past pastoral societies in Central Asia. His ethnographic findings provided a contemporary backdrop and useful information with which to compare the results from the taphonomic and osteological analysis of bone specimens from fourteen structure-less Late Bronze Age habitation sites. He concludes that a localized restricted form of transhumance, similar to what is practiced today, characterizes the seasonality of migration (5-7 km between summer and winter campsites) and animal exploitation (of primarily sheep and goat, cattle and horse were also herded) in the past.

In summary, ethnographic studies are useful for devising predictive models of processes of site formation in the past. However, inferences we made about archaeological contexts need to take into consideration the range of variability that may not be accounted for in ethnographic observations as well as environmental and anthropogenic factors that may affect how material remains are preserved.

1.3 Pastoral Nomads and Architecture

Descriptions of architecture in the context of pastoral nomadism are scarce in archaeological studies since it remains of prevalent belief that the relative absence of physical structures may well be an indication of the presence of nomads. Whereas permanent buildings are not a trademark of mobile populations, in the study of sedentary societies, they are important artifacts and provide contexts for explicating household structure, social stratification, urbanization, administrative organization, and belief systems. Previously, I have discussed the difficulty of contextualizing nomadic activities given the scarcity and varying patterns of archaeological remains. In the following, I review the types of building structures considered germane to the range of behavior and activity pastoral nomadism encompasses. The objective is to consider how structures are used in pastoral nomadic societies in order to deduce the underlying principles of their spatial placement relative to human activities, which is explored in Chapter 4.

The place of residence is the principal category of space use in pastoral nomadic societies, which is traditionally represented by variations of a tent, furnished with a hearth and a stone platform. Cribb's (1991) detailed exposition of tent types in different geographical regions across Eurasia shows that they share a few structural commonalities. Whether it is the hemispherical tents like the Anatolian *topak ev* or *alacīk,* the Mongolian yurt, the Middle Eastern black tents, the barrel-vaulted tents, or the ridge-pole tents, they consist of a ribbed frame covered by a pliable material (usually woven from animal hair) (Black-Michaud 1986). Even though the tents are shaped differently on the outside, they share very similar floor plans (Cribb 1991: 91), in that the

interior is one open space without walled structural divisions. The stone platform is used for bedding or storage and generally leans against one or more sides of the walls. The hearth is a vital feature of the domestic space and "fixed campsites contain quite elaborate recessed hearths with chimneys" (Cribb 1991: 92). Occasionally, stone walls are found to enclose the tent sites, and stacked stones may be used in tent footings to create more durable structures for lengthy occupations.

It is important to note, however, that tent use is not exclusive to pastoral peoples nor do they live solely in tents (Rosen and Saidel 2010: 64). Huts and makeshift shelters are also used by hunter-gatherers (Yellen 1976, Gamble and Boismier 1991, Whitelaw 1994); in later historical periods, tents are appropriated for ceremonial usage (Gerver and Schlepp 1997). "Ethnographies have documented that some pastoralists in Iran and Bedouin in Qatar use mud brick structures on a seasonal basis." (Rosen and Saidel 2010: 65). Attributing tent types to particular ethnic groups of nomads is also problematic, Cribb (1991: 91) discovered in his fieldwork in southern Turkey that "camps of black tents and alacīk tents within a few kilometres of each other both [belong] to Yörüks, and in one case both types were present within a single campsite".

Ethnographic studies have shown that it is common for pastoralists to adopt or appropriate more substantial buildings for their own use (Cribb 1991, David and Kramer 2001; 248). Buildings from an earlier or contemporary time period could be used as seasonal residences (Álvarez 2013) or for herding-related activities. As such, when these spaces are occupied, the existing architectural forms reshape how activities and components of pastoral behavior are spatially arranged. The presence of two architectural settings in the village of Horne's field study illustrates this process. The gradual and

organic growth of the Baghestan village in observance of a nucleated layout is juxtaposed with the qal'a that has a rectangular, symmetrical layout (Horne 1991: 47, 50).

Corrals, sheds, stables, folds, and fodder storage are vernacular structures commonly associated with animal herding in modern pastoral societies. They constitute the other principal function of space use in pastoral societies. Depending on the type of building materials available locally and the duration of occupation, it has been observed that these structures could be built from a range of materials including stone, mud, dung, and brush (Chang and Koster 1986: 113).

Ethnohistorical records of nomads in Central Asia show that while they prefer to live in tents, they would use stone-built structures for grain storage (Cribb 1991: 96). Hole (1978) documented the use of storage bins, natural shelters and abandoned buildings for storage by the Lurs in southwestern Iran. In some cases, abandoned village buildings may have also been appropriated for storage use. Corrals built of stone walls piled with dung are common in Central Asia, whereas in Iran and Afghanistan, they are constructed with mud bricks with a black tent roof (Cribb 1991: 96). Horne's study in a village occupied by transhumant pastoralists in Baghestan in NE Iran notes the use of fortified multi-residence dwellings called qal'a, which were once inhabited by tribal elites at the turn of the twentieth century, as utility rooms. Her research also shows that livestock are seasonally kept inside structures and excavated subterranean areas.

Motorized transportation, building technology and the lower cost of raw materials in modern societies would have made available a wider range of building materials for the pastoral nomads, offering them greater flexibility in catering cost-benefit building solutions to their length of stay, cycle of migration, management and processing of

animals, and food storage needs. There is in general a direct correlation between the economy of space use and building construction at pastoral sites, and how much animal husbandry contributes to the subsistence economy. Buildings therefore feature geometrically simple designs with fewer ornamental details (if made of durable materials such as stone); the layout of the buildings caters to the close management of herds by the pastoralists and their kin. In some instances, however, patterns of space use created may be more complex and not necessarily economically intuitive, especially when they comprise "off-site" locales, such as "low-walled step terraces and check dams, irrigation ditches, water storage pond, and other built structures" (David and Kramer 2001: 269).

Ethnography has also suggested that land use and the layout of structures in pastoral nomadic communities are correlated with the structures of kinship and social relationships (Cribb 1991, Kent 1991, David and Kramer 2001: 270, Dawson 2002, Steadman 2015). There are, however, instances where the building-household relation is obscure. In Horne's (1991, 1994) study, she found that properties belonging to one household could be spatially dispersed, making it difficult to discern socioeconomic differences based on architecture and spatial layout alone. As she describes, "Neither by walking through the village nor by reading its plan could one securely identify all the rooms that belong to any given village household" (Horne 1991: 49).

Since it is unlikely to reconstruct structures inhabited by ancient pastoral nomads that were primarily made of perishable building materials and given the difficulty of differentiating nomadic encampments from sedentary settlements based on domestic floor plans alone, we might consider two other approaches - the location of the settlement as a whole and its intra-site spatial organization, with regard, again, to the two primary

functions of any pastoral nomadic encampment - residence and animal husbandry. Since the productivity of their herds is their chief economic concern, theoretically, pastoralists would consider measures to maximize grazing potential (Swift 1977, Fernandez-Gimenez 2000). In selecting herding locations, they would consider factors such as altitude, access to pastures and water, terrain, and fuel. Tents are particularly sensitive to environmental conditions because of they are commonly made of materials, such as felt and canvas, that are sturdy but not durable. Thus, the positioning of tents within a settlement and between settlements would show a high degree of standardization and strongly reflect the impact of slope, aspect, shelter and wind direction, etc. (Cribb 1991: 141). As Wright and Makarewicz (2015: 265) remind us, however, "there is no simple relationship between graze availability and the locus of people's habitation".

Campsite locations are also strongly affected by non-environmental factors such as state policies (Sneath 1998), herders' familial and social networks (Horne 1994, Wright and Makarewicz 2015), and ritual observations (Seitsonen et al. 2014) even though these conditions may be difficult to discern on the basis of the archaeological record alone. The impact of state-imposed sedentarization policies on pastoral settlement patterns can be witnessed in the prefecture where this thesis's archaeological fieldwork was conducted. A large number of pastoralists are being resettled into urban houses and allocated fields to cultivate crops. Contrary to state propaganda that idealizes the benefits of sedentary and urban living, research has shown that the resettled pastoralists are struggling to habituate themselves to sedentary subsistence and stay afloat in a market economy that favors large corporations (Xun and Bao 2008, Liao et al. 2015).

In lieu of year round herding, sedentary animal husbandry is encouraged under the ecological banner of *tuimu huancao* (retire livestock, restore grassland) (Yeh 2008, Shinjilt 2010). Policies such as pasture fencing, land division, and grazing ban are implemented to increase forage availability. Ethnographic research in the region has revealed, however, that these strategies are ineffective and may in the longterm lead to overgrazing and jeopardize pastoralists' livelihood (Cerny 2008, Liao et al. 2014).

How patterns of space use and movement in pastoral nomadic societies relate to other forms of non-domestic architecture, namely funerary and commemorative architecture, is little known. Information that can be gleaned from ethnographic studies is rather limited; it is restricted to general descriptions of a village cemetery, the process of internment and associated religious beliefs and ritual customs (e.g in Watson 1979, Beck 1991, Horne 1994, Fijn 2001). Both Watson (1979) and Horne (1994) note in their field studies in Iran that the modern cemetery lies outside the village limits, rather than inside as in the case of prehistoric burials (Watson 1979: 215). Watson further notes the attention to directionality in burial rites, "with head to the west and face to the south (looking towards Mecca)" (Watson 1979: 215), a custom of Shia Islam.

1.3.1 Pastoral Architecture in Bortala Prefecture Today

In today's Bortala River Valley, where fieldwork for this dissertation was conducted, pastoralists are located in different types of residence. While many have been resettled into urban areas where they would live either in a flat or a single-storey brick and cement house with courtyard, those who do not reside in villages and towns generally occupy a yurt and/or a tent. The yurt consists of a metal frame and a cotton-synthetic

composite cover adorned with token motifs, instead of the traditional felt covering. It is closed with a metal door. The canvas green army tent accommodates a variety of functions - cooking, storage, eating, and sleeping. Stone footings are used to secure yurts and tents.

Some pastoralists live in stone and cement buildings that are intended for multi-seasonal or year-round stays. There are also houses built of logs and they are occupied seasonally. In the steppe, pastoralists' places of residence tend to be found at the foothills and near the main watercourses. A sporadic few are located above the tree line. These are inhabited by pastoralists who are often sub-contracted to herd more than one family of livestock in the subalpine summer pastures.

Fig. 1.1 Types of pastoral residence in the Bortala River Valley today.

There are two types of animal pens: one is built of a low stone wall on top of which dried cow dung, used for fuel, is piled (fig. 1.1); the other is enclosed by wire fencing with metal posts. The latter is more common as it allows the enclosure to be resized and relocated easily.

1.4 Summary

This chapter sets out to identify how pastoral nomadism has been defined, in theory and method, and the spectrum of human and animal behavior it defines. First, I recounted a brief history of the discourse, which was followed by a breakdown of the range of activities to which pastoral nomads are attributed, which hinges on the execution of two things - herding and mobility. I noted that advances in methods and contributions from ethnographic research have propelled these studies into a field of its own right. Having pivoted away from research on sedentary agricultural societies and center-periphery paradigms, studies of pastoral nomads in Central Asia have contributed significantly to the understanding of patterns of land use, social and economic mobility, subsistence methods and animal exploitation. There is a current and keen interest among archaeologists to locate and document environmental and behavioral variability through spatial modeling and biochemical analysis of archaeological remains. A redirected focus on the role of sociocultural factors in ethnographic studies has however pointed to the fact that models premised on the optimal use of pastures are unrealistic. Pastoral nomadism gained definition, but what the term designates has also become more complex.

The second part of the chapter describes how pastoral nomads are studied in archaeology given their transient occupancy and usual dissociation from permanent

structures. Ethnographic references can lend insights into patterns that evince the presence of pastoral nomads but they need to be used judicially given the principles of uniformitarianism. Studies show that pastoral nomads are not necessarily less visible since they are often partially sedentary and may well occupy village buildings seasonally, their association with architecture is more unpredictable and activity patterns more fluid, which makes it difficult to formulate helpful criteria for archaeological studies.

The final section explores the types of structure commonly associated with nomadic existence. I focused on domestic architecture since this is where ethnographic and archaeological evidence is most pronounced. I described the architecture and location of pastoralist' residences in present-day Bortala Valley, this dissertation's study area. I addressed the lack of references to funerary and ritual architecture but kept it brief, it is a subject I will further address in chapter four from a different perspective. Rather than their use of architecture, the nomads' spatial engagement with the built and non-built environment at large may serve as a more effective index to reconstructing the social and economic processes at play. Chapters three and four therefore focus on identifying the environmental and social factors affecting spatial order to establish how we may best understand pastoral nomads based on how their locales are configured.

Chapter 2

Bronze Age Archaeology of the Inner Asian Steppe:

A Perspective from Xinjiang

Introduction

This chapter surveys a corpus of selected archaeological findings that reflect the development of pastoral nomadism in Central Asia in the second and first millennia BCE. It draws from published reports of research in the steppe zone of Central Asia - east-west from the mountain range of Tian Shan to the Ural Mountains and north-south from the Altai Mountains to the Hindu-Kush - but puts focus on materials found in the area of the modern Xinjiang Uyghur Autonomous Region (China). The goal is to identify relevant archaeological data to provide the necessary contexts to discuss the results of survey and excavation in Bortala Prefecture (Xinjiang) in the following chapter. In doing so, it also aims to provide an assessment of how the indigenous discourse has been shaped.

It is primarily in consideration of the second objective that the following discussion pivots around the Andronovo Culture, whose meaning and composition play a critical role in shaping the discourse of Bronze Age Central Asia. I begin by examining its definition, which is a Bronze Age Cultural Complex composed of a collection of archaeological objects that have been assigned to the same cultural group based on similarities in their physical traits. Because of its vast geographical span from south of

the Urals to western Xinjiang and explicit shared physical traits, the Andronovo material record has become a figurative nexus with which to trace developments in the Central Asian Bronze Age in terms of subsistence economies, languages, and cultures and ethnicities. Next, I give a broad description of its connection to steppe cultures that are contiguous in space and time, as well as to contemporaneous findings from Xinjiang. I then present the main types of archaeological material in question, which are ceramics, metal objects, and architectural structures. I limit my discussion to the period between 2000 BCE and 800 BCE, during which the practice of pastoral nomadism was the defining feature of livelihood in the Eurasian steppe. This is also the period to which settlement stone structures analyzed in the Chapter 3 are dated. Lastly, I evaluate the validity and limitations of the use of typology in the study of the archaeology of Xinjiang relative to Central Asia.

2.1 The Andronovo Culture of the Eurasian Steppe

The Andronovo encapsulates a principal collection of artifacts tantamount to a material culture characteristic of the Bronze Age Central Asian steppe. These artifacts are connected to the development of pastoral nomadism and agro-pastoralism beginning from the third millennium BCE in a region that consists of unforested temperate montane grassland intersected by scrublands, deserts and oases. Aridization in the mid-latitudinal zone (Chen et al. 2008) and the growth of husbandry technologies such as the expanded use of animal secondary products such as milk (Yang et al. 2014:185) and wool (Abuduresule et al. 2004) promoted the practice of transhumance herding in the Eurasian

steppe. The formation of pastoral nomadic groups in the steppe was further encouraged by the introduction of accelerated forms of locomotion through the domestication of the horse and the invention of the wheel (Anthony 2010). Increase in local mobility opened routes of communication and exchange that fostered the trade and exchange of materials and ideas across Central Asia.

Findings of metallurgy (Mei 2009, Park et al. 2011), ceramics (Doumani et al. 2012, 2015), equine domestication (Levine et al. 2000; Outram et al. 2009, Francfort and Lepetz 2010), mortuary and ritual stone structures (Rudenko 1970, Allen and Erdenebaatar 2005, Fitzhugh 2010), in particular, have augmented our understanding of food-producing economies (Frachetti and Benecke 2009, Jia et al. 2011, Outram et al. 2012, Spengler et al. 2014a, 2014b), sociopolitical structures, trade networks, demography (Keyser et al. 2009, Cui et al. 2010), and ritual practices (Allard and Erdenebaatar 2005, Fitzhugh 2010).

The name "Andronovo" comes from a village on the Yenisei River in Southern Siberia, near which burials were found with a distinct pottery type (discussed later in this chapter) later named "Andronovo" and human remains in the flexed position. It became at first a systematized classification of materials from the Minusinsk lowland with Teploukhov's (1927) initial study but expanded to include an area from southern Siberia to west of the Urals (Koryakova and Vladimirovich 2007: 123, Kuzmina 2001).

The eponymous Andronovo Culture is used to describe a collection of materials that appeared first in the steppe/ forest steppe zone west of the Ural Mountains. It lasted over a millennium between 4000 and 2800 BP by radiocarbon dating (Kuzmina 2001: 1). Due to its vast geographical spread, it has been associated with various steppe cultures by

relative chronology. It follows the early Bronze Age Yamna (Pit-Grave) Culture in the west and the Eneolithic Afanasievo Culture in the east. It is partially concurrent with the Okunevo Culture of the Minusinsk Basin, which lasted until mid-second millennium BCE; it precedes the Karasuk Culture that occupied an area from the West Siberian Plain to the Aral Sea, which replaced the eastern part of Andronovo during the second millennium BCE and remained until mid-first millennium BCE. Similarities in settlement layouts and dwelling designs between the Andronovo and the contemporary Timber Grave (culture) of the Urals (further discussed in section 2.1.3.3) suggest their likely affiliation (Kuzmina 2007: 47).

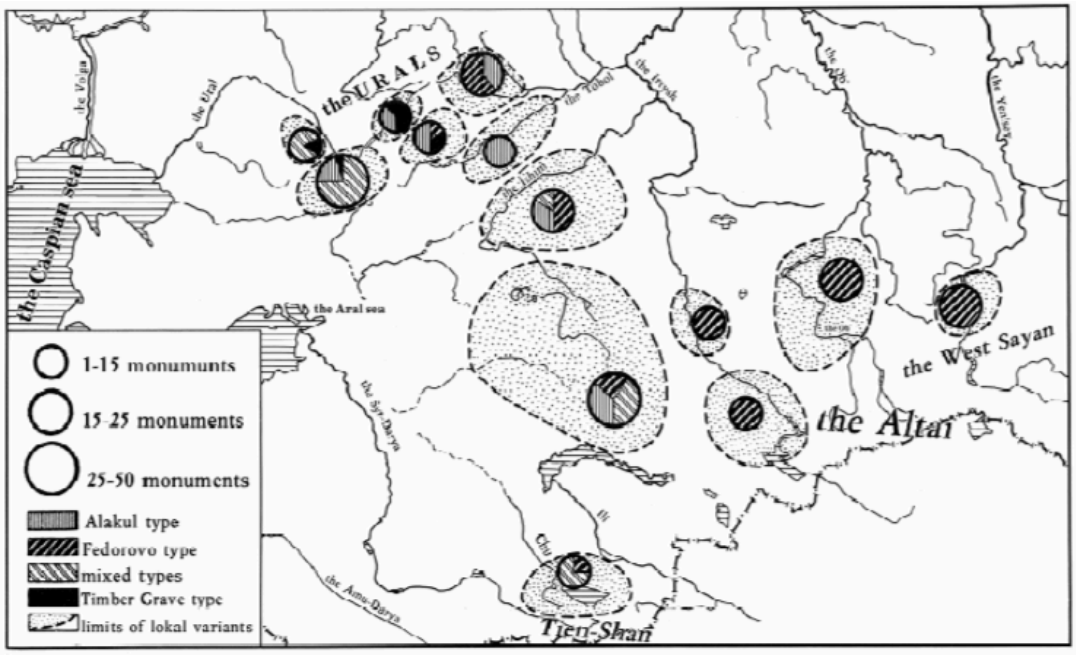

Fig. 2.1 The distribution pattern of the Andronovo types (from Kuzmina 2001: 602, map 11).

The Andronovo has been sub-divided into regional cultures (fig. 2.1) based on variations in the physical characteristics of the archaeological remains. The sub-traditions of Sintashta-Petrovka, the contemporaneous Alakul and Kozhumberdy, and Alexeevka

sequentially covers the southern Urals, northern, western, and central Kazakhstan from 4000 to 2800 BP (Kuzmina 2001: 6- 18). The Fedorovo sub-tradition, dating to the same period as the Alakul, occupied the same region but its influence also extends into eastern and southern Siberia, the Tian Shan, the Pamir, and reaches in the south to northern Afghanistan, and is generally considered the Andronovo type of east Kazakhstan (Kuzmina 2001: 10).

2.2 The Shape of the Andronovo in Xinjiang

2.2.1 Definition and Debates

To begin, it should be noted that the Andronovo cultural scheme has been applied to dating and classifying contemporaneous archaeological assemblages discovered in Xinjiang where material traits are analogous. It is common for newly excavated assemblages to be designated a new eponymous "culture", resulting in the creation of a multitude of local cultures, a situation not unlike that of the Ural steppe. Cultural designations of archaeological assemblages are often created haphazardly by excavators and researchers and lack standardization. There is also a traditional adherence to cultural typologies that accompanies a strong bias toward investigating funerary structures which have been discovered in large numbers. This is one important reason why Xinjiang archaeology remains object-centric. Settlement archaeology is largely absent and settlement structures are often overlooked and understudied.

Over the course of the history of research, those most well-known have included - Gumugou 古墓溝, Xintala 新塔拉, Wupu 五堡, Yanbulake 嚴布拉克, Nanwan 南灣,

Sharmirshak (Qie'mu'erqieke 切木爾切克), Haladun 哈拉頓 and Aketala 阿克塔拉 (Chen 1987, Debaine- Francfort 1988, 1989, Chen and Hiebert 1995, Mei and Shell 1999 and 2002, Shao 2008), but the complete list is much longer than this. Deducing chronological and spatial relations among different so-called cultures has become therefore unnecessarily challenging. Furthermore, since descriptions of archaeological findings are often piecemeal and some remain unpublished long after they are excavated, it makes it even more difficult to interpret beyond the attributions designated by the excavators of the site and extract contexts that would benefit archaeological interpretation. What is often compared are the packaged "archaeological cultures" and their presumed geography and time span, the context of their connections is seldom explored independent of the cultural designations.

Despite the problematic use of "archaeological cultures", it is nonetheless worthwhile to delineate "the shape of the Andronovo in Xinjiang" from this particular perspective because it will help shed light on the current state of research and some inherent methodological problems. Furthermore, it shows appreciation of the fact that Chinese literature pays considerable attention to the relation of Bronze and Iron Age Xinjiang to the Andronovo. Considering the issues mentioned above, however, delineating the fuzzy geography and timeline of the Andronovo in Xinjiang based on the established culture types would be a difficult and unproductive approach. Thus, the following discussion does not set out to critique the validity of each of these cultural attributions, for which a comprehensive review of the archaeological records in question would be necessary. It instead assesses the makeup of what has been regarded as the

Andronovo, irrespective of how local appellations have been applied. I will illustrate with a few examples below.

There is a longstanding debate that has spanned over two decades since the 1980s on the cultural attribution of the well known Agarsheng 阿尕爾生 bronze hoard, which consists of 13 pieces of axe, sickle, chisel and hammer discovered during canal work in Agarsheng Township of Gongliu 鞏留 County, Ili Prefecture. It was surmised that they were closely related to Andronovo Culture whose elements were supposedly present in the neighboring counties as well (Wang et al. (eds.) 2008: 34). I will address the breadth of this debate in section 2.1.3.2 on "metal artifacts". For the purpose of the present discussion, I would like to draw attention to how it is presented in a 2008 museum catalog.

Although this set of production tools is attributed to the Andronovo, its adzes and sickles show remarkable formal similarity to those discovered at the site of Sazi 薩茲 in Tacheng 塔城 City, which are assigned to Sazi-Qiongkek Culture (fig. 2.2). It was reported that the lowest occupational layer of the type site of Sazi-Qiongkek contained elements of Andronovo material culture (Lin 2011 (original reference: Liu et al. 2003)). Without corresponding results from metallurgical analysis, scientific dates, and further information on burial contexts, however, assigning these objects to different designations of archaeological cultures does not help define the relationship of Sazi-Qiongkek 薩孜-窮科克 Culture to the Andronovo, or the Agarsheng bronzes. In what respects are these cultures related and how are these connections manifested? And are they unrelated to the contemporaneous Deerstone Culture in Ili Prefecture, which is characterized rather by

stone mounds, stone circles, courtyard burials and deerstones (erected stone slabs carved in relief). Devising appellations before careful analysis can impede the very understanding of said cultures and their material records.

Fig. 2.2 Comparison of bronze sickles of the Agarsheng type to bronze sickles of the Sazi type (Wang et al. (eds.) 2008: 34, fig. 1; 41, fig. 12). Left: Upper- from Nileke County. Length: 24 cm, width: 5.4 cm. Middle- from Zhaosu County. Length: 23.8 cm, width: 4.5 cm. Lower- from Gongliu County. Length: 22.6 cm, width: 6.5 cm. Right: from Tacheng region. From top to bottom: Length: 24 cm, width: 5.1 cm. Length: 23.5 cm, width: 4.3 cm. Length: 22.4 cm, width: 4.5 cm. Length: 14.5 cm, width: 2.5 cm.

This so-called Deerstone Culture may be equivalent to what has been coined Sandaohaizi 三道海子 Culture. Wu Guo (2008: 196), the lead excavator of the site of Sandaohaizi, which is known for its large conical stone mound of *ca.* 15 m high, explains that this culture comprises three subtypes, namely Wushijin 烏什金 Culture, A'er'ran 阿爾然 Culture, and Huahaizi 花海子 Culture, and spans the area of Mongolia, Transbaikal and Tuva regions, and northern Xinjiang, lasting from 1300 BCE to 500

BCE. It has been speculated that Sandaohaizi Culture was developed from Qier'ermuqieke Culture, which is a process also closely connected to Okunevo Culture and bronze cultures of Northern China. Sandaohaizi is described as a herding culture that gained prosperity in the period from late second to early first millennium BCE as a result of the propagation of horseriding technology and the ritual importance of Sandaohaizi itself (Guo 2008: 196-7). In the absence of environmental and site-based contextual data, this kind of cultural generalizations and pan-regional deductions of trans-cultural influences, developments, are however rarely conducive to tracing the nature of past human behaviors and activities.

Another example of cultural attribution as an impediment may be found in eastern Xinjiang. The culture of Yanbulake 嚴布拉克 is named after the Yanbulake Cemetery, which is dated to 700-1300 BCE, and include three other cemeteries in the Hami Region. The Yanbulake Cemetery contains remains of habitation and 90 graves of three chronological periods. It was surmised that the culture might have been related to the people of the Gumugou Cemetery (Li 2002), which in turn may be affiliated with Afanasievo Culture, except for its absence of pottery (Kuzmina 2007: 252).At the same time, scholars remain divided over its purported ceramic connection with the Bronze Age cultures of the Gansu-Qinghai region (Li 2002 on Chen 1982 and Shui 1993). Its connection to the development of the later Subeixi Culture in Turfan is speculated also on the basis of ceramic similarites (Guo 2008: 44).

The aforementioned deduction that the Gumugou 古墓溝 Cemetery is more akin to the Afanasievo Culture and not the Andronovo is explained in the literature by the

complete absence of ceramic remains, the presence of pure copper rather than bronze artifacts, wooden vessels, faunal remains, and the practice of specific burial rites, namely, the supine positioning of skeleton, circular and concentric fences, timber roofing (Mei and Shell 1999, Kuzmina 2008: 94-95). It is, however, not always clear how the assemblage could be incorporated into the existing typology since the prerequisite elements of these "archaeological cultures" are only present in part. Considering the fact that even the Iron Age and the Bronze Age of Xinjiang can be difficult to set apart (Chen 1990), relating archaeological materials based on arbitrary cultural types may risk obscuring undiscovered patterns and overlooking the possibility that multi-period occupations may not be culturally continuous.

There are many more instances where the relation between archaeological culture and the material attributions is less than clear and consistent, but what is more pertinent to the present discussion is to recognize, given the history of the discourse, how materials may be interpreted, in what contexts and by what means. Whether these "cultures" of Xinjiang are regional derivatives of steppe cultures in the existing scheme or if they reflect local developments that incorporate varied degrees of borrowings from China or the west remains inconclusive.

Attempts to correlate Xinjiang with the rest of the Andronovo sphere on the basis of the archaeological record are grounded primarily in ceramic remains, metal artifacts, and burial rites but these comparative elements are geographically sporadic and non-uniform. Thus, coining new "cultures" each time a different blend of material elements is found, especially when it is not accompanied by scientific dating and analysis in material science is premature and misleading. It may be more effective to consider the cultural

term and its packaged definitions sparingly so that the true variability of the archaeological record may be brought to light. At the same time, attention should be paid to devising a more prudent and standardized approach to classification that would be amenable to cross-regional comparisons.

Another contentious issue is the correlation of material cultures with the movement of linguistic and ethnic groups. Arguments put forward by Colin Renfrew and reviewers of his *Archaeology and Language - The Puzzle of the Indo-European Origins,* for example, has captured the core of the debate on the subject of negotiating linguistic models of population movement with archaeological data that may suggest more complex and less uniform patterns of migration. While consensus is reached on questions such as the relation of Proto-Indo Europeans with the progenitors of wheeled technology in the Caucasus (Renfrew 1988, Anthony 2009), the manner in which subsequent linguistic and cultural transitions took place across the steppes remains an incomplete synthesis as attempts to reconcile multiple sources of data from archaeology, language, genetics, and paleoecology continue.

In tracing the origin of Indo-Europeans, which has been a prevailing interest among historical linguists and archaeologists of prehistoric Central Asia (e.g. Renfrew, Kuzmina, Mair, Mallory), an important hypothesis that has been put forward is that the eastward spread of the Yamna culture corroborates the migration of Indo-Europeans tribes, who were antecedents of Tocharian (an Indo-European language) speakers, to the area later occupied by the Afanasievo Culture in southern Siberia where Tocharian groups grew and later expanded south into the Tarim Basin (Mallory and Mair 2000, Mair 2005, Mallory 2010). The subsequent Andronovo epoch is also considered

homologous with the development of the Indo-Iranian (Indo-Aryan) ethnolinguistic groups, which accounts for the emergence of the Sakas and Scythians towards mid- first millennium BCE. On the basis of presupposing a uni-lineage that connects the disparate groups of steppe population through time, ethnographic examples are used to explain cultural styles of earlier periods (e.g. Kuzmina 2007: 50-57) although these cross-period comparisons are conceivably ill-founded. The objective of the present study is not to probe the correlation between language and archaeology, it is nonetheless useful to draw attention to the role of linguistic theories in deducing trajectories and spatial patterns of how steppe cultures developed in the Bronze Age. The following discussion considers primarily archaeological data but takes into account models from other disciplines where applicable.

2.2.1 Material Remains

Materials diagnostic of the Andronovo Culture are composed primarily of ceramics, metal artifacts and architecture; the majority are discovered in funerary contexts. The range of objects of ceramics and metal includes a miscellany of storage vessels, weaponry, agricultural implements, horse-riding paraphernalia, and ornaments; these manufactures represent technological innovations connected to pivotal social and economic changes across the steppe region during this period. These include accelerated and more developed means of conveyance, transition to nomadic or semi-nomadic pastoralism, increased social differentiation, and mounted warfare. The following discussion by no means suggests that the Andronovo is a cultural designation that corresponds to the Bronze Age of Xinjiang; other substantial cultural collections include

Qiermu'erqieke 切木爾切克 and Tianshanbeilu 天山北路, and beyond that, there exists a corpus of material that falls under a myriad of typologies and classifications. The Andronovo is selected in this instance to set focus on a more or less cohesive group of materials that may prove most relevant to the analysis of the field data from Bortala in the next chapter. One other pertinent consideration is that it would be impossible to digest the sizable volume of data from China on Xinjiang archaeology that are nonetheless often lacking in detailed descriptions and clear illustrations. Thus, to aid analysis, in every instance, I will select materials of which there are detailed descriptions and accompanying illustrations.

According to reports of archaeological findings to date, the collective features of Andronovo ceramics and metals can be described as follows:

2.1.3.1 Ceramics

These are handmade vessels in globular shapes mostly with an open orifice, a direct or slightly articulated rim, and a flat bottom. The common shapes are bowls and jars with a profile of a straight wall connecting to a collar right below the orifice. The vessel is deep rather than wide; the height of the vessel exceeds its maximum diameter. The clay has a coarse temper and was slow-fired, there is no slip and it is not painted. The most visually distinct feature of the Andronovo pottery is etched geometrical patterns arranged in bands across the collar, the body and the base of the vessel. These include but are not exclusive to motifs of herringbone, pyramids, triangles, swastikas, meanders, festoons, zigzags, and finger-prints (Mei and Shell 1999, Kuzmina 2001: 4, Kuzmina 2007). Differences in the pottery's physical features are the basis for characterizing regional and chronological variants of the Andronovo Culture and date archaeological assemblages.

Ceramics are one of the principal determinants of Andronovo influence in Xinjiang and have been mainly recovered from burials. Ceramic finds with material and decoration comparable to the Andronovo types discovered in Kazakhstan and further west have been found in northwestern and western Xinjiang, at sites such as Aduuchuluu (Adunqiaolu 阿敦喬魯), Tarbagatay (Tacheng 塔城), Xintala, Urumqi, Jimsar (Jimusa'er 吉木薩爾), and Qitai 奇台, suggesting that the Andronovo ceramic tradition was present in the southern Dzungarian Basin and had reached as far as the southern foothills of the Tian Shan (Mei and Shell 1999). It is here at the site of Xintala (east of the Karasahr (Yanqi 焉耆) Basin, Bayingol Mongol Autonomous Prefecture) that the confluence of two traditions can be found - "one represented by painted pottery…most likely of local origin; the other characterized by a bronze socketed axe and grey-black pottery with incised and stamped decoration" (Mei and Shell 1999, see also Lü 1988). The second is Andronovo, and the first has been speculated to be related to Karasuk (Guo 2012: 320) or Bronze Age cultures in Gansu (Mei and Shell 1999).

In northern Xinjiang, coarse non-slipped vessels decorated with geometric etched patterns distinctive of Andronovo pottery in either a flat or rounded base are typical Bronze Age wares of the Altai region. There are altogether approximately 58 pieces that are now stored in various county museums including Bu'erjin 布爾津 and Habahe 哈巴河, although most were not obtained from archaeological excavation (Bureau of Cultural Relics of Altay Prefecture and Altay Prefectural Museum 2014: 207-214). The material and decorations of the Altai collection are remarkably similar to the vessels discovered at various sites in Central Kazakhstan, except that the vessels from Kazakhstan are made of

darker clay, have more precise etchings, and the vessel shape is highly uniform across different sites with an open orifice, a straight or slightly flared rim, under which is a slight constriction followed by a rounded body tapering towards a smaller flat base (Popescu et al. 1998: 108-111). The Altai vessels show a larger range in form, particularly, in the base of the vessel, which are often rounded or pointed (fig. 2.3).

Fig. 2.3 Comparison of Andronovo ceramic vessels from Altai Prefecture, China and Central Kazakhstan. Left: Ceramic vessel from the Necropolis of Tau-Tary. Incised, burnished ware, dated to 14th -11th centuries BCE. Orifice measures 19 cm in diameter, vessel height 18.3 cm (Popescu et al. 1998: 111, fig. 19). Right: Ceramic vessel in the Altai Municipal Museum collection. Dated to 20th -8th BCE . Vessel height 23 cm, orifice measures 14 cm in diameter (Bureau of Cultural Relics of Altay Prefecture, and Altay Prefectural Museum (eds.) 2014: 208).

Further east, the Andronovo pottery is scarce and appears to be substituted with a painted pottery tradition that is distinctive of the eastern Tian Shan region. An example is the pottery of what is dubbed Yanbulake Culture, which are hand-made red sandy wares that are thought to be inspired by ceramic traditions in the Gansu-Qinghai region (Li 2002: 174).

Adjacent to Xinjiang, sherds with similar features of incised or impressed patterns have been found, for instance, in the Murghab Delta in Turkmenistan. They were found to be associated with camp-site remains but bear no relation with the fine-tempered wheel-made pottery made locally (Cattani et al. 2008: 42). A ceramic production area with a semi-subterranean ceramic kiln was identified at one of these sites, Ojakly, where evidence for non-permanent architecture and living spaces have been found (Rouse and Cerasetti 2014). Macrobotanical remains retrieved from the kiln date the site to ca. 1950-1300 BCE (Spengler et al. 2014). From the sites of Begash and Tasbas in Kazakhstan, Doumani and her colleagues recovered ceramic sherds dated to the late second millennium BCE with textile/ cordage impressions that were also noted in a few Andronovan assemblages in southern Russia (Doumani and Frachetti 2012: 375; Doumani et al. 2015). At Botai, Outram et al. (2011: 123, 125-6) discovered in the cemetery of Temirkash large Andronovo-styled "feasting" pots that were repaired with bronze staples, suggesting that ceramic vessels were probably no longer produced exclusively for use in funerary rites and that they were repaired for their sentimental value.

2.1.3.2 Metal Objects

Products characteristic of Andronovo metallurgy range from weaponry, horse trappings, objects of ritual or social value associated with burial rites, and agricultural implements. The Andronovo bronze, manufactured through a copper sulphide reduction process, contains 3-10% tin (Sn) (Mei 2009) and therefore distinguishes itself from other bronze alloys. Significant sources of tin have been located in Uzbekhistan, Tajikistan,

and Afghanistan (Mei 2009). Metallurgical debris and furnaces are ubiquitous in the fortified structures of the settlements at Sintashta (Chernykh 2004, Kohl 2007, Hanks and Drennan 2011: 163), suggesting that metal production was an important driving force of steppe economy (Kuzmina 2008: 59). Metal ores were sourced locally from mines such as Kargaly (Kuzmina 2001: 4, Chernykh 2004). The evidence for extensive metalwork in the southern Urals heralded the growth and diversification of bronze-making productions across the steppes in the following two millennia. The creation of distinct alloys for different uses (Kuzmina 2001:4, Mei 2009), ranging from weaponry to ornaments, and their ornate designs (Stark et al. 2012) attests to developed pyro-technology, selective raw material extraction, and craft specialization. The possession of metal objects may also be an indication of status in society as inhumations are often accompanied by gold, copper, and bronze ornaments worn by the deceased, such as earrings, bracelets, anklets, and mirrors (Kuzmina 2001: 4).

The presence of metallurgical elements of the Andronovo Culture in Xinjiang is evident. From Tacheng 塔城 in the northwestern part of the province, for example, copper and bronze finds of ornaments and agricultural implements were discovered. It has been determined that the chemical composition of these bronze objects matches that of the Andronovo bronze (Mei et al. 1998, Mei and Shell 1999). Adze, axe, sickle, and gouge were discovered at multiple sites in Ili Kazakh Autonomous Prefecture bordering Kazakhstan; bronze implements discovered in Nileke County, for example, are characteristically Andronovo (Institute of Archaeology 1991; Wang et al. 2008). The famed Agarsheng hoard was discovered here, in Gongliu County. Excavator Wang Binghua classified the 13 copper and bronze objects, which include “three lop-headed

axes, three sickles, five chisels, one celt-hammer as well as there adzes with a flange" (Kuzmina 2008: 101) as Andronovo based on their form (Wang 1985, Mei and Shell 1999), but alternative designations have been suggested by other researchers and synthesized by Kuzmina (2008). Debaine-Francfort (1989) assigns it to the Saka Culture but also considers the possibility of an Andronovo date. Peng (1998) dates it to 1500-1000 BCE by comparing it to late Andronovo contexts in Kyrgyzstan but Kuzmina (2008: 92, 101) disagrees with his chronological placement. Other significant metallurgical finds in Ili Prefecture are located at the settlement site of Sazi and the copper-smelting site in Nulasai 奴拉賽, both found in Nileke 尼勒克 County.

According to Gong's (1997) periodization of ancient metallurgical trends in Xinjiang, the period between 2000 and 1000 BCE is characterized by the appearance of bronze and the phasing out of copper. Archaeological assemblages dated to this period are found along the northern and southern foothills of Tian Shan, in four main geographical areas - Hami Basin, northern foothills of eastern Tian Shan, Karasahr (Yanqi 焉耆) Basin, Lop Nur (Luobupo 羅布泊) region - in addition to sporadic finds in Karahoja (Gaochang 高昌), Aksu (Akesu 阿克蘇), and Altai (Aletai 阿勒泰) regions (Gong 1997). 36 radiocarbon dates have been obtained and they fall in the period between 1800 and 1000 BCE (Gong 1997). Mei and Shell (1999) posit that since no finds of other archaeological cultures in this area can be dated to the same period, the existence of Andronovo metallurgy in western Xinjiang is unequivocal. The figure below compares the bronze axe and sickle discovered in the Altai Prefecture to those of the Agarsheng hoard from Ili, which are strikingly similar. There remains, however, a large repository of

bronze artifacts that are not (yet) identifiable by the major cultural complexes, the Andronovo being one of them (Molodin and Komissarov 2004), our understanding of metallurgical cultures in Bronze Age Xinjiang is still therefore fragmented.

2.1.3.3 Architectural Structures

The Andronovo Culture encompasses a large corpus of Bronze Age structures extending from south of the Urals to northern Kazakhstan, with its influence reaching as far as western Xinjiang in the east. Based on research to date, the origin of characteristic Andronovo architecture is traced to the Eneolithic in the steppe zones west of the Ural Mountains, subsequent to Yamnaya (Pit-Grave) Culture. It is considered closely analogous to Timber-Grave (Srubna) Culture (1700-1200 BCE) in the Caucasus while being distinct in layout and construction technique from the Near Eastern architectural tradition (Kuzmina 2007). On the eastern edge of its spread, the Andronovo succeeds the Afanasievo Culture of the South Siberian Eneolithic and outlasts the contemporaneous Okunevo Culture.

It is a building tradition Kuzmina (2007: 47, 50, 56) describes as characteristically Central Eurasian and represents a material culture connected to Indo-Iranian lineages. She considers its location and architecture as attributes of a homogenous tradition of household economy that would become a cultural predecessor of domestic and funerary structures built by the Saka, the Scythians, and the Sarmatians in the first millennium BCE. Following this hypothesis, she draws on ethnographic and archaeological examples of architecture of later Indo-European speakers to explain the structure and use of

Andronovo dwellings (Kuzmina 2007: 47) although these analogies are yet to be substantiated.

Remains of Andronovo architecture, which comprises domestic, funerary and defensive structures, have been identified in primarily three regions - the Urals, northern Kazakhstan and western Kazakhstan. Smaller settlements are typical of the western region (Shandasha, Ushkatta 2, and Tasty-Butak). In the east, larger settlements in the late Bronze Age contain a dozen to several dozen structures. Kuzmina (2007: 40, 60, 66) classifies the Andronovo house into three types - "long-term semi-subterranean structure" (divided into wooden and stone constructions) constructed with clay, sand and stones and breastwork; "light timber-frame constructions, rectangular, polygonal or rounded in plan", and "*kibitkas*, large covered vehicles on solid wheels", which is likely inferred from the extensive accounts of removable yurts and tent carts in historical ethnography (Gervers and Schlepp 1997). There may be a certain degree of validity to Kuzmina's typology but how these house types may be connected on a single evolutionary trajectory of architectural tradition can only be determined after substantive research into respective archaeological and historical contexts, especially when the materials cover a large geographical span.

Below, I compare selected findings from the greater region of Central Asia as a whole to specific examples from Xinjiang, in three architectural aspects - location, form and layout, and building material. The goal is to identify variability and attributes to be considered in the analysis of architectural remains in the Bortala Valley in the following chapter. The general focus of the discussion is on settlement and funerary structures which make up the majority of the archaeological sites, and limited to tangible

architectural forms, thus excluding indirect evidence of activity areas and pre-existing structures. Given the limited information available to draw site-specific comparisons cross-regionally, descriptions of findings outside of Xinjiang will be broad and serve only to highlight the key representative architectural characteristics in each corresponding region.

i) Location

Andronovo settlements are consistently found in the vicinity of rivers, on flood plains or the first river terrace. In the forest-steppe zone of the Urals, they are often located "in the very floodplains inundated in modern times" whereas in Kazakhstan, they are found on the first river terrace (Kuzmina 2008: 38) and in the high mountains. The placement of the majority of cemeteries in the Semirechye, for example, suggests its connection to mobile pastoralism (Kuzmina 2007: 246). They are located on mountain slopes and in the high mountains, taking into account wind direction and the aspect of the building's entrance, which is often on the leeward side. Some of these structures face the river (Kuzmina 2007: 44).

Bronze Age stone structures are ubiquitous in the steppes of western and central Mongolia but they are not assimilated into the Andronovan typology despite similarities in certain construction types. Results from surface surveys by Esther Jacobson-Tepfer and her team in the Mongolian Altai provide ample examples. Among them, it is worthy to note that khirigsuurs, which are a typical Bronze Age ritual construction composed of a central mound, radiating pavements, and concentrically placed stone circles on the perimeter, are generally located "on open plains or on terraces overlooking rivers" (Jacobson-Tepfer et al. 2010: 24). Another type of Bronze Age stone mound made of

sharp talus or heavy boulders are found “along terraces” or “across elevated slopes” (Jacobson-Tepfer et al. 2010: 25).

Extensive surveys conducted in the Khanuy Valley (Allard and Erdenebaatar 2007) and the Egiin Gol Valley (Wright 2006, Honeychurch et al. 2007) also located a large number of stone built structures including khirigsuurs, slab burials, and various forms of rectangular and circular enclosures. Many of them are dated to the Iron Age Xiongnu period and the Turkic period of the second half of the first millennium CE, but there is also a sizable collection of Bronze Age remains that exhibits a strong structural affinity with Bronze and Iron Age remains in the Minusinsk Basin, prompting comparisons with Okunevo Culture and the later Karasuk-Tagar Culture (Kovalev 2005, Honeychurch 2015). The stone slab graves, in particular, are similar in form to the slab graves of Xinjiang, which are purportedly Andronovo-typed architecture. They are both of quadrangular proportions outlined by standing slabs on the perimeter although they differ in several respects: the enclosure of the Mongolia slab grave is usually piled with stones, the corners of the structure may be marked by taller standing stones, and grave goods are uncommon (Miyamoto 2016). The *terminus ante quem* of the Slab Grave Culture of Mongolia is the late first millennium BCE (Miyamoto 2016: 81), postdating the Andronovo by almost a millennium.

In western Xinjiang, which I include Ili Kazakh Autonomous Prefecture, Bortala (Bo’ertala 博爾塔拉) Mongol Autonomous Prefecture, and Tarbagatay (Tacheng 塔城) Prefecture, the structures are commonly situated higher than 1000 m above sea level, on tablelands and piedmonts running into valley floors. They are also more often found on south-facing slopes. The sites of Kuokesuxi 闊克蘇西 in southern Kuruktag Mountains

(Xinjiang Institute of Archaeology 2012b), Tangbalesayi 湯巴勒薩伊 (Xinjiang Institute of Archaeology 2012a, Ruan 2012), Qialege'er 恰勒格爾 (Xinjiang Institute of Archaeology 2014a), and Wutulan 烏吐蘭 Cemetery (Xinjiang Institute of Archaeology 2014b), Kukesu River West 庫克蘇河西 Cemetery (Ruan 2012) in Ili Prefecture are found on river terraces, foothills and valley floors in the northern ranges of Tian Shan. The site of Kalasu 喀拉蘇 where Andronovo pottery was found is situated on a piedmont north of Kashgar (Kashi 喀什) River, a second-order tributary of Ili River (Xinjiang Institute of Archaeology et al. 2008). In Bortala Prefecture, sites with architectural structures are scattered on valley floors, piedmonts and tablelands on either side of the Bortala River that flows in between the Borohoro (Boluokenu 博洛科努) Range of Tian Shan to the south and the Dzungarian Alatau (Alatao 阿拉套) to the north. A selection of these sites are analyzed in the next chapter.

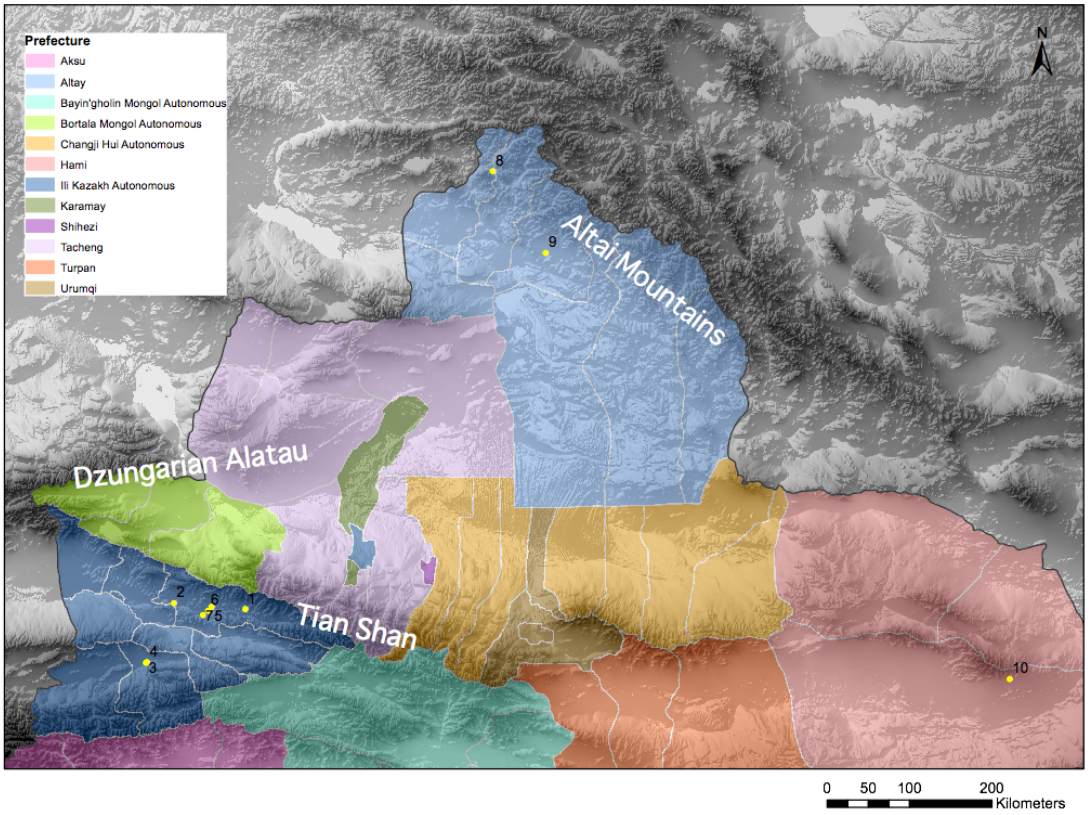

Fig. 2.4 Map of Northern Xinjiang showing sites with stone structures of Bronze Age typology in Xinjiang Uyghur Autonomous Region. 1. Jirentai, 2. Kalasu, 3. Kukesu River West, 4. Kuokesuxi, 5. Qialege'er, 6. Wutulan, 7. Tangbalesayi, 8. Tuwaxin, 9. Shamirshak, 10. Yanbulake. (This map excludes sites in the Bortala Valley of Bortala Mongol Autonomous Prefecture, which are discussed in the next chapter).

The Bogda (Bogeda 博格達) Range marks the eastern extent of Tian Shan into Bayingol (Bayinguoleng 巴音郭楞) and Kumul (Hami 哈密) Prefectures, where sites such as Xintala, Yanbulake 焉不拉克 Cemetery (Chen 1990, Wong and Tan 1990), Hongshankou (Northwest University et al. 2014), and Dongheigou 東黑溝 are found. Burial and settlement structures at Dongheigou of Barköl (Balikun 巴里坤) Kazakh Autonomous County are found on valley floors at *ca.* 2100 m above sea level (Northwest

University et al. 2006). At Hongshankou, ancient structures are found in the delta and foothills below the fir vegetational zone (Northwest University et al. 2014).

The Shamirshak (Qiemu'erqieke 切木爾切克, formerly Ke'ermuqi 克爾木齊) Cemetery (fig. 2.4) is most representative of Bronze Age in the Xinjiang Altai and the Dzungarian (Zhunge'er 准葛爾) Basin, the area of which falls under the administrative region of Altay (Aletai 阿勒泰) in the northern part of the province (Xinjiang Institute of Archaeology 1981, Shao 2008, Wang 2013). It has been posited that Sharmirshak Culture is possibly affiliated with Okunevo Culture to its north, which is partially concurrent with Andronovo Culture (as discussed above) (Xinjiang Institute of Archaeology 1981, Shao 2008, Wang 2013, Kovalev 2005). One of the definitive characteristics of Sharmirshak Culture is the presence of anthropomorphic statues adjacent to burial structures (Wang and Qi 1995). Dates of these structures range from the Bronze Age to the Turkic period. The settlement site of Adundebulake 阿墩德布拉克 located in the area of Altay County is a square enclosure outlined by large stones, it is situated adjacent to a gulley on an alluvial fan (Bureau of Cultural Relics of Altay Prefecture, and Altay Prefectural Museum (eds.) 2014). Another settlement structure (360 m2) with interior partitions is found interspersed with burial cairns in a similar geographical environment in the summer-autumn pasture of Yutasi 玉塔斯 Village (Bureau of Cultural Relics of Altay Prefecture, and Altay Prefectural Museum (eds.) 2014). Other prominent and recently excavated Bronze Age sites include Tuwaxin 圖瓦新 Village in Burqin (Bu'erjin 布爾津), located on a piedmont (Xinjiang Institute of Archaeology 2014c), and Tuoganbai 托

干拜 Cemetery on a mountain ridge near the County of Kaba (Habahe 哈巴河) (Xinjiang Institute of Archaeology 2014d).

A GIS analysis of the distribution of anthropomorphic stelae which are commonly associated with burials, in the administrative area of Altay Prefecture, shows that irrespective of the time period to which the stela and its connecting burial structure are ascribed, these sites are consistently found on low to moderate slopes of between 10 and 20 degrees in gradient, between 1000-1500 m in altitude, and within a 5 km distance from the closest stream (fig. 2.5c). They occur in several clusters (fig. 2.5d) that align with the Irtysh River in a NW-SE direction, the primary watercourse in the region. The largest concentrations are in Qinghe 青河 and Altay 阿勒泰 Counties.

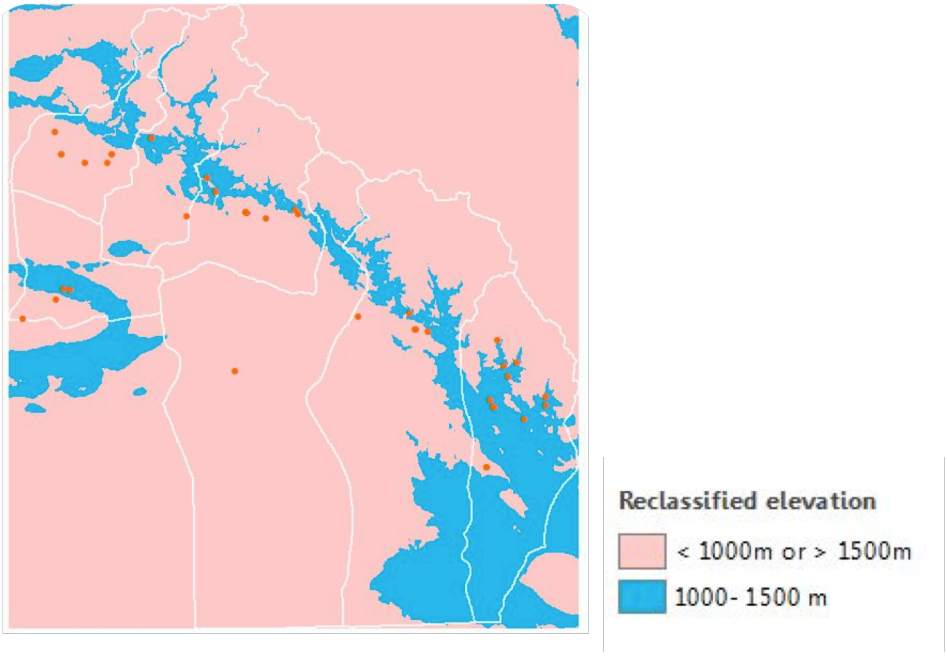

Fig 2.5a Reclassified elevation map of anthropomorphic statues in Altai Prefecture. It shows the distribution outside and within the interval of 1000 m and 1500 m in altitude.

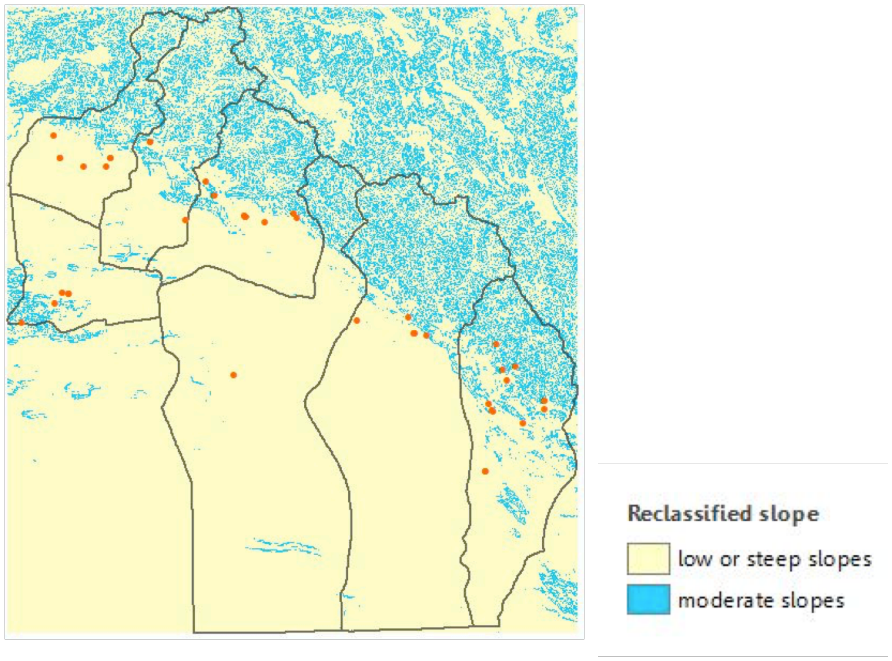

Fig. 2.5b Reclassified slope map of anthropomorphic statues. Statues are consistently found on the margins between low (between 0˚ and 15˚) and moderate (between 15˚ and 30˚ in gradient) slopes.

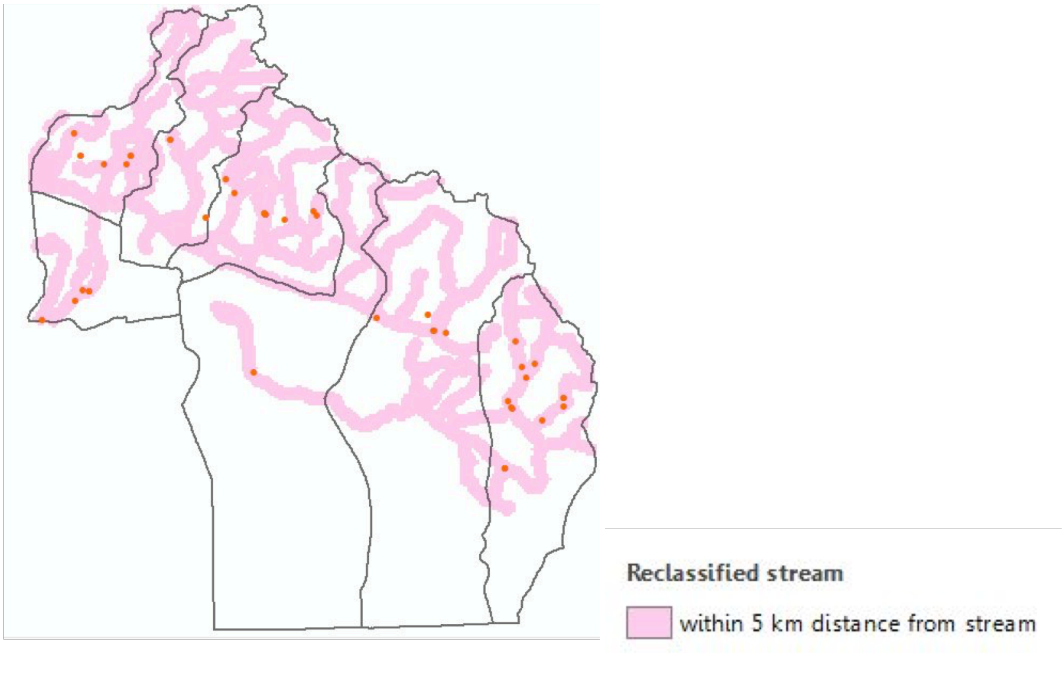

Fig. 2.5c Map of Euclidean distance of anthropomorphic statues to stream. Most statues are located within a 5 km distance to the closest stream. A 2 km buffer zone was tested but it excluded most statues.

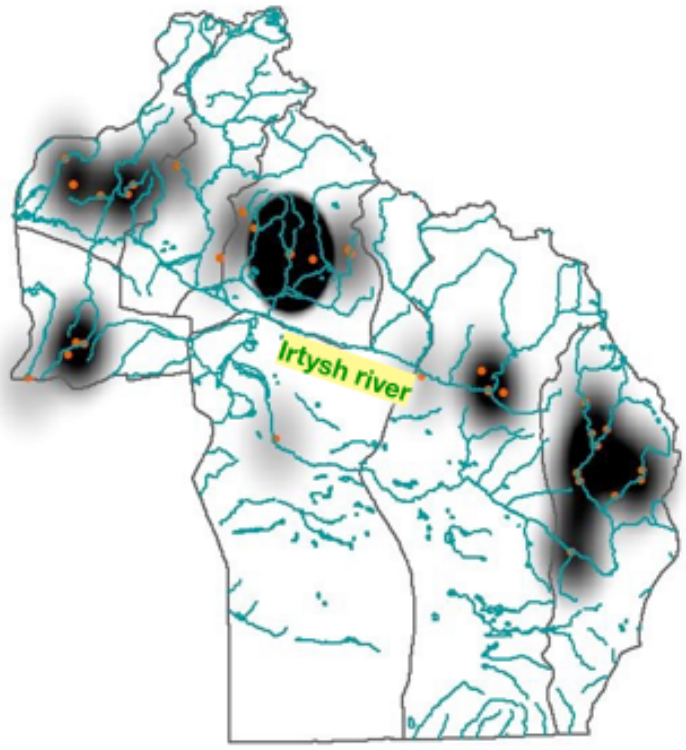

Fig. 2.5d Kernel density analysis of anthropomorphic stone statues.

ii. Form and Layout

Bronze Age fortified settlements attributed to Sintasha-Petrovka Culture and Abashevo Culture are found in the southern Urals (Kuzmina 2007, Zdanovich and Zdanovich 2002, Drennan et al. 2011). Among them, Sintashta-typed sites contain houses that surrounded by a ditch and walls made of hardened clay and sod (Drennan et al. 2011). Settlements appear to be scattered between 40 and 70 km apart outside the fortifications. In an area of approximately 82,000 km^2, 22 fortified settlements are found. The size of houses range between 100 and 250 m^2, the largest site measures up to 160 m in diameter. The Arkaim settlement, attributed also to Sintashta-Petrovka, covers an area of 20,000 m^2 where trapedoizal houses are surrounded by two concentric walls in between which habitations are found (Kuzmina 2007). Sintashta and Petrovka settlements

are differentiated by their building form and site layout. The Sintashta Culture, which is earlier in time, has circular settlements with trapezoidal houses while the later Petrovka Culture has rectangular settlements with rectangular houses (Kuzmina 2007: 33). Oval and rectangular surface houses measuring between 50 and 100 m2 have been discovered at sites such as Petrovka II, Petrovka IV, and Novonikol'skoe I in northern Kazakhstan (Kuzmina 2007: 39, 61). At Dangal in Central Kazakhstan, a slab-enclosed round house measuring 70 m2 attributed to the Andronovo is found. The Malokizil'skoe settlement of Abashevo Culture containing rectangular houses with post holes and hearths is surrounded by a ditch and covers an area of 5000 m^2 (Kuzmina 2007).

Structures attributed to Fedorovo and Kayrak-kum (Karakum) sub-traditions are located in the Ferghana Valley, the Karakum Desert, the Semirechiye, and western Tian Shan, which together spans the area from Turkmenistan in the south to eastern Kazakhstan in the north, with Uzbekistan, Tajikistan, and Kyrgyzstan in between. Both funerary and settlement structures have been found in this region, and they can coexist in the same complex. A full inventory of these sites is provided by Kuzmina (2007), I will mention several of the archetypes below.

In western Tian Shan and the Semirechye, stone enclosures are common. At the site of Asy, for example, a large semi-subterranean stone-walled house fortified by posts is found at 2400 m above sea level (Kuzmina 2007: 246, see Mar'yashev 2001). There are rectangular and round stone enclosures and burial mounds built of cobbles at Tamgaly (Kuzmina 2007: 246) where abundant petroglyphs are also found. The cemeteries at the sites of Kulsaj, Uzunbulak, and Kyzylbulak have rectangular interconnected graves marked by horizontally placed stone rows or erected slabs (Kuzmina 2007: 247). The

linking of individual graves is reminiscent of the connection of adjacent dwellings through an underground passage, a building practice that is suggestive of how the design of living and funerary spaces may be affected by clan-based ties.

Throughout southern Ferghana, round, square and rectangular enclosures are predominant. The Syr-Darya and Amu-Darya flow through the Central Asian deserts of Kizilkum and Karakum and the oasis of Khorezm, wherein lies a nucleus of Bronze Age settlements. Cemeteries with slab-built cists have been found at Khodzhi-Yagona, Dakhana, and Dashti-Asht along with 70 settlements and industrial complexes (Kuzmina 2007: 248). Several post-less round houses with a center hearth and a sand bank around the floor have been discovered at Khorezm at the site of Dzhanbas 34 (Kuzmina 2007: 61**,** *cf.* Itina 1977: 105-106). Toward the late Bronze Age, rectangular multi-chambered structures appeared in central Kazakhstan, housing constructions became more structurally complex. This development signals what might have been "the apex of architecture achieved by Eurasian populations in the Bronze Age" (Kuzmina 2007: 47).

An archaeological atlas published by Jacobson-Tepfer and her colleagues based on nearly two decades of survey and research in the Mongolian Altai offers a comprehensive overview of the area's Bronze Age structures (mid-second to mid-first millennium BCE). They include khirigsuur, talus and boulder mounds, a type of four-cornered mound, which according to its cardinal alignment, is likely a burial structure, and east-west oriented circular or rectangular dwellings with marked entrances delineated by stones on their perimeter and standing stones on its east entrance (Jacobson-Tepfer et al. 2011: 25). These features are prominent in two of the structures provided in the atlas' image inventory - one in Khara Zharyg and the other in Maikhan Tolgol (Jacobson-Tepfer et al.

2010: 154, fig. 11.8, 11.9). The design of lower-lying stones interspersed with standing stones on selected vertices and points of the perimeter is reminiscent of those discovered in the Bortala River Valley and the Altai region in Xinjiang. Based on recent excavations at the sites of Daram and Tevsh in the eastern and central part of Mongolia, the square stone construction grave and the figured grave of the Slab Grave Culture are dated to 15th -9th centuries BCE (Miyamoto 2016: 81).

In the western prefectures of Xinjiang, particularly Ili Kazakh Autonomous Prefecture (fig. 2.4), multi-period cemeteries with clusters of stone and earthen mounds of often more than 50, are commonly found. Over 10,000 burial structures, distinguished into 142 assemblages, have been identified in this region. They can be classified into four types of structure - earthen mounds, cairns, stone circles or enclosures, and stone mounds with anthropomorphic stela (Zhang et al. 2012: 16-75, see also Wang and Qi 1995). Burials are most concentrated in the counties of Nileke 尼勒克 and Tekesu 特克蘇. Vertical shaft graves with slab-lined cists or wooden coffins were found inside earthen mounds at Kuokesuxi 闊克蘇西, Jirentai 吉仁台, Tangbalesayi 湯巴勒薩伊, Wutulan 烏土蘭 and Kukesu River West 庫克蘇河西. Of the 154 graves at Wutulan, flat-based urn-shaped Andronovo-typed pottery were found in 17 of those excavated (Xinjiang Institute of Archaeology 2014b). The earthen mounds and cairns at Tangbalesayi are arranged between 10 and 30 m apart in a belt shape. It is documented that 26 graves were excavated in 2010 with the earliest occupation attributed to the Andronovo. The earthen mounds measure 5 - 10 m and cairns are 10 - 20 m in diameter and 0.4 -1 m in height (Xinjiang Institute of Archaeology 2012a). At Kuokesuxi, more than 200 burials dated to

multiple periods are distributed in an area measuring 19 km EW and 16 km NS. Among them, 7 Bronze Age earthen mounds of 8-20 m in diameter were investigated, and they contain vertical shafts lined with stone or wooden logs, attributed to Andronovo Culture (Xinjiang Institute of Archaeology 2012b).

Settlement structures in this region are rare, however, and remain poorly investigated but two examples might be cited. The site of Qialege'er 恰勒格爾 at the foothills of the Borohoro Mountains has two subterranean dwelling structures - one measures 6 x 4 m and the other is poorly preserved (Xinjiang Institute of Archaeology 2014a). Its pottery is characteristic of Bronze Age Andronovo and radiocarbon dates of animal bones place the site at 3300 BP. The settlement structures at Jirentai 吉仁台 (Nileke County) contain stone-built hearths that are comparable to late Bronze Age structures discovered at Hu'ertuoleha in the Bortala River Valley, one of the sites surveyed in the current study (source: personal communication with excavators).

Burial mounds are also abundant in northern Xinjiang. The Sharmirshak (Qiemu'erqieke 切木爾切克) Cemetery consists of 32 graves in three clusters. They are composed of cisted and non-cisted shaft burials enclosed in large plazas measuring between 200 m2 and 600 m^2. It has been observed that certain elements of the Sharmirshak burials and ceramic properties are analogous to the Okunevo Culture of southern Siberia and suggest its potential relation to the earlier Afanasievo Culture (Xinjiang Institute of Archaeology 1981, Shao 2008, Jia et al. 2011). The recently excavated large stone mound complexes, measuring at *ca.* 80 m in diameter, at the site of Sandaohaizi 三道海子 in Qinghe 青河 County comprise a center mound encircled by

ritual circles (Guo 2011). They are dated to late to mid first millennium BCE based on the presence of accompanying deerstones and the design of the mound structure.

The earliest burials at Yanbulaq (Yanbulake 嚴布拉克) Cemetery in Kumul (Hami 哈密) Prefecture are single or double-terraced vertical earthen pit graves dated to 1700 BCE; the same burial structure continued into the mid-first millennium BCE although two-terraced adobe brick grave and other forms of adobe brick grave appeared only in later periods (Chen 1990, Wang and Tan 1990). The Hongshankou 紅山口 site of eastern Tian Shan has large stone-built terraced settlement complexes covering areas the largest of which measures 992 m^2. There are also 66 stone enclosures of various shapes, and 255 burial circles and cairns in between the settlement complexes (Northwest University et al. 2014). At Dongheidou in Barkol (Balikun 巴里坤) County, 1666 burial structures (either square or circular), 140 stone enclosed foundations, and a raised platform (tower) dated to multiple periods of occupation are scattered on foothills and valley floors at *ca.* 2100 asl (Northwest University et al. 2006).

Large numbers of cairns, stone enclosed structures, and earthen mounds are found also in other regions of Xinjiang though they are dated by typology to the Iron Age and after. Vertical shaft graves covered by cairns spread across the plains on either side of the river, at the foothills of the southern ranges of Western Tian Shan in Bay (Baicheng 拜城) County, Kuqa (Kuche 庫車) County, Wensu 溫宿 County and Uqturpan (Wushi 烏什) County of Aksu (Akesu 阿克蘇) Prefecture (Xinjiang Institute of Archaeology 2008).

A short summary: the combination of these existing archaeological finds shows that the characteristic Bronze Age building in the Central Eurasian steppe is either rectangular or oval in plan, with dimensions reaching 300 m^2 in area. Buildings may be distributed at regular intervals on river banks, valley floors, and piedmonts, and individual structures could be internally connected. In the southern Urals and northern Kazakhstan, they are enclosed in fortifications that might have been designed to secure mining resources, pasturage, productions in metal, ceramics, and other paraphernalia. Fortified settlements have also been located from Eastern Kazakhstan through Xinjiang although burials are the predominant type of architectural remain that have been documented so far. It is also important to note that while architectural remains in the west have been banded together under the designation of Andronovo, comparisons of Xinjiang material to the Andronovo remain unsystematized and piecemeal since the criteria may vary by excavator (some focus on ceramics, others on burial design or metallurgy). The zeal to brand the assemblage might have at times biased the descriptions of what are in fact common and indistinguishable material traits.

The aboveground structure of a burial appears in various forms, shapes and sizes, but they can all be described as: either a stone-enclosed space with a slab grave in the center where an enclosure may be structurally connected to another conceivably on account of kinship, or an earthen mound or a cairn that superimposes. It is common to find burial structures arranged in clusters near a watercourse alongside settlement structures but structures within a single cluster are not necessarily dated to the same period. Because burial locations were often revisited and re-used, designs with affinity to earlier architectural styles are often noted in structures of purported later periods, making

it even harder to distinguish Bronze Age structures from later constructions without excavation.

The internal structure of the Bronze Age grave can be generally described as a vertical shaft pit holding a slab-lined cist or a wooden coffin. In cases of stone enclosures, the mouth of the burial pit is often marked on the surface by a stone circle; where cairns and mounds are built, the cist marks the center of the structure and is occasionally visible on the surface where prolonged weathering would expose the edges of the slabs because the vertical burial shaft lacks depth.

iii. Building Material

Wood and stone are the two primary building materials that have been preserved archaeologically. Their use might have been contingent on what was available in the immediate physical environment. The use of the light timber frame is prevalent in the forest-steppe zone during the Bronze Age, as the name of the eponymous Timber Grave (Srubna) Culture of the Urals and western Kazakhstan suggests. The dwelling construction is "vertically divided in two, many sided or round in plan, either surface or slightly sunken, and with a light conical roof" (Kuzmina 2007: 61). At the site of Arkaim, the walls are built of wood enforced by clay blocks with added lime (Zdanovich and Zdanovich 2002, Kuzmina 2007: 32). The houses of Sintashta settlements are also built with a wooden infrastructure that is reinforced with hardened clay and sod bricks (Drennan et al. 2011). Compared to the western regions of the steppe, the use of wood in settlement structures is far less common in Xinjiang in this period.

Post-fortified constructions have been discovered in western Tian Shan. The house at the site of Asy is built of stone and supported by posts (Kuzmina 2007: 246). Postholes have also been found at the site of Kalasu in Xinjiang in a subterranean stone-walled structure (Xinjiang Institute of Archaeology et al. 2008). Wood is also used inside funerary structures. Graves at Kulsaj, Uzunbulak, Kyzybulak have frames made of wooden logs (Kuzmina 2007: 247). Multiple sites in Xinjiang reported the discovery of the use of a wooden coffin. Decomposed remains of wood were recovered from the slab grave M4 at Aduuchuluu Cemetery in the Bortala River Valley (see analysis in chapter three). At Kuokesuxi (Ili Prefecture), the burial shafts under the earthen mounds are lined with wooden logs or stones (Xinjiang Institute of Archaeology 2012b). At another site in Ili, Kukesu River West Cemetery no. 2, wooden coffins are found at the bottom of a vertical pit buried beneath an earthen mound or a mixed stone-earth mound (Ruan 2012). The nine graves excavated in Tuwaxin 吐瓦辛 Village in Bu'erjin 布爾津 County contain either a cist or a wooden coffin (Xinjiang Institute of Archaeology 2014c). Further east at the site of Dongheigou 東黑溝 in the Hami 哈密 area, wooden coffins and wooden covers were discovered in a number of the 1666 burial structures surveyed (Northwest University et al. 2006).

The glacial landform provides an abundant supply of large rocks for construction. In the Ural steppe where forests provide the means to build in wood, however, stone was a complementary resource. In treeless areas, it is more common to find stone as a building material. It is usually worked from granite or used as is. One feature of Andronovo settlements and houses is walls built of stone slabs (Kuzmina 2007: 47),

which would have been sourced locally from glacial and alluvial deposits on piedmont and valley floors. The slabs are erected in two parallel rows, occasionally layered with rubble in the middle; clay mortar was not used until the late Bronze Age (Kuzmina 2007: 43). Slab-walled enclosures can be found, for example, at the sites of Dangal, Kulsaj, Uzunbulak, Kyzylbulak (Kazakhstan), and Arpa (Kyrgystan). This building feature is also present in Xinjiang but is mostly found in the Bortala River Valley where I conducted my fieldwork. Besides lining the boundary of a settlement or burial structure, slabs were also used as cist walls. Examples of slab graves are copious throughout the regions of western Tian Shan, the Semirech'ye and Ferghana. The long axis of the cist is commonly oriented east-west.

Another popular technique of using stone in construction is the stacking of cobbles to build boundaries, walls or mounds, and there are abundant examples of these throughout eastern Kazakhstan and Xinjiang. At Tamgaly in western Tian Shan, for example, rounded stones outline rectangular enclosures and cobbles are piled into burial mounds (Kuzmina 2007: 246). This is a site better known for its abundant petroglyphs (Francfort et al. 1995, Rogozhinsky 2008). At Aduuchuluu (Bortala Prefecture), stacked stone walls are also a distinctive feature of the settlement structure, they are also used to line the edge of grave pits though these structures are conceivably of a later period. The subterranean dwelling structure at the site of Kalasu (Ili Prefecture) is enclosed by cobble-stacked walls and supported by posts. Stone built burial mounds are ubiquitous throughout western and northern Xinjiang and are assigned to different building traditions dating from the late Bronze Age to the Turkic period (fifth to tenth century CE). The numerous earthen mounds and cairns found at the sites of Kuokesuxi,

Tangbalesayi, and Kukesu River West Cemetery in Ili Prefecture are one of the more prominent archaeological clusters. Even though a rough chronology of these structures may be constructed on the basis of the scale and method of construction, the style of stonework, the level of surface vegetation and weathering, the use of more refined building materials such as adobe bricks, and the style of accompanying fixtures such as stone stelae, etc., the lack of results from excavation remains a hindrance to developing definitive criteria for dating stone architecture in Xinjiang.

2.2. On the Uses and Limitations of Typology: The Case of the Andronovo

The term "Andronovo" captures a combination of material traits of Bronze Age Central Asia that are most distinctive in ceramics, metallurgy, building tradition and burial features. What this "cultural package" designates, however, varies geographically and semantically. It is difficult to argue that elements of the Andronovo at its origin in the Minusinsk are analogous to how it manifests in Xinjiang, the easternmost reach of its presence. Granted that the term is on some level merely a classification tool and it should be used as such, what is concerning, however, about the application of this typology is not its correctness as such but, to follow Adams and Adams (2008: 4) advice on improving archaeological typologies, its "purpose" and "practicality". We may ask, what are the applications of the Andronovo typology and are they effective?

Take the sizable corpus of Bronze Age architecture for example, the attributes of what is and what could be considered "Andronovo" include many building types and styles of construction. The considerable regional variability makes it unrealistic to apply

a consistent pan-regional typology, which is difficult to formulate to begin with. That is not to say, however, that the current Andronovo typology is erroneous. But, when, for instance, timber-frame houses enforced with clay and sod surrounded by a ditch and defensive wall are effectively placed in the same cultural category as slab-walled enclosures or cobble circles, the question of what this cultural system conveys about past human behavior and how its elements are connected must be addressed by the typology as well.

What has further complicated the Andronovo is the coining of sub-cultures that are presumably derivative of the parent Andronovo Culture. Understandably, these sub-cultures help account for the significant variability in material traits across a large geographical expanse. But a fundamental question remains unresolved - what do the "Andronovo" and its subcultures represent? A people, a cultural epoch, a community of uni-lingual descent, a type of economy, a socio-religious group, or a combination of all of the above and then some? And do these aspects occur in equal unison across the entire geographical span? Did a site with Andronovo-typed sherds and metal objects in Xinjiang arise from the same conditions that created a site with similar findings in central Kazakhstan or the Caucasus?

The efficacy of the current typology may also be challenged in the negative - on what basis do we judge a sherd uncharacteristic of Andronovo pottery non-Andronovo? Archetypes are created to better organize and classify disparate material traits, but when they are held as a firm yardstick against which new materials ought to be assessed and classified, the meaning of the archaeological objects risks becoming manipulated by an arbitrary sorting system of modern creation. Thus, typology should not only be

synchronized with respective archaeological contexts, it should also be adaptable to new clues and evidence. Grappling with the problems the uneven and haphazard use of typology has introduced to Xinjiang archaeology is pivotal to formulating a more coherent understanding of the materials at stake. I will now describe where things stand with respect to research in architectural structures.

Given that funerary structures are generally favored in archaeological fieldwork in Xinjiang, evaluating the presence of the Andronovo building tradition in Xinjiang using criteria largely built on features of settlement structures becomes improbable (*cf.* Andronovo house types in Kuzmina 2007). Chinese researchers often take to using features of burials and artifacts to identify the cultural type of the site, albeit at the expense of or independent of the site environment and depositional contexts. This situation stems from a number of research oversights. First, there have been few excavations of settlement structures in Xinjiang. The fieldwork in Bortala Prefecture I will cover in chapter 3 is the first project in Xinjiang to collect data on Bronze Age settlements and burials through excavation and large-scale archaeological survey. Second, the only large-scale surveys in Xinjiang are the three-yearly national census of cultural relics whose main goal is to enumerate identifiable relics of culture and document their location, which in the case of stone structures means that the descriptions are often based on a cursory visual examination and limited to how the structures, based on physical appearance, fit into the existing typology (more on the execution of census surveys in chapter 3). What could further distort the interpretation of the archaeological data is that this kind of object-centric approach often goes hand in hand with the correlation of object with ethnicity, leaving little room for readers to discern the validity

of the primary field record. Third, the precedence given to salvage excavation, particularly of burials, to prevent looting of artifacts of curatorial value (Jia et al. 2011: 269) means that settlement structures tend to be overlooked. Finally, there is the assumption that the scarcity of settlement remains of the Bronze Age is evidence for pastoral nomadism (Chen and Hiebert 1995), a view that has since been challenged by studies that show that agriculture was also practiced on alluvial fans in northern Xinjiang (Jia et al. 2011: 269). Before further deductions can be made about the nature of the Andronovo in Xinjiang, what should be better addressed is the connection between patterns of subsistence and socioeconomic development and aspects of culture represented by the archaeological objects in question.

2.3 Summary

This chapter provided an overview of archaeological materials most pertinent to understanding the discourse of Xinjiang archaeology today. I chose to focus on the use of the term Andronovo because of the extent to which the typology it carries have impacted interpretations of archaeological remains dated to the second millennium BCE. I presented what is known to date about the nature of the Andronovo in Xinjiang through typology by examining the three most definitive types of artifacts - ceramics, metal objects and architectural structures, and assess the limitations of this approach. I noted how cultural designations such as the Andronovo are haphazardly applied, and the even more worrying problem of the unsystematic and rampant coining of new archaeological cultures. The chapter concludes with a critique of typology. I contended that the utility of

typology is restricted by its own inflexibility and the lack of commensurate research of local depositional contexts. As an analytical tool, the term Andronovo cannot be used to effectively render the regional variations of what is an important phenomenon into useful archaeological information. In the following, I take an alternative approach to studying the architectural structures in Bortala River Valley - instead of categorizing these sites and structures into cultural types, I study their locational and structural arrangements in relation to features of the physical environment. While the appearance of these structures are comparable to certain descriptions of Andronovo architecture, and they may well belong to the same cultural horizons; however, I posit that the more important question is how they had shaped the physical and social landscapes of pastoral nomadism in the steppe.

Chapter 3

Results of Survey and Excavation

in the Bortala River Valley (Xinjiang Uyghur Autonomous Region)

Introduction

The myriad of ancient stone structures dispersed across a distance of over 250 km in the Bortala River Valley constitutes an important nucleus of prehistoric stone architecture in the Asian steppes. Built in different time periods ranging from the Bronze Age in the early second millennium BCE to the Turkic period in the second half of the first millennium CE, the diverse forms of architecture include slab graves, cairn mounds, quadrangular and circular enclosures, walls, and anthropomorphic statues, to name the few most common. Glaciofluvial deposits strewn on the treeless grasslands provide copious raw materials for building stone structures easily discernible on site and via satellite imagery.

The ubiquitousness of these structures, in spite of their structural variations, evinces a consistent architectural tradition of stone construction in the Asian steppes that spans over two millennia. They provide readily identifiable traces of past human activities, indicating pockets of ritual, funerary and settlement histories traversing an area that includes Xinjiang, Mongolia, Kazakhstan, southern Siberia, reaching as far as the Urals. Concomitant with these structures are abundant displays of petroglyphs, portraying

animal and human figures, symbols, and representations of chariots, wheels, and figures riding astride.

For five field seasons since 2012, the Institute of Archaeology, Chinese Academy of Social Sciences, in collaboration with the Bureau of Cultural Relics of Wenquan County, has conducted excavation and intensive topographic surveys at ten selected sites in the Bortala Valley (fig. 1). This multi-year project focuses on stone structures that have yielded early second millennium radiocarbon dates and material remains dated to the Bronze Age, bearing characteristic traits of Andronovan bronze and ceramic typologies. The following discussion describes the architectural forms of the stoneworks, identifies their distribution patterns in relation to environmental attributes and explores underlying economic and ideological constructs.

The following discussion is divided into three main sections - background, approach and methods, and data analysis. The geography of the study area and the research question are described in the background section. This is followed by a description of research approach and corresponding data collection and analytical methods. Finally, data obtained from survey and excavation are analyzed on three different spatial scales - macro region, micro region, and site.

3.1 The Geography of the Bortala River Valley

The Bortala River Valley is situated in Bortala Prefecture of Xinjiang Uyghur Autonomous Region in China. It spans 79˚53’ -83˚53’ east-west and 44˚02’-45˚23’

north-south. It fans out from the Hongbielin 洪别林 Mountain Pass (3235 masl) at the intersection of the Dzungarian Alatau and the Biezhentao 别真套 Range of Western Tian Shan, a natural junction coterminous with the China-Kazakhstan border. From there, the Bortala River travels east and is fed by multiple tributaries flowing from the northern and southern mountain ranges, culminating in a drainage basin that covers an area of 15946 km2 (Chen et al. 2007: 3). Flowing downstream from the west, the Bortala River travels a course of 252 km into Ebi (Aibi 艾比) Lake in the Dzungarian Basin (Chen et al. 2007: 1, 3).

To the north, the ridge line of the Dzungarian Alatau stands at 3000m asl; the Tian Shan ranges to the south are slightly higher, with ridge lines between 3500m and 4500m asl (Chen et al. 2007: 1). Flanked on three sides by high mountain ranges, the Bortala River Valley experiences a continental climate with pronounced seasonality, particularly summer and winter. The average temperature in summer is 22 ˚C and rainfall ranges between 53 mm and 238.2 mm. Precipitation is the highest between the months of May and August when flash floods are common (Chen et al. 2007: 1, 2, 5, Sun et al. 2016). In the coldest month of January, the average temperature is -15.7˚C (Chen et al. 2007: 1-2). The streams ice over for roughly six months of the year from late October to late April.

The valley is the result of the recession of Quatenary glacial landforms, which, over time, deposited masses of erratics on piedmont slopes. Streams carry eroded debris downstream, carving gullies into valley floors. In the warmer months, the thawing of ice and higher precipitation generate flash floods on alluvial plains where the large tributaries join the main river course.

The predominant types of vegetation are montane grasslands and shrub-lands. The middle reaches of the Bortala River travels through wetlands. In their study of the Bortala River Basin, Li et al. (2014: 1519) divide the area into six vegetational zones (table 3.1), which are namely, from the upper to lower reaches of the river, the alpine meadow zone, the subalpine meadow and steppe zone, the forest-shrub zone, the shrub steppe zone, the desert steppe zone, and the desert zone. Betula is the most common genus of tree, which covers up to 70% of areas delineated as Natural Conservation Area. The predominant genera of plants are listed as follows:

Vegetational zone	**Predominant genus of Plants**
alpine meadow (sampling altitude: 3235 - 2929 masl)	*Carex, Lolium, Comarum* (grass and flowering plants)
subalpine meadow and steppe (2714 - 2314 masl)	*Caryophyllaceae, Festuca*, *Artemisia* (tufted grasses and flowering shrubs)
Forest-shrub (2210 - 1809 masl)	*Potentilla fruticosa*, *Sabina procumbens*, *Caragana, Picea* (Deciduous flowering shrub, low-growing trees and coniferous trees)
Shrub steppe (2826 - 1013 masl)	*Potentilla fruticosa*, *Sabina procumbens*, *Caragana* (Deciduous flowering shrub, low-growing trees)

Desert steppe (2521 - 217 masl)	*Aster, Artemisia, Festuca* (Perennial flowering plants, grass)
Desert (388 - 210 masl)	*Nitraria, Chenopodium album* (flowering shrub and weed-like plant)

Table 3.1 The six vegetational zones of Bortala River Basin (translated from Li et al. 2014: 1519)

Results of Li et al. (2014)'s pollen analysis show that pollen dispersion patterns for different taxa are affected by a combination of factors, including altitude, rainfall, and temperature.

The largest city in the Bortala Mongol Autonomous Prefecture is Bole 博樂. The study area, however, largely falls under the jurisdiction of Wenquan 溫泉 County, which occupies the westernmost part of the prefecture. Pastoralism constitutes a significant sector of the local economy in the region today. Sheep, goats, cattle, horses, and camels are herded by a population that is predominantly Kazakh and Mongol. Traditional methods of producing animal secondary products are routinely practiced; the pastoralists make and trade milk products including yoghurt, butter, hard cheese, and alcoholic milk beverage. Agriculture is also an important part of the economy. Wheat (*Triticum spp.*), sunflower (*Helianthus annuus*), corn (*Zea mays*), potato (*Solanum tuberosum*), and beetroot (*Beta vulgaris*) are the most common crops cultivated in the outskirts of the Wenquan County where agricultural fields spread across the flood plains and wetlands of the Bortala River.

3.2 Methods of Data Acquisition and Analysis

3.2.1 Sources

The following analysis employs aerial photos, excavation photos, geographical coordinates and excavation records collected during the author's participation in the survey and excavation projects directed by the Institute of Archaeology of the Chinese Academy of Social Sciences between 2011 and 2015. These datasets are supplemented by published and unpublished government inventories of cultural relics, especially in regard to analysis on the macro-regional scale. Information from online news articles and published blog posts authored by members of the fieldwork team published through formal media outlets is also incorporated sparingly. The use of these non-academic sources, though less authoritative, is necessary since in this case most of the excavation and survey result is not published or has not been made available through scholarly avenues.

3.2.2 Approach

To effectively examine data of varied types, geographical scopes and resolution obtained from the project's field research and the national census inventory of archaeological remains, a multi-scalar approach is used. Three geographical scales in the scopes of macro regional, micro regional and site-specific are used to analyze the spatial data.

The multi-scalar approach is widely used in archaeological studies of settlement and artifact distribution patterns, it encompasses a wide array of analytical methods and

statistical approaches (e.g. Markofsky 2013). The approach entails the application of methods most sensitive to detecting patterns at distinct spatial scales (Bevan and Connolly 2006) to allow data to be analyzed in ways most conducive to addressing the research hypotheses and reaching meaningful interpretations. Thus, it offers researchers the flexibility to accommodate data of various time scales, precision and resolution, to obtain results that transcend arbitrary data collection and analytical boundaries while accounting for inherent sampling and recovery biases. A notable application of multi-scalar analysis in Central Asia is the Koksu River Valley of the Dzhungar Mountains in Eastern Kazakhstan by Frachetti (2006). He explains that the approach is particularly useful in modeling ancient pastoral landscapes where traces of human activity occur at various geographical scales; specifically, it prevents the interpolation of geographically discrete data sets while effectively contextualizing "an array of dynamically changing locales that are activated and deactivated in time" (Frachetti 2006: 132).

In subjecting archaeological data to multiple scales of analysis, the attention of archaeological interpretation is shifted from object-centric deductions and the nature and extent of human agency as part of larger processes of social development at play can be better brought into perspective. For example, Wansleeben and Verhart (1995) of the Meuse Valley Project who set out to understand the Neolithization process in southeastern Netherlands note the benefit of the multi-scalar approach in effectively connecting individual site properties to large-scale patterns of social organization by integrating data of different spatial scales from multiple primary and secondary sources.

3.2.3 Data recording techniques

3.2.3.1 Macro-region: Field-walking and Hand-held GPS Recording

In the extensive survey conducted by the Wenquan Bureau of Cultural Relics under the auspices of the State Administration of Cultural Relics, remains of ancient stone structures visible on the ground surface were recorded using a GPS handheld device. The prefectural wide survey focuses on recovering stone structural remains, the most prominent and readily identifiable type of material remain in the region; local pastoralists and previous prefectural surveys provided critical information for locating structures that might have otherwise been missed. Field-walking is used as a technique for locating individual structures and identifying their outline among known clusters of stone structures. Other material remains such as ceramic fragments and ground stone tools are occasionally found during these surveys, they are retrieved and brought in to the local museum.

The goal of the large-scale survey is to map and enumerate the occurrence of archaeological remains across an extensive area in order to identify patterns of artifact distribution and human activity. The result provided the basis for selecting sites for intensive survey and documentation by a high precision satellite positioning device and aerial photography.

In the analysis below, the sites are mapped against large-scale regional terrain and hydrological spatial layers downloaded from the web. This provides a preliminary geographical understanding of spatial and potentially diachronic patterns of land use.

3.2.3.2 Micro-region: RTK and Aerial Photography

From over 250 sites recorded by the prefectural census of cultural relics conducted jointly by Bureau of Cultural Relics of Wenquan County and the Bortala Prefectural Museum from 2007 to 2009 (Xinjiang Bureau of Cultural Relics 2011), ten sites were selected for intensive topographic survey in the 2013 and 2014 fieldwork seasons.

These sites are chosen for their large area size and the types of structures they comprise. Another selection criterion is the presence of structures indicative of habitation, and not simply burials and commemorative structures. The survey also prioritized sites with structures similar to the quadrangular slab-enclosed structures at the site of Aduuchuluu where excavation data of four field seasons are available in order to assess the prevalence of this structural type and architectural tradition on a wider geographical scale.

By identifying the diverse structural elements within a site, the micro-regional survey aims to detect principles of spatial organization and the intensity and nature of site use over time. Since most structures are situated too far apart for the transmission range of a total station, a high-precision satellite positioning device, Real Time Kinematic (RTK), which consists of a base station and two mobile units, is used to map topographic features and the structures by tracing their outline. Given the generally treeless terrain, the coordinates obtained are accurate to *ca.* 5 cm.

Owing to grass overgrowth, the confusion of natural rocks with those purposely arranged, and destruction by natural forces of weathering and modern construction, the outline of the structures is often obscured and cannot always be easily delineated. Low-altitude drone photography was introduced to the project in 2012 to obtain a

comprehensive plan view of the site locality and to make clear the spatial relationship between different architectural elements or the temporal relationship between overlapping structures. The aerial images are geo-referenced against the ground control points (RTK coordinates) to reconstruct the site and its surrounding topography in 3D models (see analysis in next section).

Taking into consideration the number and location of sites to be surveyed and excavated, UTM (Universal Transverse Mercator) coordinates are used for both the micro-regional survey and the excavation. The use of a uniform coordinate system instead of arbitrary coordinates ensures that we are able to map all the sites on to the same grid plan, which is important for establishing spatial correlations between sites and structures, and conducting geospatial analyses.

3.2.3.3 Site: Excavation, Pole and Aerial Photography

From 2011 to 2016, excavation of multiple burial and non-burial structures was carried out at the site of Aduuchuluu (45°1’32.05”N, 80°32’45.82”E), which is made up of two localities about 2 km apart. The total station is used to set up 10 m x 10 m grids with UTM coordinates. During excavation, the position of each artifact is shot in using the total station; the artifact type, unit number, associated structural feature, and excavator are recorded at the same time. These data are used to generate provenance plans of artifacts against the layout and profiles of the structures. These plans are, however, not included in the following analysis due to restrictions on data disclosure before formal publication.

Photos providing a bird's eye view of the site were taken with a helium balloon kit in 2012 and 2013. A new set of images was taken in 2014 and 2015 with a drone, which allowed for better control and a speedier documentation of the site and its surrounding topography.

Pole (low-altitude) photography is used to record the structures's form and construction before any building elements are removed for the subsequent phase of excavation. This was done by mounting a camera on a long pole to capture partial topdown photos that are subsequently stitched together to create an orthophoto and a 3D model in a photogrammetry program.

3.3 Macro-regional study

3.3.1 Introduction

Commissioned by the State Administration of Cultural Heritage, the Third National Survey of Cultural Relics was carried out between July 2007 and October 2009, which entailed the survey of eighty-eight prefectural administrative divisions in Xinjiang Uyghur Autonomous Region (Xinjiang Uyghur Autonomous Region Bureau of Cultural Relics (ed.) 2011a). Accordingly, the Bureau of Cultural Relics of Wenquan County conducted an extensive survey of Bortala River Valley. The study area spans approximately 4500 km2 and 130 km east-west along the Bortala River. It encompasses the Bortala River Valley and the surrounding mountain ranges of the Dzungarian Alatau and the Tian Shan.

The national survey was successful in obtaining a large representative sample of ancient structures by means of on-site observation and recording by GPS. Two official publications have since been released, one of which is circulated only interna[1]lly. The analysis in this section employs data from both publications in addition to observations during subsequent intensive micro-regional surveys. The corpus of sites documented during the national census provides an important database for the project initiated by the Institute of Archaeology of the Chinese Academy of Social Sciences (CASS) in 2011.

A total of 238 sites[2] have since been identified and recorded. All but one site are documented in the two reports published by the Bureau of Cultural Relics of Xinjiang Uyghur Autonomous Region. Of these, 213 sites are plotted on a map; precise location is not available for the remainder.

The map (fig. 3.1) below shows the 213 sites with declassified locations, in addition to the site of Heishantou 黑山頭 which was discovered in 2013 during an intensive topographic survey of Xiaohusita 小呼斯塔 by the Institute of Archaeology of CASS after the Third National Census was concluded. Because geographical coordinates have not been provided by the Bureau on grounds of censorship and prevention of illegal investigative activities, I plotted these sites on Google Earth by matching their locations to what is shown in the census report (Xinjiang Uyghur Autonomous Region Bureau of Cultural Relics (ed.) 2011a). Then I exported the coordinates to GIS for analysis.

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[1] The author would like to thank the Bureau of Cultural Relics of Wenquan County for supplying this information.

[2] The term "site" does not adhere to strict archaeological definitions and is used loosely to connote a location with a given number of congregated structures in all contexts related to the said preliminary survey unless otherwise specified.

3.3.2 A Note on Site Inventory

Six categories of non-movable cultural relics are used in the national census survey, which include ancient remains (*gu yizhi* 古遺址), ancient burials (*gu muzang* 古墓葬), ancient architecture (*gu jianzhu* 古建築), grotto temples and stone inscriptions (*shikusi* 石窟寺, *shike* 石刻), modern historic sites and architectural archetypes (*jinxiandai zhongyao shiji ji daibiaoxing jianzhu* 近現代重要史蹟及代表性建築), and miscellaneous (*qita* 其他). The cultural relics recorded under these categories are arranged chronologically or by typology.

In the official report, each site record is accompanied by a small map indicating the location of the cultural relic, a description of the layout of the structures and their features. Images of artifacts and plan drawings are included where available. The surrounding physical environment is introduced and the position of the site is described relative to the closest administrative area, either a village, a township or a pastural zone, and significant places of interest. The preservation condition of the site is documented and a note on where the site is inventoried is included in the end.

Site names used in the present discussion are the *pinyin* spelling of the Chinese transliteration of Mongol or Kazakh place names the Bureau used to record the sites. To distinguish the cardinal directions (*dong* 東, *xi* 西, *nan* 南, *bei* 北) used as modifiers in the place names, these directions are written in English instead of their Chinese *pinyin*.

3.3.3 Data Limitation, and Sampling and Recovery Biases

Without official GPS coordinates, the site locations shown below (fig. 3.1) are only accurate to the degree they illustrate the position of a given site relative to natural features such as watercourses and topographic zones, or to modern transportation routes and areas of administration. They are not precise locations, some may have an error margin of up to several hundred meters. They are therefore not adequate for measuring how the sites relate to topographic features on a local scale. Nonetheless, this extensive regional survey serves well to illustrate the relative density of ancient structural remains across the study area.

Delineating outlines of the structures proved challenging at times since the stones are either concealed by vegetation cover or have been relocated or damaged by alluvial action especially in alluvial fans where the erosional effects on landforms and artifact distribution are particularly erratic (*cf.* Markofsky's (2013) review of effective survey strategies in the Murghab Delta)). During the summer months where there are frequent flash floods on the alluvial plains, new gullies may be cut. At times, these gullies cut through and truncate parts of an ancient structure. Surveyors who worked in similar steppe environments of regions contiguous to Xinjiang (Honeychurch et al. 2007, Bourgeois et al. 2014) also remarked the challenges of delineating stone structures. It should also be noted that the identification of what constitutes an individual structure is conditional on the surveyor's interpretation, particularly where outlines are exceptionally obscure. Looting is another cause of damage. Structures with a discernible slab grave outline on the surface are particularly susceptible.

But because the present analysis only takes into account surface or subterranean stone structures that are less likely to be have been transported, effaced or redistributed by post-depositional processes of weathering and excludes other archaeological forms of sites such as artifact scatters or settlement deposits that are more susceptible, the occurrence and location of "site" in this regard can be considered geographically reliable.

Another crucial limitation of this regional survey is uncertain chronology. Most structures are assigned a date based on architectural typology. Not without its limitations, typology is nonetheless a method generally used to date stone monuments and petroglyphs in the steppe region. The Dzhazator Valley in the Altai Mountains (Russia) survey recorded 2060 structures over 225 locations in an area covering 284 km2. Based on typological characteristics, researchers were able to distinguish geographical differences among the distribution of Chalcolithic and Bronze Age monuments and those of the Iron Age and the later Turkic Period (Bourgeois et al. 2014: 108, 116). The survey also classified all structures as ritual or funerary in nature (Bourgeois et al. 2014: 108). Similarly, differences in distribution pattern between the Bronze and Iron Age sites and the Xiongnu sites were detected in the survey of the Egiin Gol River Valley based on differences in the structures' physical design (Honeychurch et al. 2007).

The multi-period pattern of site occupation from the macro-regional survey, however, does not allow us to discern the expanse and duration of individual occupations in the Bortala Valley because sites may be composed of elements belonging to different time periods and the chronology of most sites is not confirmed by absolute dating (*cf.* Bevan and Conolly 2006). Another notable bias in the survey data is the preliminary identification of most structures as burials or for ritual use. Of the six categories of

non-movable cultural relics, ancient burials constitutes the majority. The classification is based solely on the examination of the structures' physical appearance. Subsequent excavations and cross-regional comparisons have suggested that some of these structures are likely non-burials but served some kind of funerary purpose. Subsequent fieldwork has therefore worked toward clarifying the chronology and function of the sites and their structures. At 16 of the 214 sites, structures comparable to the Aduuchuluu habitation structure dated by AMS of charcoal remains to the range of 3450 to 3250 BP (see images of selected sites in Appendix 2) were identified during intensive surveys carried out between 2014 and 2017. These dates suggest the likely affiliation of this type of structures with the Bronze Age Andronovo Culture. These are structures with a perimeter built of stone slabs enclosing a quadrangular space. At no other location in the region have likely habitation structures been found. Consequently, it can be understood that the rest of the 197 sites contain only non-habitation structures although this remains a preliminary assessment. The distribution pattern of the 14 sites as a contemporaneous landscape is also analyzed below to compare with the pattern of non-habitation sites.

3.3.4 Results

To distinguish between the two sets of samples used in the following tests and for ease of discussion, the sample of sites (n=214) generated from the extensive regional survey will be referred to as census sites, the subset of sites (n=16) where habitation structures have been identified will be referred to as habitation sites.

Point pattern analysis is used in the following to test the correlation between site location and a number of environmental parameters to determine if sites are distributed at

"random" or in conformity with certain geographical characteristics or the location of other sites. By rendering archaeological sites and finds as points on a map, it employs statistical methods to describe their spatial patterns of occurrence. The properties of these patterns are considered in two regards - external dependency and neighborhood dependency (Nakoinz and Knitter 2016: 130). The first examines the dependency of a location on parameters such as altitude and distance to water courses. The second looks at the relationship between points by assuming that the location of one depends on others through tests of complete spatial randomness (CSR) that compare the observed pattern to randomly generated points (Nakoinz and Knitter 2016: 135). The behavior of these points - whether random, clustered, or regular - helps establish deterministic values in point patterning that stem from environmental factors or human activities. Lastly, the visibility of and from selected sites is analyzed using viewshed analysis to reconstruct subjective perceptions of landscape. These analyses were run using ArcGIS and R (a package for running statistical algorithms).

3.3.4.1 Frequency of sites with respect to altitude

The census sites are distributed in three discernible topographic regions that are consistent with the following brackets of altitude: foothills between 2500 and 2000 masl; alluvial fans and bajadas formed into piedmonts (usually also the first terrace) between 2000 and 1500 masl; and valley floors between 1500 and 1000 masl (fig. 3.1). According to Li et al.'s (2014) classification of vegetational zones, these altitudes encompass the subalpine meadow and steppe, the forest-shrub, the shrub steppe, and the desert steppe. The predominant plant types are flowering shrubs, tufted grasses, and coniferous trees.

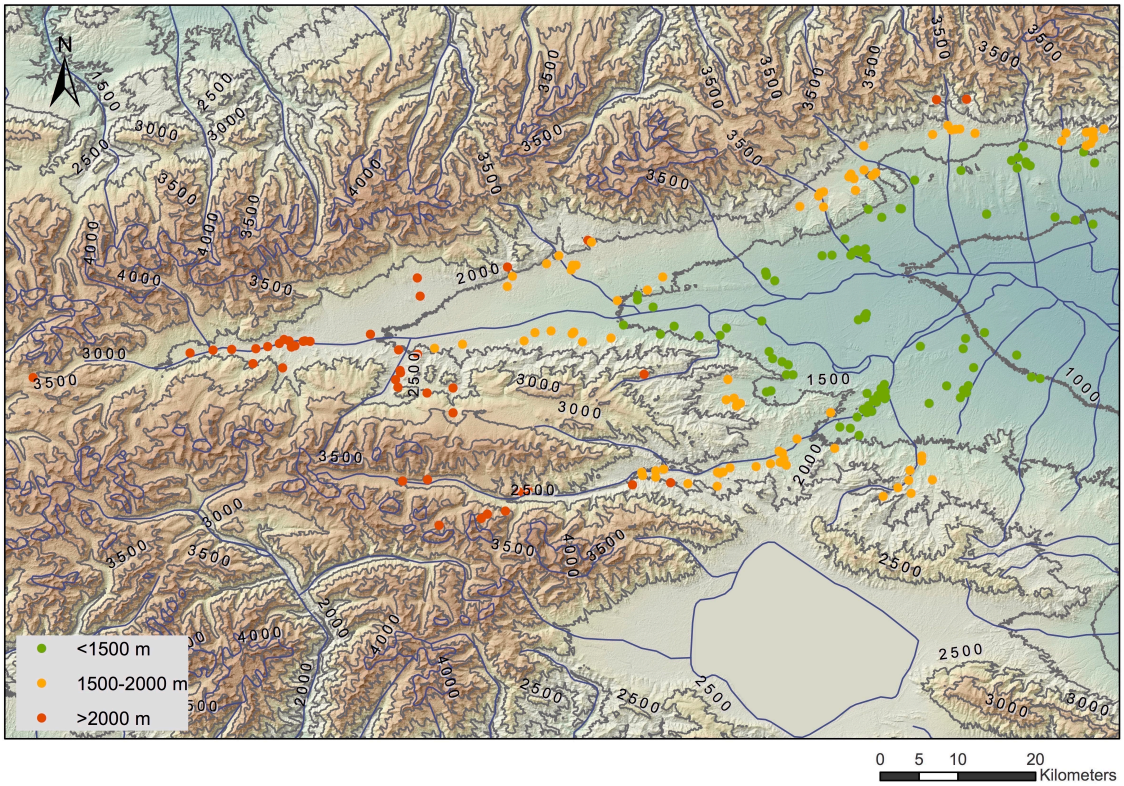


Fig. 3.1 Distribution of census sites in the Bortala River Valley in three altitudinal groups (>2000 m, 1500-2000 m, and >2000 m).

The result summarized in the table (3.2) below is produced with a sample of 214 sites (n=214) and 10345 structures. It shows that there are half as many sites in the highest altitude group as there are in the other two groups. Because the designation of "site" is arbitrary and dependent on criteria that are not detailed in the national census report, the average number of structures per site is also factored into the calculation to normalize inherent biases in the delineation of "site". With exponentially fewer sites, the average number of structures per site is the largest in the highest altitude group. To determine if the size of the sites, as represented by number of structures, is significantly larger at higher altitudes, the Kruskal-Wallis test is used to determine if the frequency of

structures differs significantly for different elevation groups (see table 1 in Appendix 1 for data set).

	<1500 m	1500-2000 m	>2000 m
sites	88	83	43
structures	4071	3976	2298
structures/ site	46.26	47.90	53.44

Table 3.2 Number of sites and structures in the Bortala Valley in three altitudinal groups.

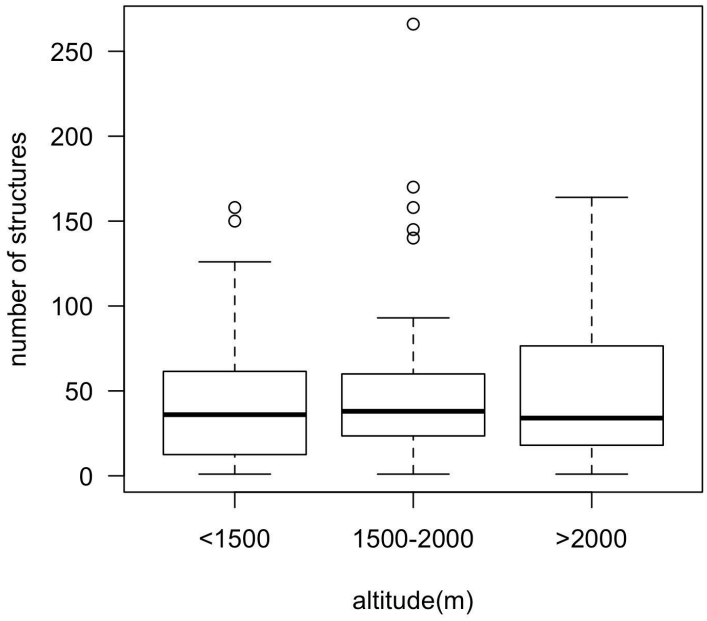


Fig. 3.2 Kruskal-Wallis test of statistical significance between number of structures and altitude (chi-squared = 1.144, df = 2, p-value = 0.5644).

The test produced a p-value of 0.5644, rendering the relationship between the two variables - number of structures and altitude - insignificant at a confidence level of 0.05. There are more sites at lower altitudes but the difference is not significant. This shows

that although larger sites tend to be found in the highest altitude group and lower altitudes have a higher number of smaller sites, the difference is statistically insignificant.

3.3.4.2 Distribution of sites with respect to distance from watercourses

It is hypothesized that proximity to primary watercourses (first and second order streams) may have been an important factor in the choice of site location. Access to water could be associated with a combination of social, economic, and ritual reasons, the most important of which would be to water the livestock, cultivate crops, assert territoriality, and to provide general support for human subsistence. To establish classes of distance effective for testing the relationship between the frequency of structures and proximity to streams, the mean distance of site to nearest stream is calculated using a sample size of 214 (n=214). Each site's (target feature) distance to its nearest stream (join feature) is calculated using the function of spatial join and with the "closest" option. The result shows that the distance ranges from 6.45 m to 7059.52 m. The mean distance is 1864.59 m with a standard deviation of 1734.97 m. These figures are rounded to 2 decimal points.

The following density plot (fig. 3.3), generated by R-statistics, shows that the number of sites over a distance to nearest stream is a unimodal distribution skewed right. The spread is small. The peak of site distribution is located between 0 m and 1000 m. To consider visualize this pattern in geographically, I drew up a map (fig. 3.4) to show the distribution of sites in four distance groups - <1000 m, 1000-2000 m, 2000-5000 m, and >5000 m. Sites with the smallest distance to the closest stream (blue dots) show a higher concentration compared to sites in groups of larger distances, which tend to be more dispersed.

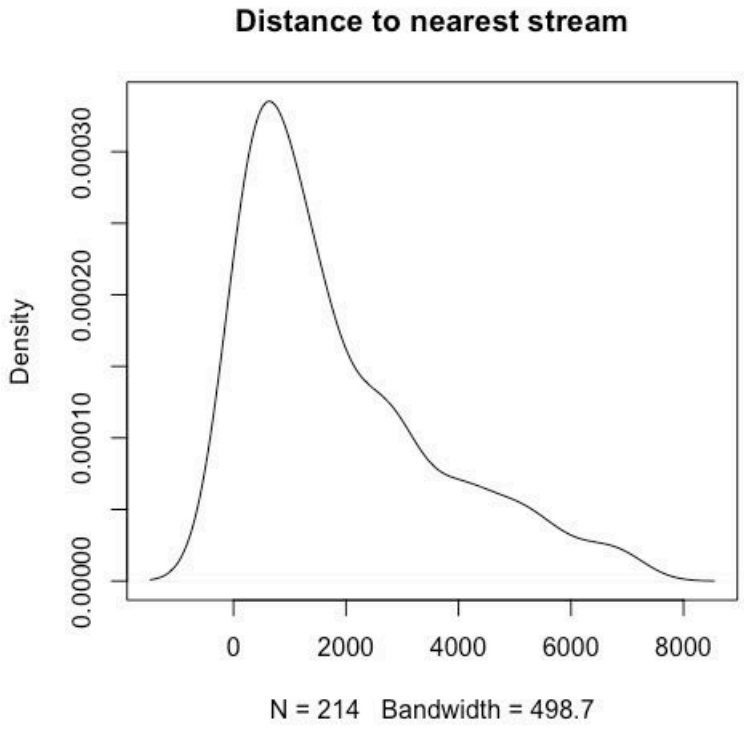


Fig. 3.3 Density plot showing the distribution of sites (n=214) over a distance of 8 km.

This pattern can be accentuated by measuring the density of sites (by structure count) using Kernel Density analysis. What it does is calculate the value of point features distributed around each raster cell within a given radius, divided by the specified unit of area. It then produces a density surface showing the area where a given feature is most concentrated. The result of the Kernel Density analysis shows five distinct concentrations displayed in gray blotches (fig. 3.4), which are all clustered around primary watercourses. It also shows that the number of structures is highest closest to the river, suggesting that proximity to a primary or secondary watercourse is an important site selection factor.

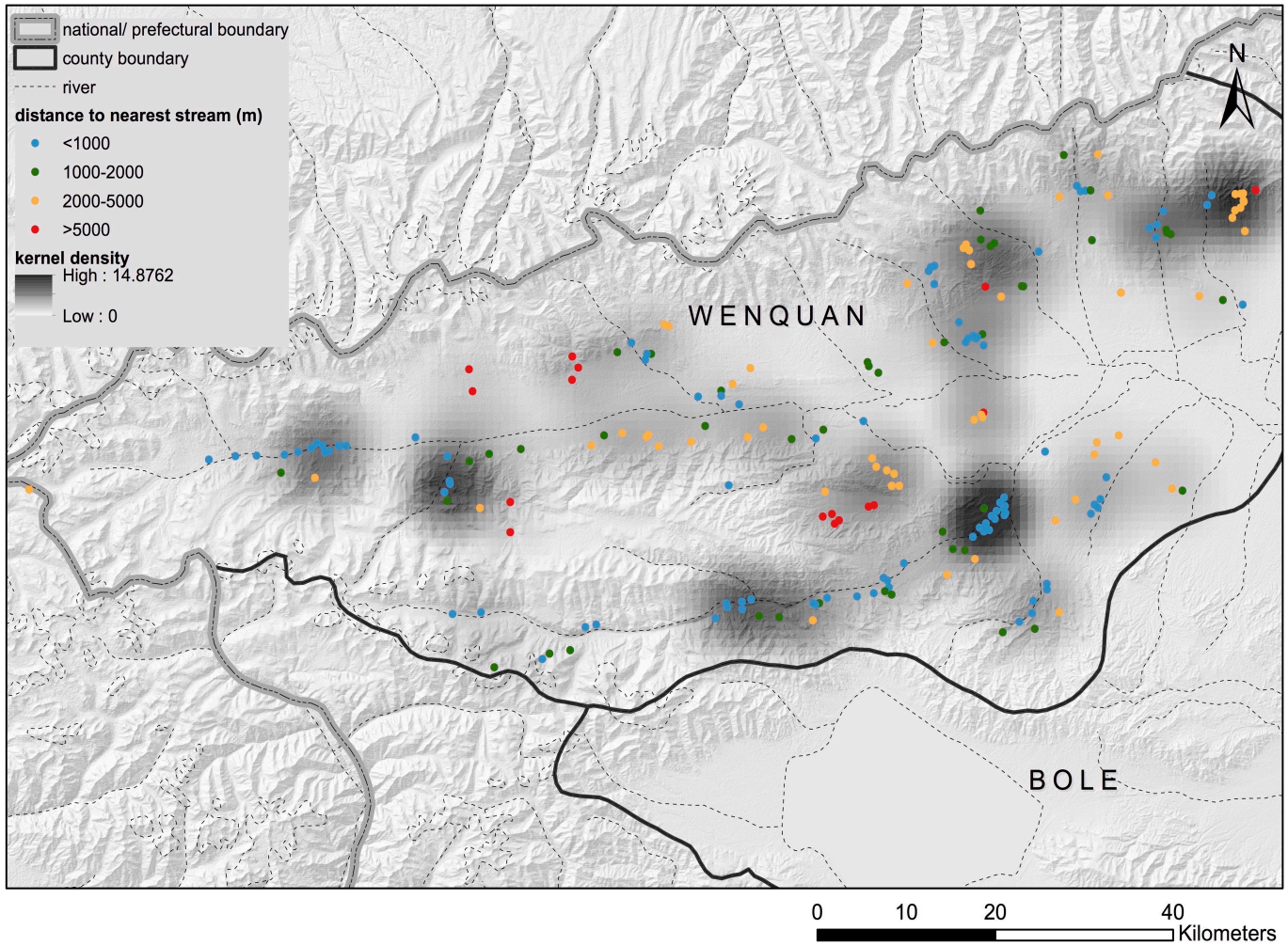


Fig. 3.4 Kernel density map showing location of the 214 sites color-coded by their distance to nearest stream (m).

Next, to test the significance of the relation between the size of site, measured by structure count, and distance to closest stream, the Kruskal-Wallis test is performed (fig. 3.5, see table 2 in Appendix 1 for data set). The null hypothesis is that there is no relation between these two populations. The distance to nearest stream is grouped into 6 bins. Since these distances are calculated based on coordinates from Google Earth locations, they have an error margin large enough to consider a range of 1000 m as a discrete value. The >6000 m bin includes 6 sites in the 6000-7000 m range and 1 site over 7000 m; the >7000 m site is included into the same group because the distance is merely 59 m over 7000 m.

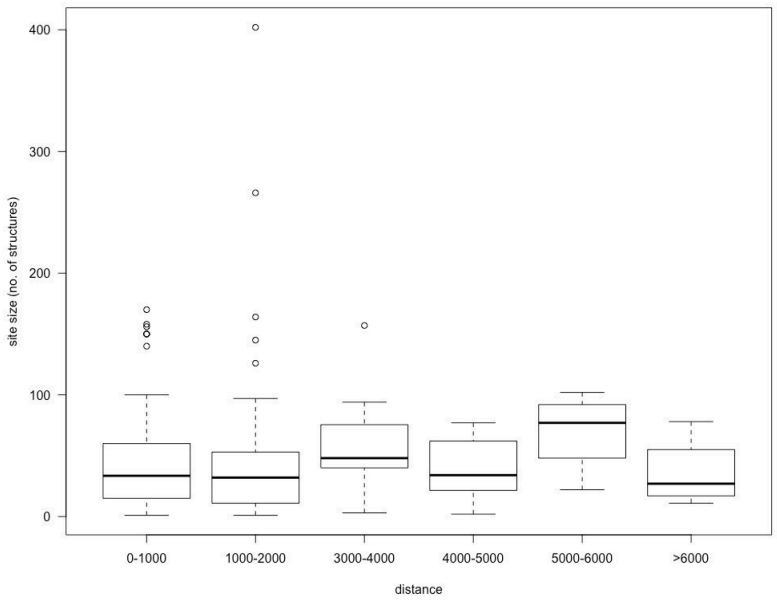


Fig. 3.5 Kruskal-Wallis test of statistical significance between site size and distance to stream (chi-squared = 13.171, df = 6, p-value = 0.0404).

A p-value lower than 0.05 means that the null hypothesis is rejected. It is unlikely that there is no relation between site size (number of structures) and distance from nearest

stream. The result corroborates the density pattern suggesting that proximity to a primary watercourse is a favorable location. Proximity however does not indicate accessibility because terrain changes, such as a sudden increase in slope and drop in altitude in the case of a ravine, between the site and the nearest stream are not factored into the calculation.

Proximity to water courses may not always be a locational advantage, particularly for low-lying areas susceptible to erratic cycles of high water discharge. Gillings' (1995) study in the Tisza Valley of north-east Hungary shows that the Middle Neolithic sites in the flood plain tend to situate away from water courses to evade the impact of flooding while those on the terraces do not display a particular preference. His research shows that stream networks and hydrological cycles have a significant bearing on the placement of the Middle Neolithic sites. The effect of topography on site location is also seen in the Dzhazator Valley in the Russian Altai where stone monuments and petroglyphs are connected to the presence of terraces and access to river-crossing (Bourgeois et al. 2014).

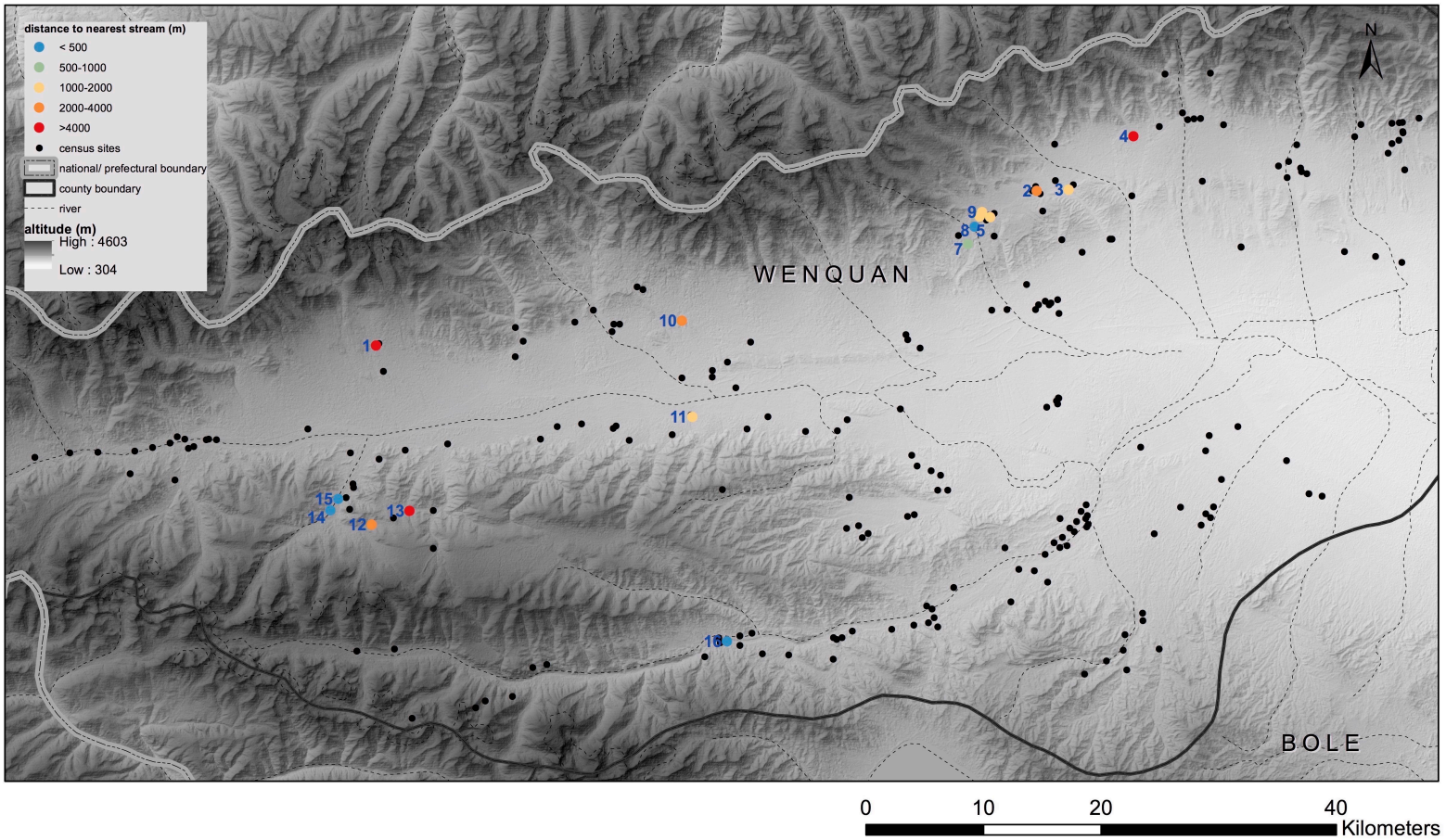


Fig. 3.6 Location of the 16 sites with habitation structures in color dots coded by their distance (m) to the nearest stream. The remainder of the census sites with only non-habitation structures are displayed in black dots. Sites: 1. Aduuchuluu 2. Hu'ertuoleha 3. Xiaohusita 4. Chagansayi 5. Sabibuliuke Turigen 6. Sabibuliuke West Checkpoint 7. South Huji'ertu 8. North Huji'ertu Cemetery Site 9. Sabibuliuke East Checkpoint 10. Narenwusu 11. Bure Village. 12. A'aote 13. Gulijiaba 14. South Wusutebiezhen 15. Wusutebiezhen 16. Southwest Checkpoint Cemetery Site

When the habitation sites (n=16) in the Bortala Valley are subjected to the stream proximity analysis, it is found that 10 of the 16 sites are located within 2 km of the nearest watercourse (fig. 3.6). Only 3 sites are found more than 4 km away. They are namely, Aduuchuluu, Gulijiaba, and Chagansayi.

The map (fig. 3.6) shows the distribution of these habitation sites relative to the rest of the census sites. There are two discernible clusters, which are no. 2, 3, 5, 7, 8 and 9 located in the alluvial fans of the lower river valley at the foothills of the Dzungarian Alatau, and no. 12, 13, 14, 15 in the high mountains (above 2000 masl) of the Biezhentao Range in the Tian Shan. Future research will investigate if these habitation sites had an impact on the location of later period funerary and ritual structures.

3.3.4.3 Neighborhood dependence

As opposed to the kernel density analysis (above) which serves to show where the highest number of sites is in a smallest given area, the following methods are used to test the randomness of the pattern (meaning the location of one point is not dependent on others) or whether there is a spatial correlation between these sites. The two methods applied below are nearest-neighbor analysis (G-function) and Ripley's K (K-function).

The nearest-neighbor analysis establishes if there is a statistical significance of clustering by calculating the average spatial distances between the points and their first nearest neighbor. It compares this empirical pattern to a hypothetical random set of points positioned in the study area generated by the Monte Carlo algorithm.

The test produces a z-score of -13.36, meaning that there is a less than 1% likelihood that this clustered pattern could be the result of random chance. This establishes that there is attraction (positive interaction) between points (Nakoinz and Knitter 2016: 136), as illustrated by the shorter observed mean distance (1462.54 m) than the expected mean distance (2799.29 m). All these figures are rounded to 2 decimal points.

The use of nearest neighbor analysis is quite common in spatial studies of archaeological landscapes since admittedly, it is a relatively easy method and it produces a straightforward interpretation of the point pattern. However, because it can only detect spatial patterning at the first nearest neighbor, spatial patterns may be overlooked when dealing with more complex multi-scalar patterns. The measurement of spatial tendencies is also highly affected by the scale of the study area, which when calibrated differently, can show patterns of both clustering and dispersion (Bevan and Conolly 2006). Knowing the method's limitations, researchers would generally apply a second or third statistical method to analyze the data.

The alternative method used here is Ripley's K function. Although this is also a function sensitive to the size of the study area, it is more stable and robust (Nakoinz and Knitter 2016: 138) because it can detect spatial patterns at multiple analytical scales simultaneously (Bevan and Conolly 2006; Markofsky 2013: 707). Given the size of the study area and the site distribution pattern in the Bortala River Valley, the K(t) statistics is computed for a distance of 5 km at 100 m increments. A weight field is entered, measured by the structure count at each location. The confidence level is estimated at 999 permutations (i.e. 999 sets of random point placement by Monte Carlo simulation) and

Ripley's edge correction formula is applied. The result is converted and displayed as an L-function graph below, which allows the variance of the y-axis to be better displayed than a K(t) plot.

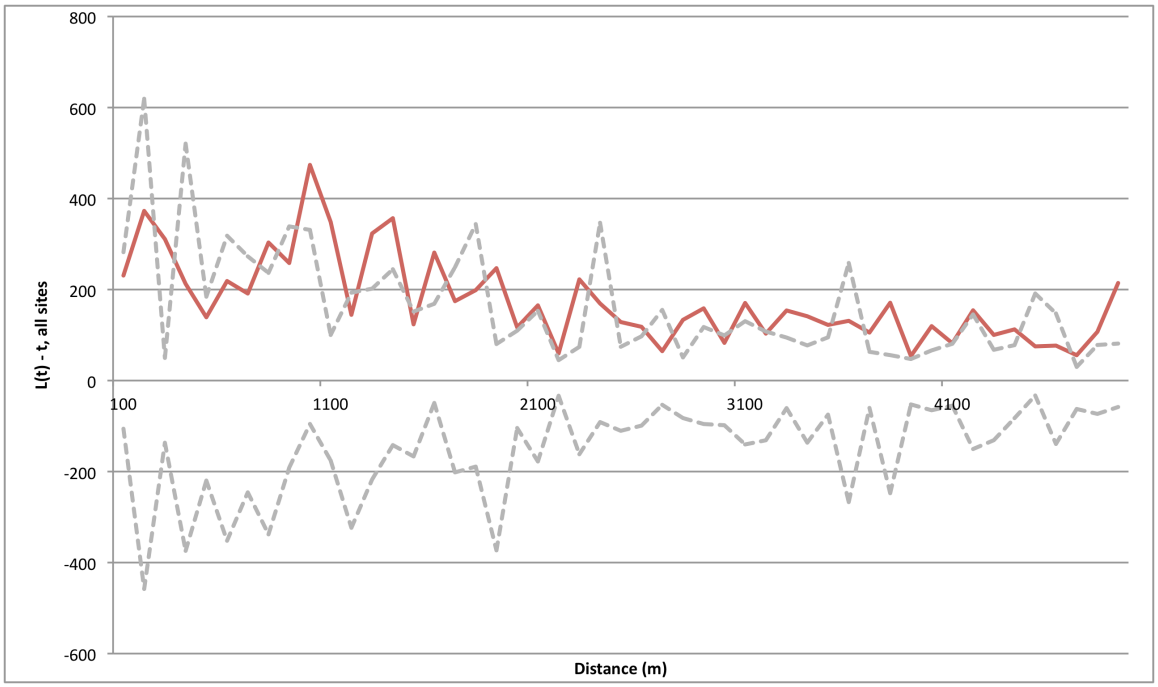


Fig. 3.7 Plot of L (t) -t for all 214 sites (10345 structures) over a distance of 5 km at 100 m increments. Lower and upper dashed lines are 2.5% and 97.5% quantiles.

The results shows that the pattern of distribution aligns more or less with the upper 97.5% quantile (upper gray dotted line). L(t)- t is larger than 0 (which represents complete spatial randomness) across the entire distance, suggesting spatial clustering; however, it is only statistically significant at sporadic intervals where the observed value lies slightly above the confidence level. The pattern appears to suggest drastic shifts in site clustering patterns, and it may be related to the biases in site delineation and structure enumeration during the census survey and the likelihood of conflating sites of multiple occupational periods under a single analysis. Establishing more definitive survey areas

and typological and chronological categories of structural remains in future research will help distinguish localized patterns of distribution and understand the underlying human or environmental factors of clustering.

3.3.4.4 Viewshed and observer points

The function of viewshed is to compute the areas visible from any given viewpoint(s) based on the factor of elevation (Nakoinz and Knitter 2016: 215), the calculation can be adjusted to reflect the cardinal directions, vertical angles from which the viewing is made and the distance of sight. Mathematically, what viewshed indicates is "whether a certain grid cell is visible from a certain point of view"(Nakoinz and Knitter 2016: 215). In terms of the location of archaeological sites, it offers an emic perspective into what might have been the ancient visual perception, which could offer an explanation of land use and network patterns. In some cases, such as Markofsky's (2013) study in the Murghab Delta, the viewshed analysis reveals an underrepresentation of archaeological finds in expansive open areas of the alluvial plain that is indicative of the effect of land cover and post-depositional processes on the preservation of the archaeological record.

In the map (fig. 3.8) below, the color of each grid cell indicates the range of viewpoints from which it is visible. It is computed with an input of the raster elevation grid and a 214 point feature (n=214). The darker the color, the higher the visibility of the grid cell.

Since viewshed is determined by viewing and target heights, it is no surprise that the most visible areas coincide with the most elevated (highest altitude) areas in the

mountains on either side of the lower river valley. By comparison, the highlands on either side of the upper river valley (the left side of the map), even with their higher altitudes, are not as visible. This appears to be consistent with the narrowing of the valley which restricts the angle of view. It is also affected by the relative lower number and density of sites in the upper valley compared to the lower valley.

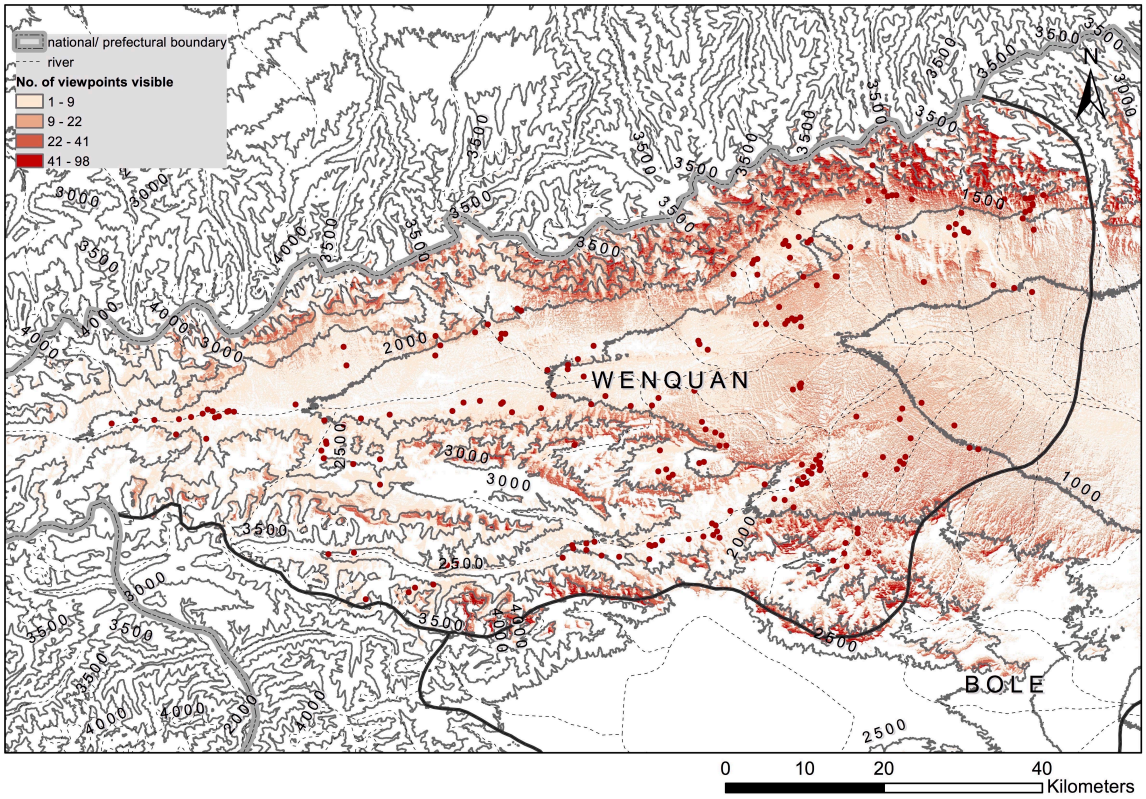


Fig. 3.8 Viewshed map of visibility based on an input of 214 viewpoints.

The Observer Points analysis performs a function parallel to viewshed. It provides specific information on where each of the observer points is visible. In the following, a sample of 15 viewpoints (n=15), representing 3 sites, are selected from three of the concentrations illustrated on the density map (fig. 3.4) where intensive survey and/or excavation has been conducted. 15 locations are selected because the maximum number

of point features allowed for Observer Points analysis is 16. These locations belong to the sites of Aduuchuluu, Xiaohusita, and Etuokesai'er. Selected sites from these three concentrations are also examined in the analyses of subsequent sections (3.2.3.2 "micro-regional study", 3.2.3.3 "site-based study").

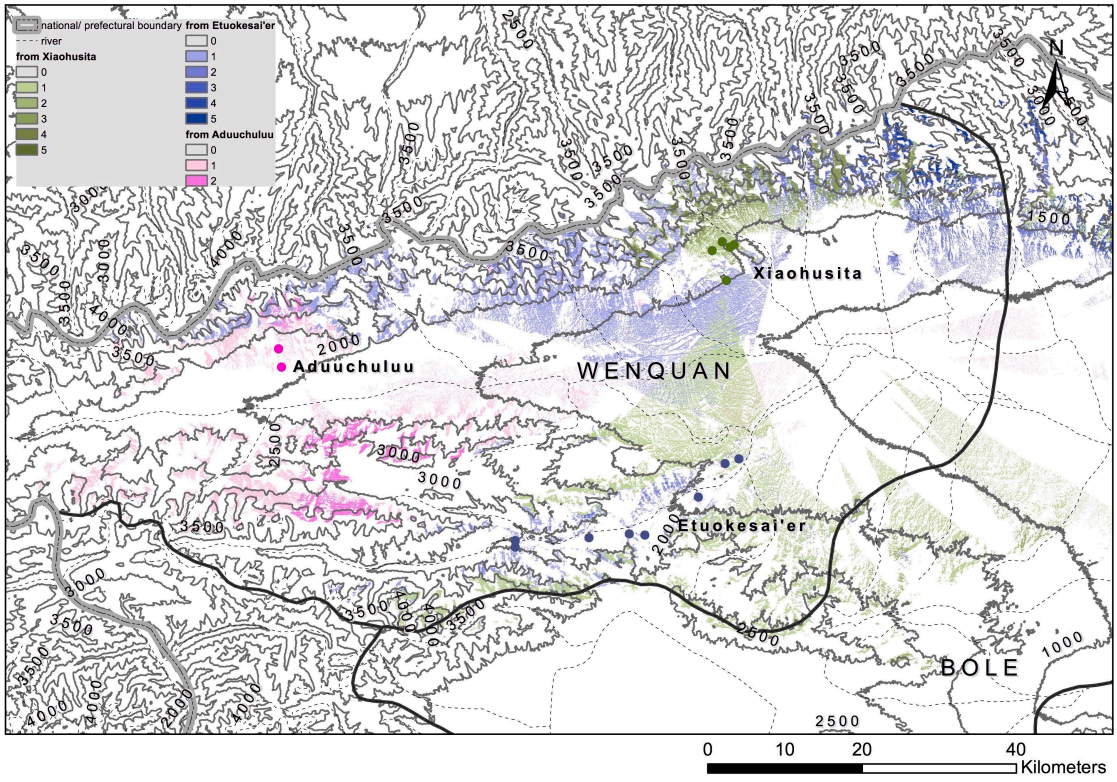


Fig. 3.9 Map of areas where observer points of three different clusters of sites are visible.

The areas in pink, green and blue show where the observer points are visible and therefore what is visible from the corresponding observer point (fig. 3.9). The areas where the observer points are visible from Etuokesai'er and Xiaohusita are larger than the areas for Aduuchuluu. Even though Aduuchuluu is represented only by fewer (i.e. 2) observer points, it appears that its location in the narrower upper valley is the reason for its relative limited visibility. Xiaohusita, on the other hand, commands a cumulative

viewshed (in green) comparable to that of Etuokesai'er (in blue) although its observer points are more clustered than those of Etuokesai'er.

Since viewshed is a calculation based on elevation, and elevation data could be easily compromised by elements such as vegetation that might have in the past blocked the line of sight (Nakoinz and Knitter 2016: 220), its limitation in indicating visibility should be noted where precise land use data cannot be incorporated. In this sense, viewshed as a tool better illustrates what is not visible rather than what is (Nakoinz and Knitter 2016: 220). In the case of the Bortala River Valley, visibility is mostly constrained by topography; low-lying areas and narrow valleys have more restricted visibility because of the surrounding highlands.

The binary classification of locations into visible or non-visible within certain parameters has been rightly cautioned and critiqued in existing literature (Fisher 1992, Ogburn 2006). Researchers have since suggested introducing variables such as the *z* (height) value absent in digital terrain models, target size, and quality of object perception over distance, etc. to the calculation. These formulae include Fisher's (1992) "fuzzy viewshed" (Fisher 1992; Wheatley 1995: 179) and the visual index of distance developed by Higuchi (1983) (*cf.* Wheatley and Gillings 2000, Ogburn 2006). To improve its applicability and accuracy, Paliou et al. (2011) even advocate the integration of viewshed with reconstructed 3D spaces, which has seen success when the method was applied to small and medium spatial scales (individual buildings and townscapes). As data on the aforementioned variables are currently absent, the present analysis will not explore these modified techniques further than to make note of the methodological

caveats of a traditional binary viewshed (Fisher 1992; Wheatley and Gillings 2000; Ogburn 2006) when interpreting past viewing conditions.

On account of the result of this analysis and the lack of commensurate data from intensive survey or excavation, there appears to be no grounds for further testing the inter-visibility between other groups of structures in the Bortala River Valley, especially considering their temporal heterogeneity and diverse functionality. In some cases such as Aduuchuluu who possesses various topographic advantages as a purported religious or cultural landmark (see discussion in section 3.2.3.3), it may be worthwhile to test the hypothetical connection between visibility and ritual importance.

We might take the notable study of long barrows in the Danebury region of England as an example. Viewshed analysis shows that there is a significant association between the location of the barrow and the number of other barrows from which it is visible. But in this case, the visibility of other barrows is invariably not favored, suggesting the practice of territoriality by visual exclusivity (Lock and Harris 1996; Wheatley 1995: 172). This phenomenon happens to contrast the random distribution of barrows in the neighboring Avebury region, or that of the Stonehenge barrows, whose viewsheds tend to include rather than exclude other barrows (Wheatley 1995: 172, 179, 182-3). And incorporating visual references to preexisting foci may be interpreted as a way of uphold ritual authority (Wheatley and Gillings 2002: 215). It is likely that degree of visibility was one of the ritual criteria of site selection in the Bortala Valley. There is at present no indication of landscape modification to achieve visibility other than the building of structures at higher vantage points. It may also be argued that visibility may not necessarily be in line with topographic advantage but is rather conveyed on a more

local scale and by other measures and media that are not readily conspicuous (see section 4.2.1). Further data are required from archaeological fieldwork to identify variables that affect inter-site associations.

3.3.5 Summary

Based on the results of the analyses above, altitude is not a statistically significant factor in determining site frequency and site size. Although the average size of sites (measured by structure count) does increase with altitude, it can be largely accounted for by a twofold decrease in the number of sites from below 2000 masl to above 2000 masl. There are five locations with relatively high densities of sites (displayed in the kernel density analysis) and they are all situated around primary stream networks. The likely relationship between site size and distance to nearest stream is corroborated by a statistical test in which the null hypothesis is rejected. Proximity to water sources is also observed among habitation sites where the majority are located within 2 km of the nearest stream, but because the sample size is small (n=16) relative to the study area and the sites originate in different topographic regions, it is difficult to determine if this is a primary locational factor. Site location could have been affected by a host of other environmental factors as well.

The degree of dependence among sites is also examined as a locational factor. The result shows that there is statistically significant clustering at the first nearest neighbor. Across a distance of 5 km, however, the clustering occurs only at sporadic intervals and even so, it occurs more or less within the confidence envelope assigned by the hypothetical set of permutations. The result points to the need for more intensive surveys

to obtain a finer resolution on site chronology and structure types. This will help identify the local parameters that determine site location and patterns of clustering.

The visibility of selected sites is computed but the viewsheds do not show clear signs of territoriality or ritual inclusivity/exclusivity. The researchers from IAS, CASS have speculated that sites such as Xiaohusita were selected for their topographical advantage of not only being in an economically productive area but also enjoying a wide viewshed. Present fieldwork has not identified explicit visual references which its viewshed would have supposedly incorporated other than the observation that likely defense structures have been found on hills that afford a good vantage point over their surrounding plains.

In sum, the macro-regional analysis offers an overview of the location of sites relative to features of the physical environment. The application of statistical analysis to spatial modeling is effective to the extent that it reveals large-scale patterns of organization to which certain environmental factors of selection may apply, but does not address the variability of the archaeological record on an individual scale (Clarke 1977: 20). Future studies would incorporate additional parameters such as wind shelter and the NDVI (Normalized Differential Vegetation Index) (Sun et al. 2016), which was excluded in the foregoing analysis due to the lack of complementary data from ground reconnaissance. The NDVI can be used to understand the possible effects of relative biomass on site selection, and in the case of the steppe, model pasture productivity and routes of migration where vertical transhumance is a key subsistence strategy (Frachetti 2006: 141). It thus provides insight into the relationship between the practice of nomadic herding and the location of funerary and habitation structures.

Future research will also consider testing the correlation between site size (by number of structures) and accessibility. The null hypothesis would state that site size (structure count), which supposedly grew as the number of visits increased, is nonetheless unrelated to the site's level of accessibility. Accessibility, in this sense, is determined economically and rests on the assumption that the "optimal" route is selected by default. It will be calculated by way of a least cost path analysis which is calculated on the basis of certain environmental criteria such as terrain and access to resources. This would then be combined with viewshed patterns to locate overlaps that might better explain patterns of movement (Bell and Lock 2000: 91). It will also explore the site patterns by way of spatial syntax, a method commonly used in environmental behavioral studies to analyze movement behavior in topological, rather than metric, dimensions (Penn 2003). In other words, it considers the possibility that the mechanisms for movement are determined by its geometric relation to other elements in space, rather than the cost of movement (Penn 2003: 31).

3.4 Micro-regional study: intensive survey of selected sites

3.4.1 Introduction

On the basis of the inventory compiled by the national census of cultural relics and subsequent reconnaissance conducted by the team from the IAS, CASS, eighteen sites were selected for intensive survey between 2011 and 2015. High precision satellite positioning device (RTK- Real Time Kinematic), drone and pole aerial photography were used to document topographical features and the location and outline of stone structures.

In 2014 and 2015, test pits were excavated at four of these sites (Wusutebiezhen, Hu'ertuoleha, Xiaohusita, and Heishantou) to identify areas for future full-scale excavation. Results of these 2 x 2 m test pit excavations are still being processed by the Institute and are therefore not included in the following analysis.

Due to restrictions on data disclosure, only three of these sites are discussed in the following analysis, which are namely Aduuchuluu, Etuokesai'er Turigen and Xiaohusita (which also includes the site of Heishantou). Between these three locales, they make up a sample representative of locational preferences and the types of structure present in the river valley. They are found in three of the site concentrations identified in the Kernel Density analysis in the previous section (fig. 3.4).

3.4.2 Data Limitations and Sampling Biases

The documentation of structures during the intensive survey encountered the same the difficulties discussed in the macro-regional study (section 3.3.3).

Aerial images were captured using low-altitude drone photography. They were then processed in PhotoScanPro by Agisoft, a 3D photogrammetry program to generate the orthophotos and 3D models below. At every location, the coordinates of the perimeter of the structures are recorded with RTK. A thorough effort was made during field-walking to identify and record discernible surface structures but given the large area the survey covers and the rough terrain involving abrupt hills and transecting ravines and gullies, it is likely that some structures were not able to be identified. This, however, does not invalidate the integrity of the data sets compiled for the analysis below, which are intended as statistical subsets for the purpose of studying the characteristics of the

population of stone structures in the river valley. The survey made no intention to delineate the geographical boundaries of these "sites" as distinct cultural units; this is a concern for future investigations. Where geographical coordinates for individual structures were recorded, they are mapped onto the photogrammetric reconstructions below.

3.4.3 Forms of Structure

Table 3.3 lists eight basic forms of structure that have been identified in the Bortala River Valley to date. It renders the design of the structures in schematic, geometric illustrations to provide the following discussion an easy reference for the structure types discovered at each of the sites described below. Breaking down the structure into individual geometric elements also serves to facilitate comparisons of structural design and layout in the following discussion and help identify variations that define different regional and temporal classifications. As Wright (2006) has found, using a typology of additive parts helps untangle the chronology and geographical typology of khirigsuur monuments since these structures are the result of cumulative constructions.

There are two key building elements - stone slab, which is usually granitic, and rounded stone, which is either granitic or basaltic. Many of these structures have a slab cist at the center, but because they are usually not visible on the surface, they are not incorporated into the illustrations.

3.4.3.1 Aduuchuluu

Introduction

This site is situated approximately 8 km north of the Bortala River and south of the Chaganwusu 查干烏蘇 Mountain Pass of the Dzungarian Alatau, at *ca.* 2200 m above sea level. Traversing this area is a tributary of the Bortala River that connects to another river that flows northwest into Lake Balkhash in Kazakhstan.

The site comprises two clusters of structures situated on piedmont floors in the upper river valley. Together it covers an area of approximately 7 km^2. Seven habitation structures were identified in one of the two clusters, three of which are shown and discussed below. One of these structures was excavated from the 2011 through the 2016 field season. Together with the other two adjoining structures, it spreads across an area measuring approximately 3200 m^2 (measured in PhotoScan), on a roughly 30 degree slope on a NE-SW descent. The other cluster comprises over sixty burial structures. They are also described in the following discussion and in the next section. The structures are distributed across an even terrain with an altitude between 1970 and 1980 masl, on a gentle downward slope from north to south.

The ancient structures at Aduuchuluu were discovered initially during an archaeological survey by the Bortala Prefectural Museum in 1988. They include stone mounds, stone circles, anthropomorphic statues, as well as petroglyphs depicting figures of ruminants, humans, and other wild animals were also found at the same time (Li and Lü 2003: 21). In 1999, Aduuchuluu was enlisted as an archaeological site under the protection of the national cultural heritage law (文物保護單位 Wenwu Baohu Danwei) (Li and Lü 2003: 20). At present, Aduuchuluu is a winter pasture for pastoralists who practice transhumance. In the summer, they herd on alluvial plains at lower altitudes.

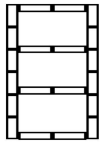
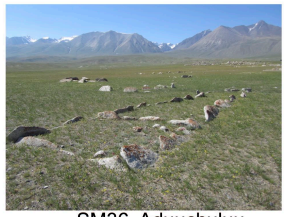
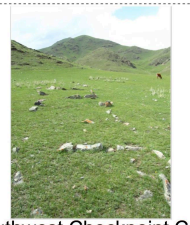
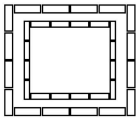
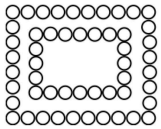
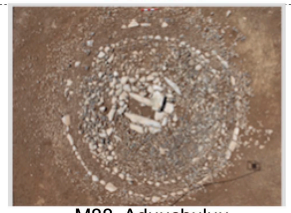
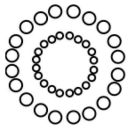
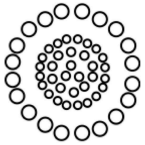
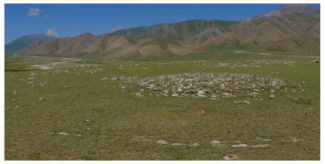
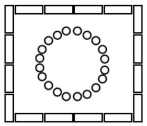
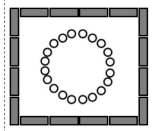
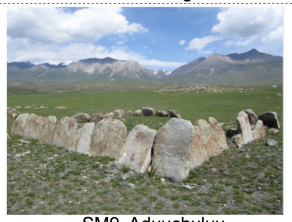
	illustration	building elements	configuration	archaeological example 1	archaeological example 2
A		low, inclined slabs	multiple adjoined rectangular enclosures	 SM36, Aduuchuluu	 Southwest Checkpoint Cemetery
B		low to medium slabs	quadrangular enclosure bounded by double slab rows on the perimeter	 F1, Aduuchuluu	 Turigen Cemetery
C		rounded stones	quadrangular enclosure bounded by double stone rows on the perimeter	 Hu'ertuoleha	 Xiaohusita
D		rounded stones	low cairn or ground-level arrangement	 M88, Aduuchuluu	 Etuokesai'er

Table 3.3 The predominant forms of stone structure identified to date in the Bortala River Valley

	illustration	building elements	configuration	archaeological example 1	archaeological example 2
E		rounded stones	circular stone arrangement with one concentric circle	 Etuokesai'er	 Gulijiaba
F		rounded stones	circular stone arrangement with inner cairn	 Dahusita	 Kuketawu
G		low slabs, rounded stones	quadrangular structure enclosing a burial circle	 Bure Village	 SM29, Aduuchuluu
H		tall, erect slabs, rounded stones	quadrangular structure enclosing a burial circle	 SM9, Aduuchuluu	 Hala'o

(continued) Table 3.3 The predominant forms of stone structure identified to date in the Bortala River Valley

Types of structure

Types B and D (table 3.3) are found at the habitation site of Aduuchuluu. The excavation of these structures will be further described in section 3.2.3.3. Types A, D, G, and H are found in the Aduuchuluu Cemetery, of which A and G constitute the majority. Based on the observation that variations in structure type and building style correspond to three distinct geographical clusters, the area of the cemetery is divided into northern, central, and southern zones. Types H and D are found in the northern zone (fig. 3.10a).

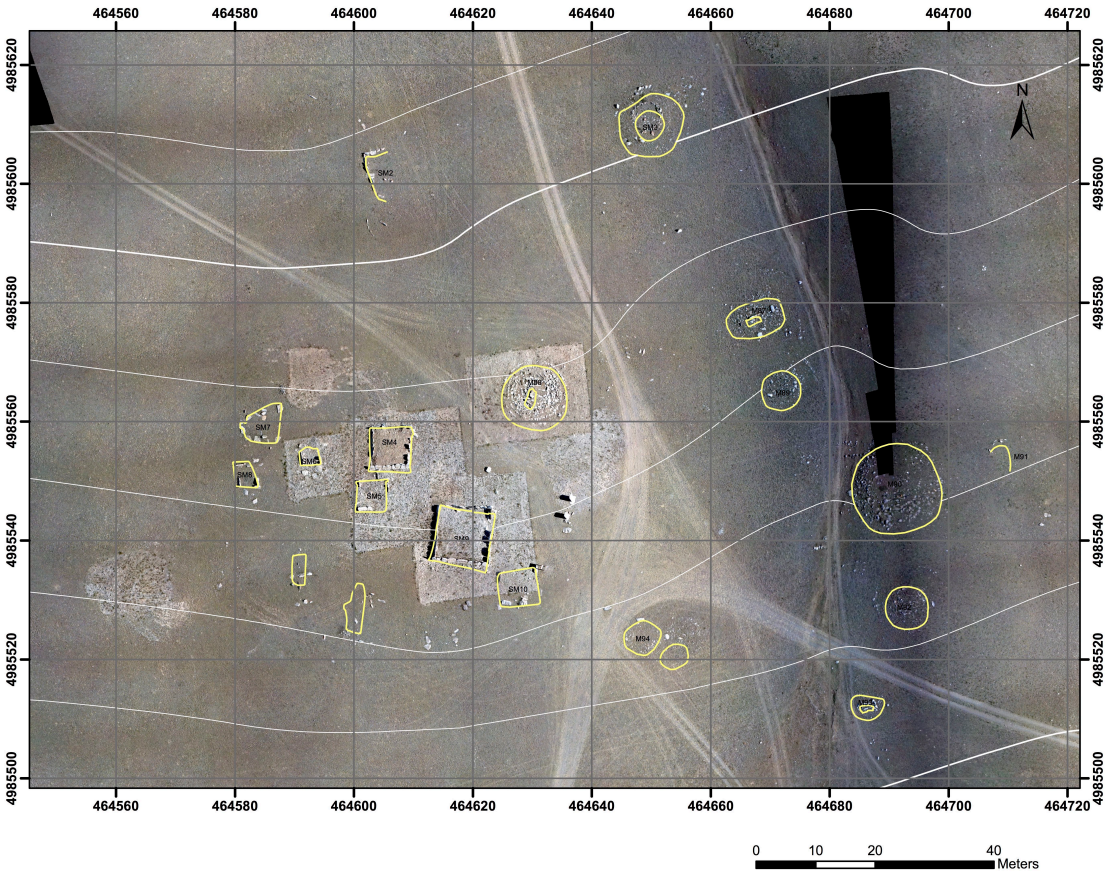


Fig. 3.10a The northern zone of Aduuchuluu Cemetery (NB: the outlines of the structures in yellow are generated by connecting multiple geographical coordinates the IAS recorded during the reconnaissance survey, hence some lines are jagged).

In the central and southern zone are types A, D and G (figs. 3.10b and 3.10c). Type D is found scattered throughout the cemetery, whereas the change from H in the northern zone to A and G in the central and southern zones appears to mark the evolution of funerary architectural style that occurred between two distinct periods of use. The change from H to G is most visible on the structure's perimeter where the slabs are tall and erect in H but low and inclined in G.

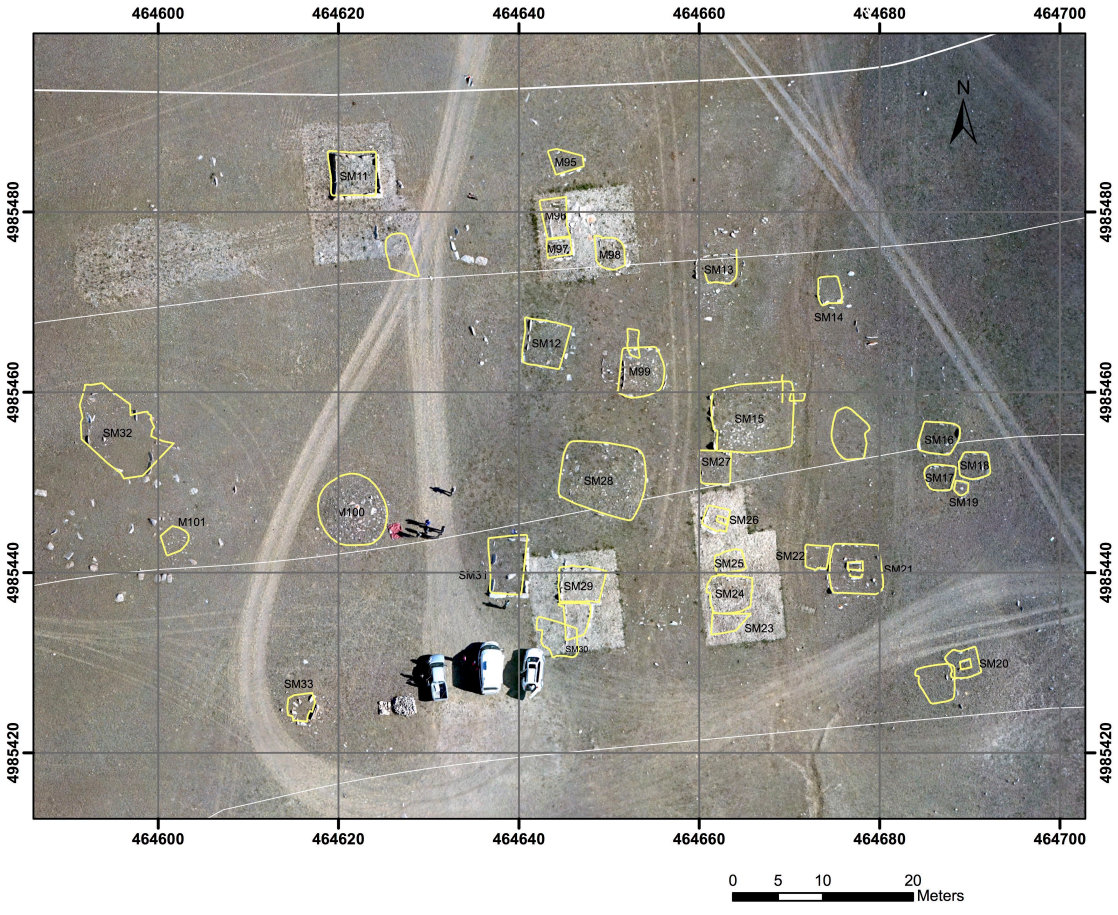


Fig. 3.10b The central zone of Aduuchuluu Cemetery

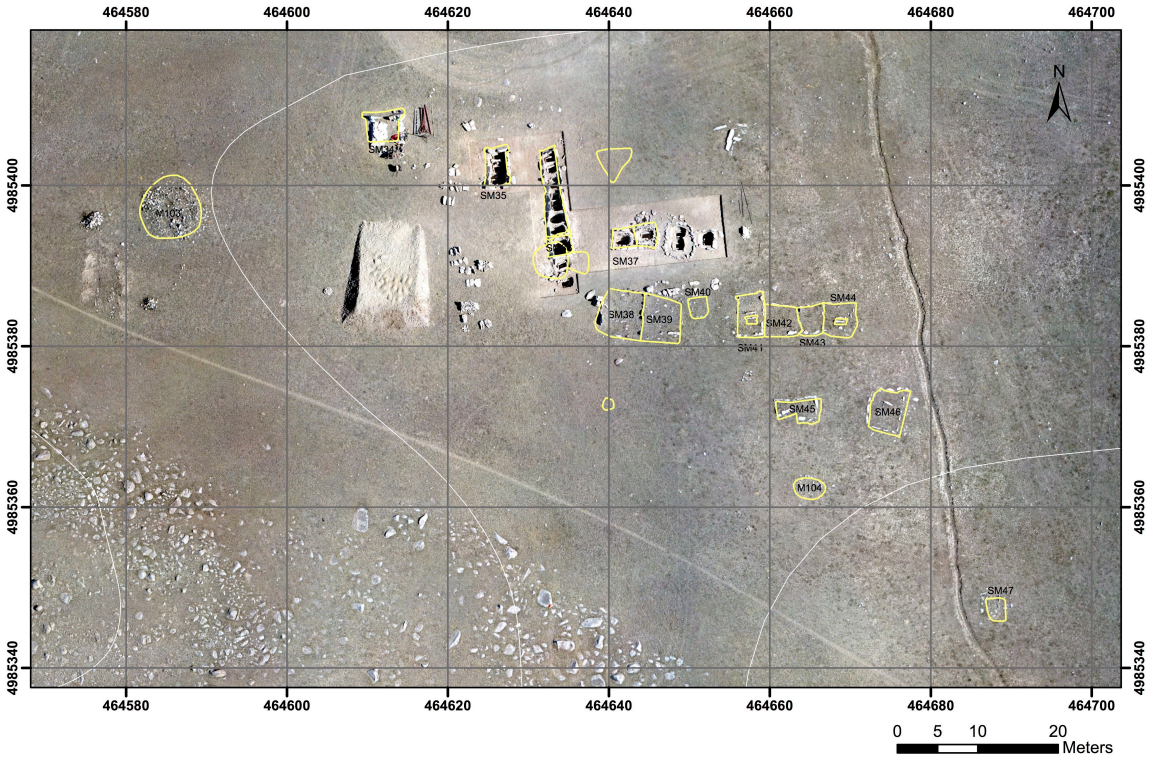


Fig. 3.10c The southern zone of Aduuchuluu Cemetery

Spatial analysis- kernel density and point density

To chart the areas of these hypothesized clusters of differential structural design, two density functions are applied to visualize spatial variations in the point pattern of these burial structures. Kernel density and point density are two methods of measuring density. The former distributes values in decreasing magnitude with increasing distance from the feature whereas the latter distributes values evenly up till the edge of the search radius.

First, a point layer is generated by marking each discernible enclosed structure in the Aduuchuluu Cemetery with a point. A total of 76 points is tallied. A search radius of 15 m is defined, taking into consideration that the dimensions of most structures vary

between 3 m and 10 m, and the maximum spacing between a given structure and its closest neighbor does not exceed 30 m for the majority of the structures. For this analysis, it is presumed that each structure in Aduuchuluu Cemetery holds equal weight.

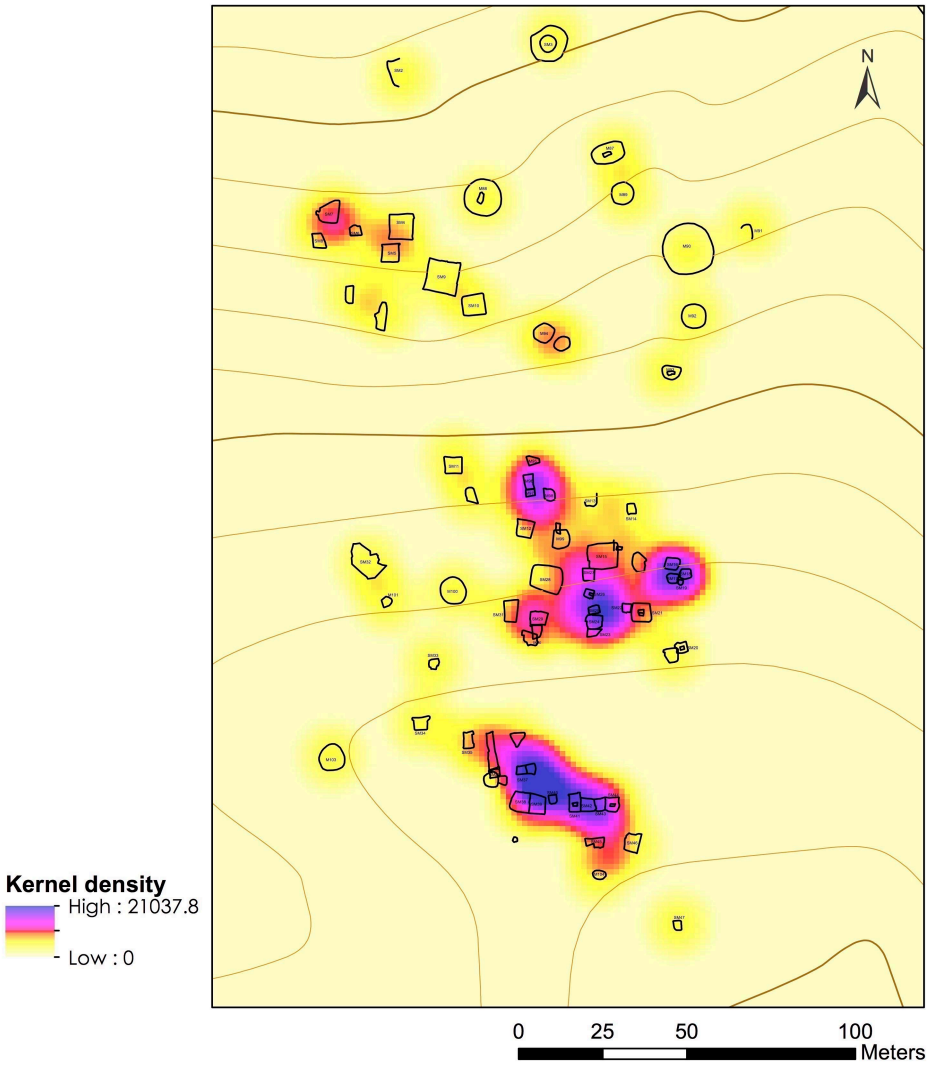


Fig. 3.11a Kernel density map of burial features at Aduuchuluu Cemetery.

The values are expressed in density units per square kilometer. The kernel density grid presents a similar pattern with two areas of distinct high value (shown in darkest color). On a kernel density surface, higher values occur in areas with the highest number of features. Thus, these areas are characterized by higher counts of structure per standard

area unit, which results in higher sums of values assigned to each pixel, rendering density. This suggests that structures in these two areas are more concentrated, with smaller in-between spacing. The marked clustering of structures lends support to the theory that the burials within the cluster are connected through some form of social membership, possibly kinship. DNA analysis of the skeletal remains would be able to confirm if biological affinity was present among the deceased.

The point density grid shows two distinct clusters with another more dispersed cluster to the north. On a point density surface, the higher values tend to occur in areas where the values intersect. The distribution is the most centralized in the middle cluster, suggesting a higher degree of intersection between the spaces surrounding each point feature, i.e. the structures, suggesting more organized and connected entities of burial.

The discrete units of concentration revealed in the density analyses are in agreement with the structural variations shown across the cemetery. This supports the conjecture that structures were built in multiple time periods, and conform therefore to different architectural styles and traditions.

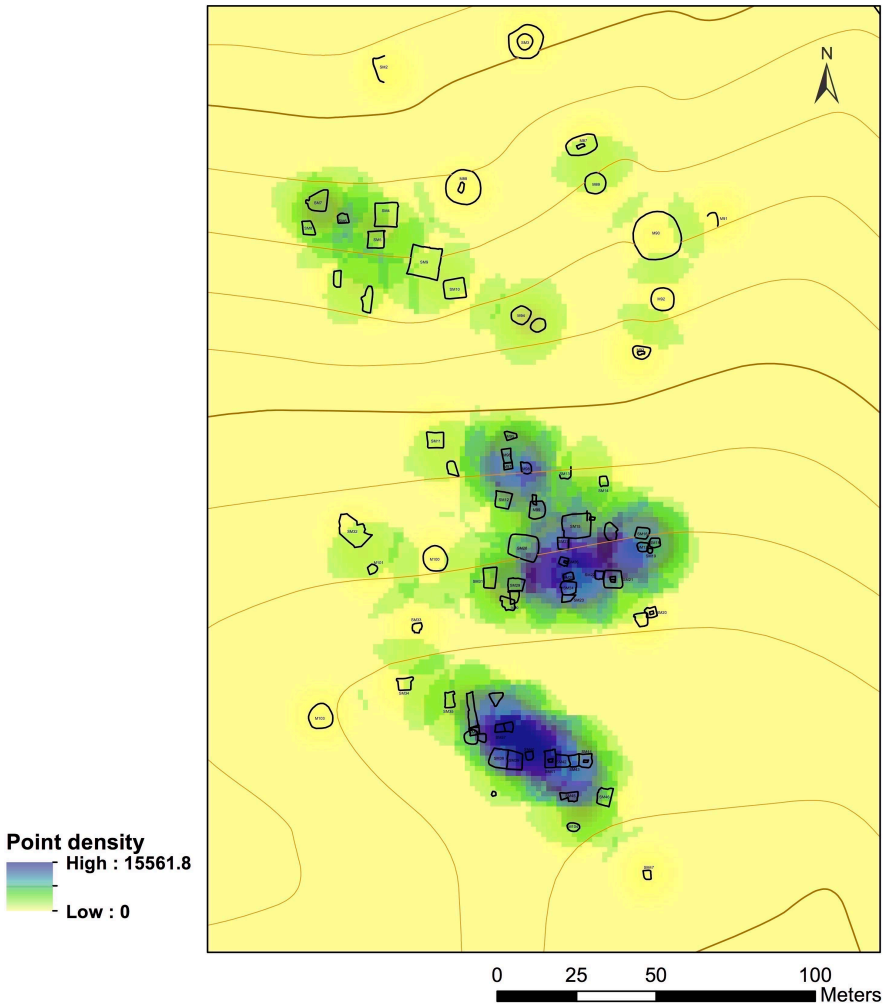


Fig. 3.11b Point density map of burial features at Aduuchuluu Cemetery.

3.4.3.2 Xiaohusita

Introduction

The site is located on the flood plains at the foothills of the Dzungarian Alatau, north of the Bortala River. The structures are distributed around and between two primary watercourses that originate in the mountains. The area becomes inaccessible at times during the wet season when there is a high water discharge and access paths are flooded.

The entire area of Xiaohusita spans nearly 12 km^2. Surveyors have distinguished three groups of structure that make up the site of Xiaohusita, which are namely an irregular habitation structure on a hill by the name of Heishantou (fig. 3.13), a second group of structures 4 km to its south that include a rectangular habitation structure and an enclosing wall on a hill named Xiaohusita, and finally the stone structures that are found on the alluvial fan between these two hills (fig. 3.14c). A total of 111 structures are plotted on the topographic reconstruction below (fig. 3.12), with the exception of part of the third group of structures situated on the alluvial fan, which was only recently documented in 2016. Field data from this season are still being compiled and are therefore not included in the following discussion. Preliminary findings that have been reported include bronze objects, ceramic vessels, animal and human remains excavated from a large (*ca.* 5000 m^2) structural complex that have been dated by typology to no later than 3600 BP. Excavators identified architectural similarities between this complex and the structure atop the hill of Heishantou (fig. 3.13), also excavated in 2016, which suggests that they form a contemporaneous landscape.

Types of structure

Structures at Xiaohusita comprise mainly types A, C, D and F. Types A, D and F are found in several large concentrations across the flood plains north of Xiaohusita Hill (fig. 3.12, 3.14b, 3.14d). Type Cs are few, but a prominent example is the structure immediately north of the hill (fig. 3.14c). There are two wall-like structures, one on top of Xiaohusita Hill (fig. 3.14a) and the other alongside a major group of structures west of one the main tributaries. Based on the topographic location of these walls and their

spatial relation to other contemporaneous structures, they can be best interpreted as territorial markers used to delineate and secure spaces intended for ritual or defensive purposes.

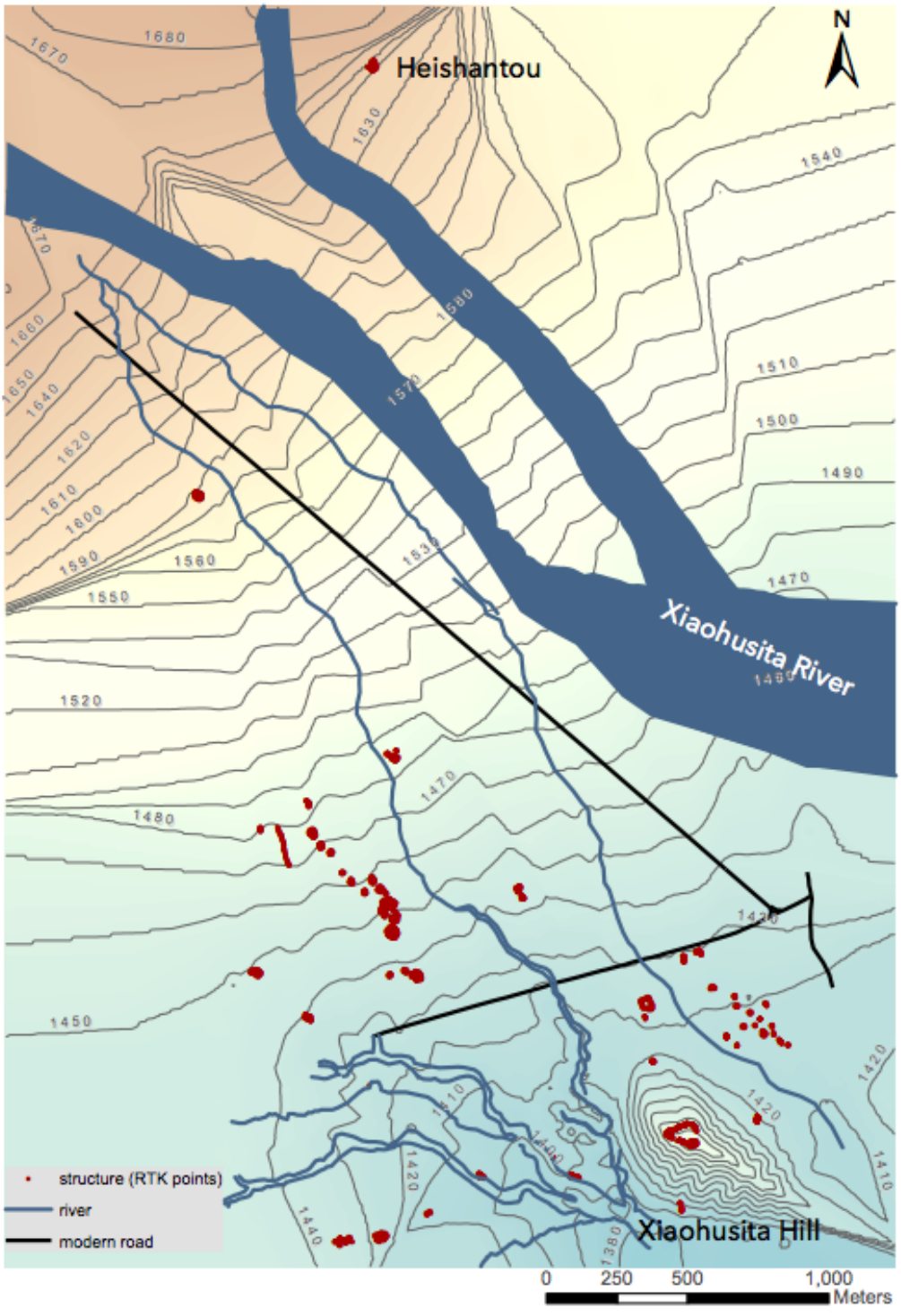


Fig. 3.12 Topographical model of the site of Xiaohusita. It is reconstructed from geographical coordinates recorded with RTK, and shows the location of major topographic features and ancient stone structures

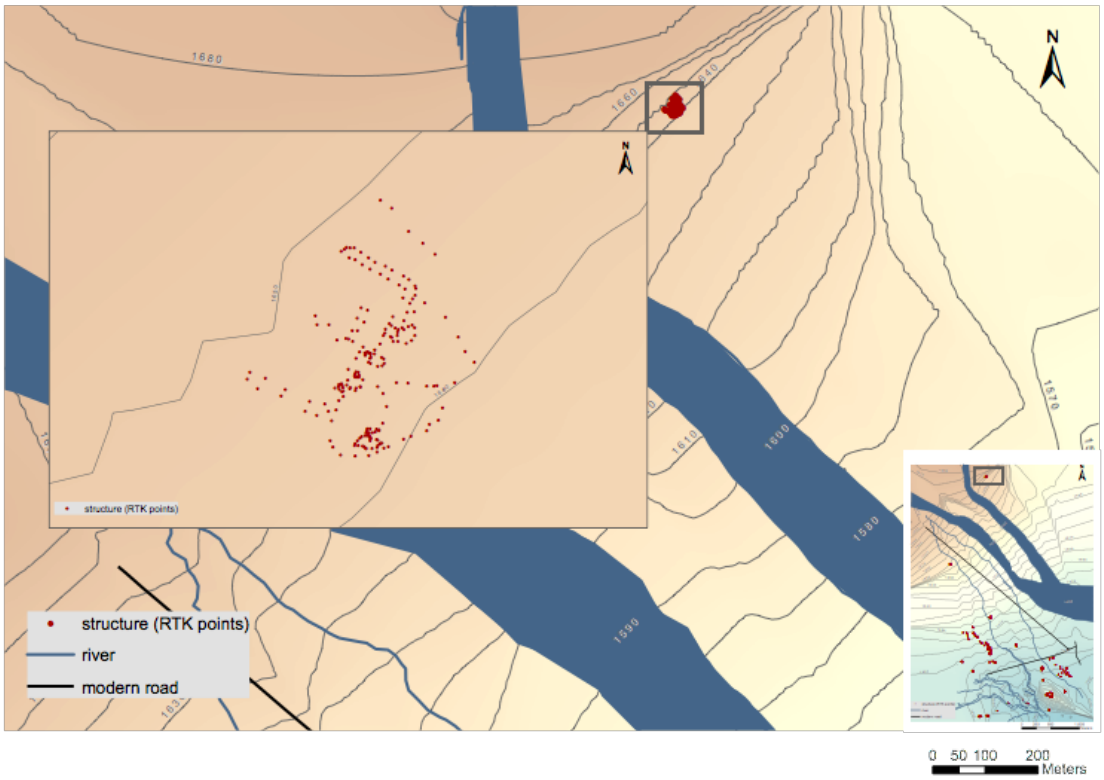


Fig. 3.13 Outline of the structure on top of Heishantou.

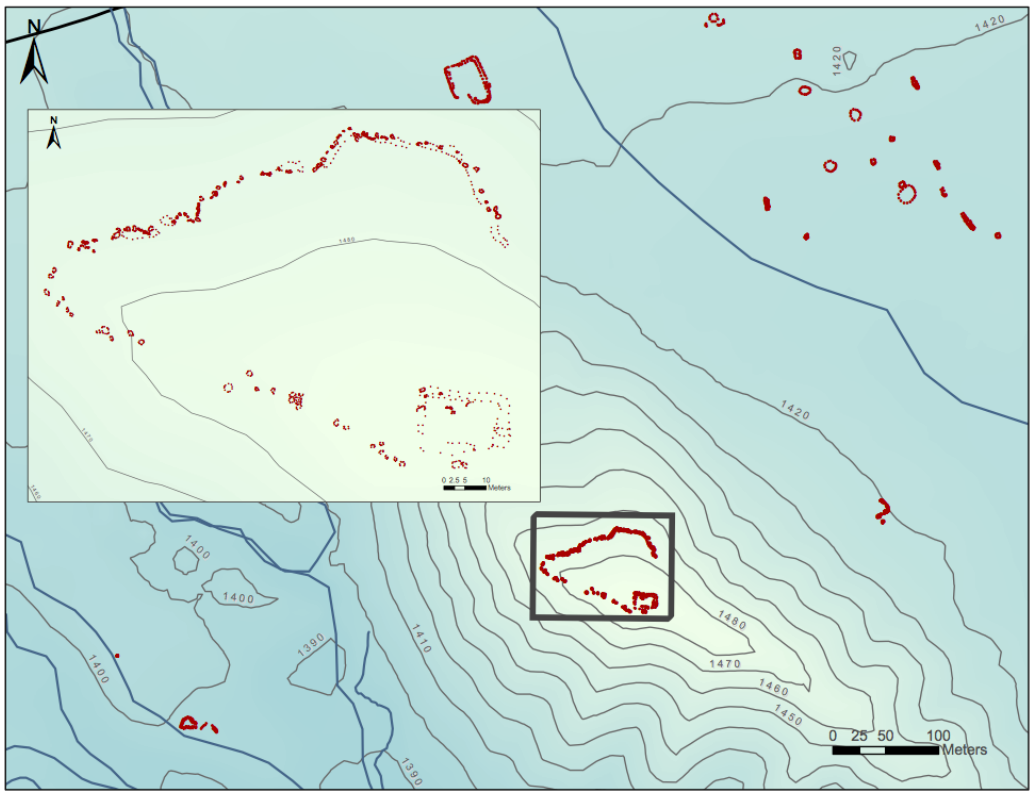


Fig. 3.14a A wall-like structure connected to a quadrangular enclosure on top of Xiaohusita Hill.

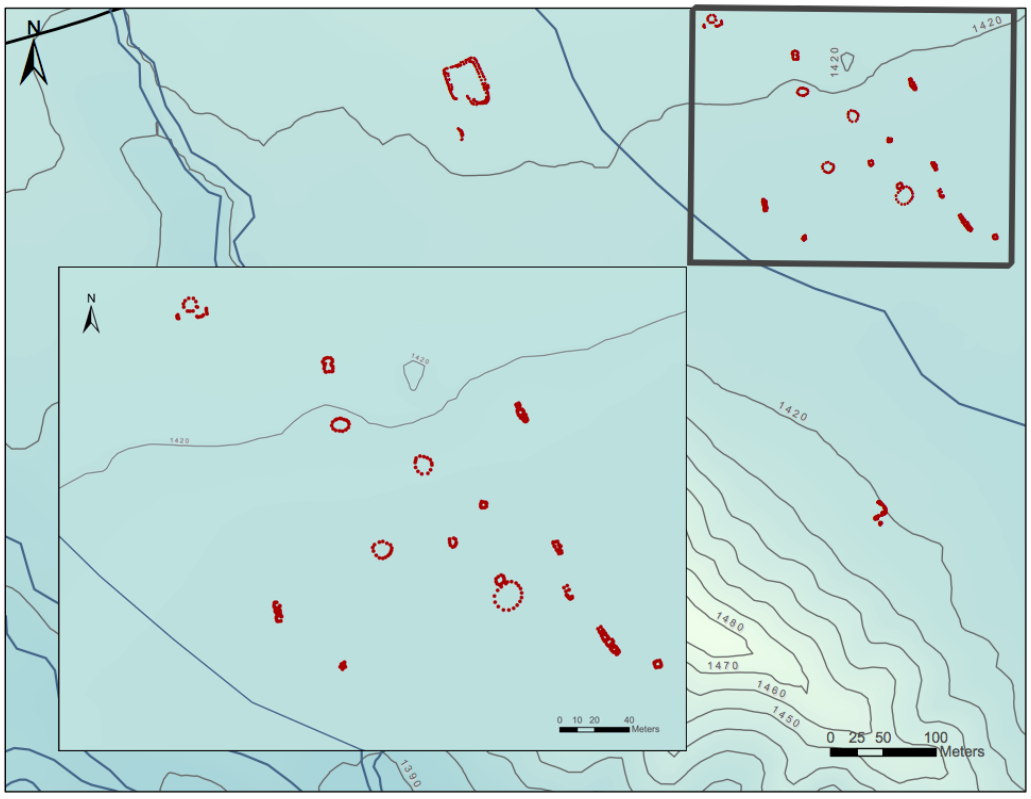


Fig. 3.14b Cluster of structures of types A, D, and F at the bottom of Xiaohusita Hill.

Fig. 3.14c Looking north toward the alluvial plain atop of Xiaohusita Hill. A type C quadrangular structure can be seen south of the modern road.

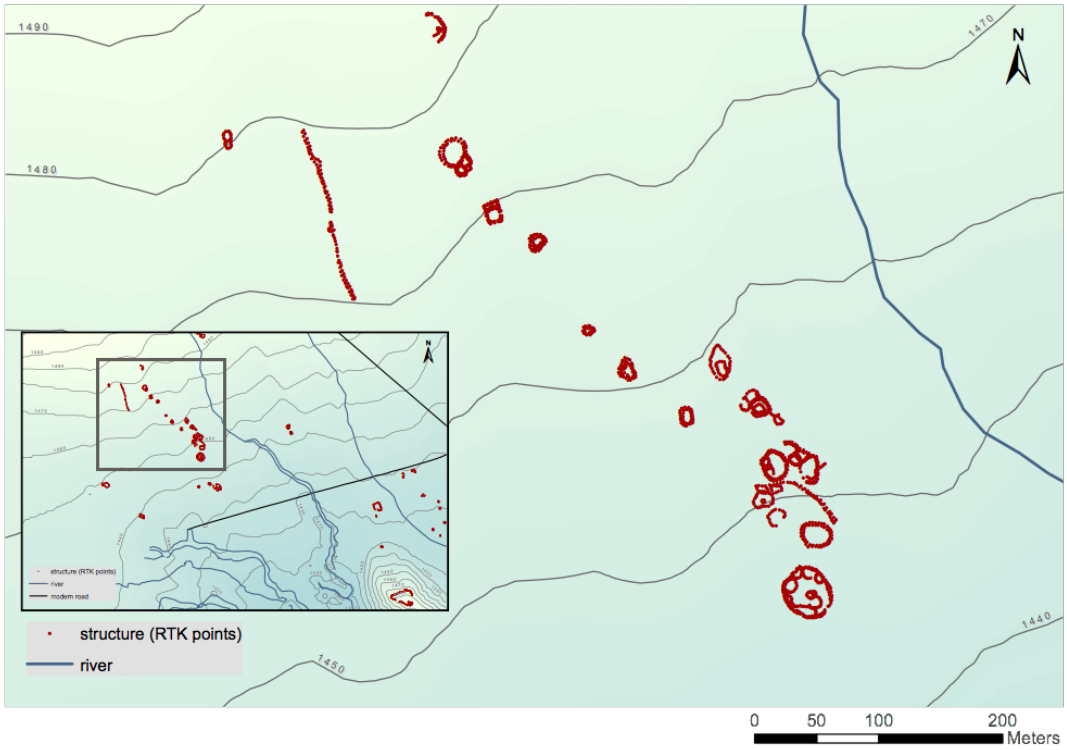


Fig. 3.14d Structures of types A and F, and of some hybrid configuration in another cluster on the alluvial plain northwest of Xiaohusita Hill.

3.4.3.3 Etuokesai'er Turigen

Introduction

The site is located on a large, elongated stretch of terrace at the bottom of the Turigen (土日根) Gully in the western Tian Shan range of Biezhentao (别真套山) located southwest of the county of Wenquan. The census survey reported that 145 structures of diverse forms were discovered in an area measuring approximately 800 m north-south and 700 m east-west (Xinjiang Uyghur Autonomous Region Bureau of Cultural Relics (ed.) 2011b). No habitation structures were identified. The most common structure types are B, D, and G. The 3D model and orthophoto below were generated

from low-altitude aerial photographs taken in the 2013 and 2014 field seasons. No further fieldwork has been planned for this site.

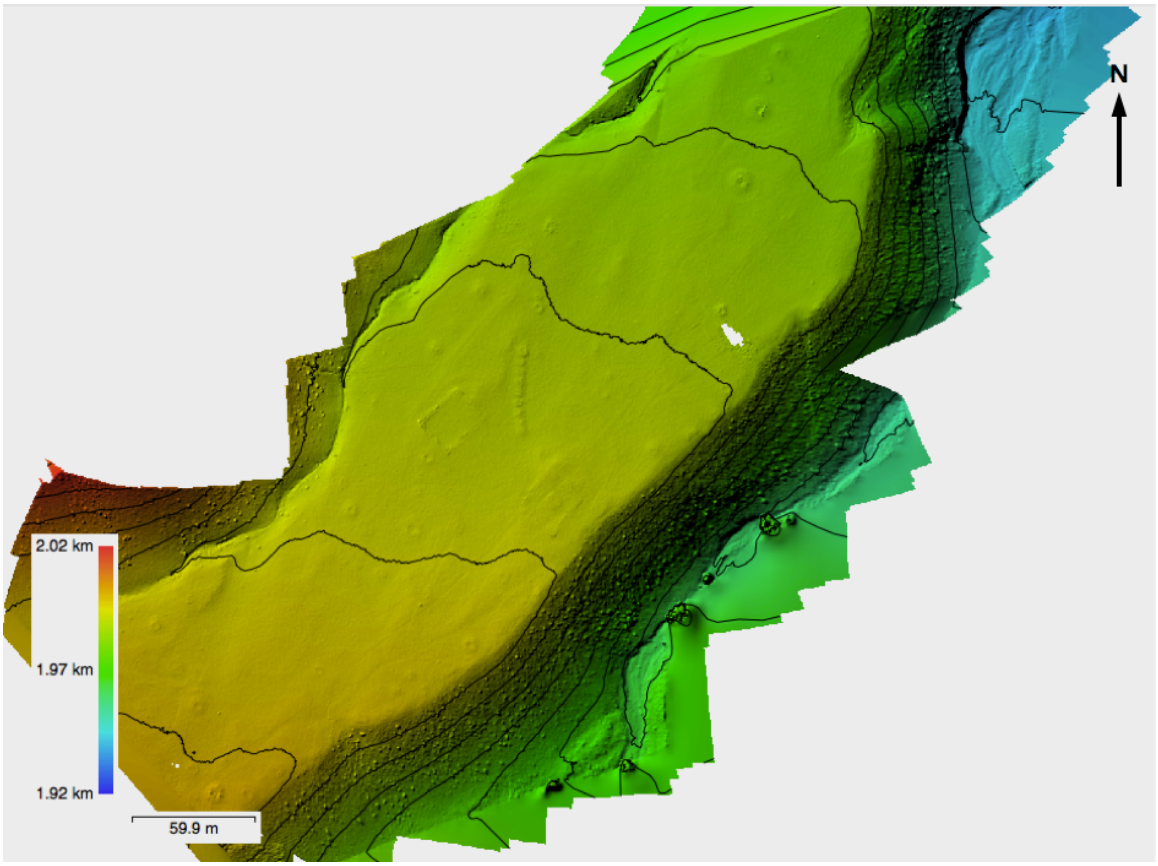


Fig. 3.15 3D model of the topography of Etuokesai'er Turigen showing the distribution of structures on the terrace. The contour lines are at 5 m intervals. (The small white hole at the center of the model shows where the field of view was missed when photos were taken from the drone).

Fig. 3.16 Orthophoto showing the outline of three prominent structures at Etuokesai'er Turigen.

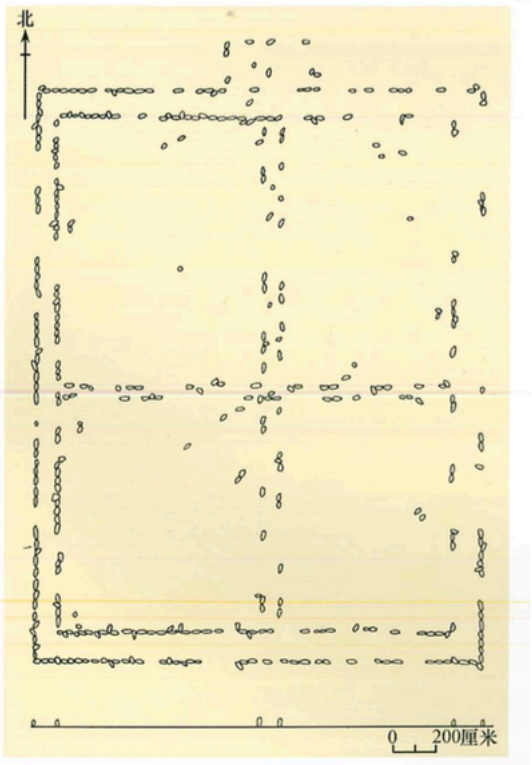


Fig. 3.17 Schematic plan of the rectangular stone enclosure partitioned into four fourths and marked by a northward entrance-like protrusion (from Xinjiang Uyghur Autonomous Region Bureau of Cultural Relics (ed.) 2011b: 40)

Of prominence at this site are three structures whose location and outline were subsequently recorded with RTK by the IAS team during the intensive survey. The one on the left in fig. 3.16 is a rectangular stone enclosure (schematic plan: fig. 3.17) that measures 25.2 m N-S and 20.3 m E-W. The distance between the parallel stone rows is about 1.2 m. Two double rows of flat stones partition the enclosure along its horizontal and vertical axes, giving it the shape of the Chinese 田 character. The census surveyors identified it as a burial structure after they traced the outline of slab graves in the center of the partitions. This is not reflected in the schematic plan they had since published,

however (Xinjiang Uyghur Autonomous Region Bureau of Cultural Relics (ed.) 2011b: 40).

Approximately 40 m southeast is a similar rectangular structure with a round cairn in the center and what appears to be a semi-circle arrangement against the western wall (fig. 3.16). The building elements and configuration of these two quadrangular structures resemble those of the excavated structure of F1 at Aduuchuluu.

The third structure is located *ca*. 15 m northeast from the first quadrangular enclosure. It consists of 8 cairns connected in a chain (fig. 3.16). Typologically speaking, the earliest possible date for this type of structure is mid-1st millennium BCE.

3.4.5 Summary

This section presented survey results from three keys sites of investigation in the Bortala Valley. The structures at these three sites - Aduuchuluu, Etuokesai'er Turigen and Xiaohusita (which also includes the site of Heishantou) - were documented using a high precision satellite positioning device (RTK- Real Time Kinematic) drone and pole aerial photography. The scope of analysis varies among the three sites since fieldwork is ongoing, and survey schedules and data availability are determined by IAS project objectives. Nevertheless, two key deductions can be made based on the analysis of the data above.

First, the structures may be organized into eight forms of architecture (summarized in Table 3.2). The variety is different at each site but the dominant forms (A, D and G) are the same and the same types tend to cluster together. The presence of the same types of structure at these sites suggests that the sites were in use, probably continuously,

across the same time periods. It also suggests that they are all connected to a specific ritual and funerary custom that is manifested in consistent displays of architectonics.

Second, the area occupied by stone structures at each site can be easily distinguished topographically. The main distribution of structures at Xiaohusita is in between two hills flanking a major water course. There are also structures on both hilltops that appear to have imposed some kind of areal boundary. The site of Etuokesai'er Turigen is in a secluded location on a flat, elevated terrace bound by steep slopes both uphill and downhill. Of the three sites, it is the hardest to pinpoint the two locations that the structural remains of Aduuchuluu occupy by geographical features. But nowadays, they are recognized by the locals as hallowed grounds that are positioned in alignment with a sacred peak in the northern mountain range.

3.5 Site-based study: Excavation at Aduuchuluu

To further examine the physical forms of these structures, this section will present results of excavation at the site of Aduuchuluu (45°1'32.05"N, 80°32'45.82"E) from 2011 to 2015.

The name of the site follows the toponym, Aduuchuluu, which is a compound word of адуу (herds of horses) and чулуу (stones) in Mongolian. According to the locals, it describes the clusters of natural and man-made stone formations that resemble herds of horses from a distance.

The structures excavated include comprise 22 burials and a large habitation structure. A sample of the most representative burial structures will be discussed below.

Material finds relevant to the understanding of chronological and spatial relations between structures will be described accordingly.

3.5.1 Site layout

The excavations of Aduuchuluu are centered on two areas located about 2 km apart - large habitation structures coded F1, F2 and F3 (F stands for *fang* 房, meaning "habitation") and a cemetery consisted of various forms of burial structures, primarily of slab graves (SM, which stands for *shiban-mu* 石板墓) and stone mounds (M, which stands for *mu* 墓) (fig. 3.18 and fig. 3.23). Based on the fact material remains uncovered from the cemetery and the habitation structures are dated to the same time period, *ca*. 3400-3200 BP (see dates in Appendix 3), it is speculated that F1 had a cultural and religious connection to the cemetery.

F1 is a symmetrical quadrangular structure, consisting of two parallel rows of stone slabs enclosing various stone arrangements in the form of stone clusters, stone lined pits, stone circles, quadrants and pavements. The 'entrance' to the structure is in the south, delineated by double rows of stone slabs that protrude from the wall. The outline of the northern wall contrasts with that of the south, with what look like antechambers in the corners, rendering the shape of the Chinese character *ao* 凹 (fig. 2). F1 is therefore described by local archaeologists as an 凹-shaped building**.** It measures 22 x 18 m, covering an area of nearly 400 m^2, the space between the two lines of slab walls measures between 0.98 m and 1.33 m (Institute of Archaeology et al. 2013: 26).

Fig. 3.18 An aerial view of, from left to right, F1, F2 and F3 at Aduuchuluu (from Institute of Archaeology et al. 2013: 26). F1 (the rectangular enclosure) is oriented NW-SE, the protruding "entrance" faces SE.

Connected to F1 to its northwest are F2 and F3, two quasi-ovoid fenced stone enclosures composed of natural boulders alternating with stones that were placed by design. F2 measures 18.2 m east-west and 14 m north-south at its widest and is outlined by two parallel lines of stone (Institute of Archaeology et al. 2013: 26). The western wall of F2 meets the longest side of F3, measuring 17.8 m.

A visual examination suggests that the arc of F2 extends from the northeastern corner of F1 and connects on the other end to its northwestern corner. The diameter of F3's semi-circle is an extension from the western edge of F2, which constitutes half of the diameter of F3. The diameter extends further northwestward and meets the arc that connects to the F1 on its northwestern corner in an almost perfect semi-circle.

The cemetery spans over 500 m north-south. In a pre-excavation field survey in 2010, over sixty burial structures were identified and documented (fig. 3). The structures can be divided into three concentrations - the northern zone, the central zone and the southern zone - based on their physical features. 22 of these structures were excavated over five seasons of fieldwork.

Year	Structure
2011	SM9
2012	SM4, SM5, SM6, SM49, SM50
2013	M88, SM29, SM30, SM23, SM24, SM25
2014	SM35, SM36, SM37, SM51, SM52
2015	SM38, SM39, SM40, SRM1, SRM2

Table 3.4 List of structures excavated in 5 field seasons between 2011 and 2015.

3.5.2 Structural remains

3.5.2.1 Habitation structures F1-F2-F3 (fig. 3.18)

A double stone wall running east-west through the middle of the structure divides F1 into two areas. The northern half of the structure is further divided it into northeastern and northwestern sections by another wall that travels north-south. The northwestern quadrant constitutes a standalone structural entity. Its western and northern walls incorporated part of the external wall of F1, but its eastern and southern walls are its own. Test excavations by way of a 2 x 1 m trench yielded remains of a child burial, ash

deposits, and fragmented pieces of animal bones and ceramic sherds in earlier layers in this area, suggesting multi-phase occupation. The base of the walls are lined with stone

Fig 3.19 Bird's-eye view of four excavated burial enclosures (from left to right: SM6, SM5, SM4, SM9) in the cemetery's northern zone (Kaogu yanjiusuo 2013: fig. 4)

slabs, on top of which small stones are stacked in multiple layers, the tallest part of the wall measures 1.2 m. There appears to be a 0.85 m wide and 2.9 m long doorway in the western part of the southern wall. The eastern part of the building is further divided into a smaller chamber measuring 2 by 2.5 m. There is a round hearth of 1 m diameter at the center of the building, in which fragments of antlers of red deer (*Cervus Elaphus*), bronzes, stone tools and ceramics were found (Cong 2016).

The northeastern area is covered by an arrangement of stones that represents an accumulation over multiple occupational periods. Preliminary observation of the

encompassed stratigraphical levels suggests that a burial cairn was constructed on top of what was previously a habitation or ritual space. This area's early occupational history is pending further investigation.

The southern half of the structure is characterized by the presence of stone clusters and double stone rows delineating quadrantal areas in the southeastern and the southwestern corners. A distinct ovoid cluster is found in the southeastern corner of F1, composed of rounded stones and a large horizontal stone slab.

Notwithstanding the various structural forms within F1, the outline of F1 is highly symmetrical. The northern edge is marked by two protruding antechambers in both corners. The southern entrance of the structure marks the midway of the structure whereas the east-west axis is marked by a double stone wall.

The use of double stone slab rows, particularly on the perimeters of F1 and F2, is another distinct characteristic. The double stone rows are likely a single wall feature filled in with rammed earth. To probe the method of construction and its initial structural design, a test trench intersecting both slab walls was installed in the southeastern corner of F1. The cross-section shows that the soil profiles inside the inner wall differ from that between the two walls, as well as that outside the exterior wall. The sediments outside the exterior wall were formed by natural deposition and the sediments inside the wall is composed of mixed soils types characteristic of infills, whereas the sediments between the walls are more compact and devoid of large (> 5 cm) pebbles. The finer texture of the sediments between the walls suggests that they could have been chosen specifically for building purposes.

Considering the different soil profiles displayed in the cross section and the inward slant (between 10˚- 30˚) of the inner stone slabs, it was speculated that the double stone-slab walls were built in the following sequence: first, a pit is dug and inner stone slabs are lined against the wall of the pit. It is then filled up to level of the ground surface, which made the sediments inside the wall less compact than that of the exterior, rendering the inward slanting of the inner stone slabs after extended weathering and deposition.

Evidence of construction and use of diverse structural elements within F1 suggests it comprises multiple occupational phases when the building was used and readapted for different uses, which according to the material remains, include ritual, burial and storage. Several features that most resemble storage cellars were also discovered although no substantial material remains were found inside.

3.5.2.2 Burial structures

To obtain a representative sample of every structural design in the burial complex of Aduuchuluu, 22 burial structures identified based on stone remains visible on the surface were excavated between 2011 and 2015. Their physical features and excavated material finds are summarized in Appendix 4.

Most of these structures are enclosed by stone slabs and contain internal circular or oval stone arrangements. While they can be attributed to an overall homogenous architectural design, there are discernible variations in the shape and positioning of the slabs, which may be correlated with burial customs of different time periods. Structures in the northern zone of generally have larger and more erect slabs than structures in the

southern zone. Within a structure, the size of the slabs varies. In SM4 for example, they measure between 0.8 m and 1.1 m in width, the tallest measures 1.3 m in height (fig 3.20). A keen attention to structural strength is evident in a few of the northern burials where another stacked small stone layer lines the slab interior, such as in SM9 (fig. 3.24). The effect of this structural enhancement is noted when comparing the positioning of the slabs in the northern structures, which are upright or angled inward at a small degree to that in the southern structures, which are more slanted and irregularly arranged because it lacks the support of an inner stone layer.

Fig. 3.20 Bird's-eye view of SM4, Aduuchuluu Cemetery (from Institute of Archaeology et al. 2013: 27).

The slabs are cut from two predominant local lithic materials - granite and schist, but mostly of granite. The smaller and rounded stones are mostly rolled basalt whereas the larger and flatter ones are granite. The former is most commonly used as a filler either

to delineate the mouth of the burial pit or to furnish the spaces marked by the primary outlines. The slabs, however, are almost exclusively employed as partitions and confines. The discovery of wood remnants of in the cist of SM4-2 suggests that cists might have been covered or lined with wooden planks; this feature might have been more common than noted because the depositional conditions are unfavorable for the preservation of wooden remains.

The only other distinct architectural form is that of the cairn of M88, a stone mound composing of small pebbled pavements and concentric circles made up of stones of different sizes (fig. 3.21). The capstone of the center cist had been relocated and the contents of the burial were looted. Only a few pieces of human bones were found.

Fig. 3.21 Bird's-eye view of M88, Aduuchuluu Cemetery.

Fig. 3.22 Bird's-eye view of SM29-30 (north-south) mid-excavation.

Between one and three cists are found inside these structures. The internal configuration of the slab enclosures varies. SM9, the largest individual slab structure in the cemetery, is an equilateral structure enclosing two cists. Measuring roughly 10 x 10 m, it is also the largest slab grave discovered so far in the Bortala River Valley. SM23, SM24 and SM25 are three enclosures joined by two slab walls. SM30 is a structural extension of SM29 which is a quadrangular enclosure with one cist (fig. 3.22). That

SM30 was a construction successive to SM29 to its north is suggested by the wall they share and corroborated by the correlation of stratigraphical layers between the two areas. The southern wall of SM29 marks the northern boundary of SM30, which is a narrower enclosure than SM29. Similar to SM23-SM24-SM25 and SM29-SM30, SM36 is a large chain burial comprising 9 enclosures containing 11 interments likely representing several different periods of burial (fig. 3.27a). The likely initial and central burial is the largest enclosure, the third from the south, to which enclosures were later appended. The later enclosures are narrower and contain cists that are smaller than that in the central burial. The configuration of this chain burial is visualized and analyzed in the next section using 3D photogrammetry.

The observance of funerary rites might have determined the structures' uniform orientation and similar layout. The long axis of the grave pit is almost always oriented east-west, and the capstones are arranged in a north-south direction. Where human remains have been preserved, the head is found in the west facing north. Consistently aligning these structures with certain cardinal directions or natural phenomena speaks to a cohesive and well-established funerary tradition.

The construction of stone slab structures calls for a significant investment of manpower and physical resources; working large granitic rocks into sizes and design that fulfill certain architectural design evinces a well-established architectural tradition built on effective resource mobilization and a strong socioeconomic backup.

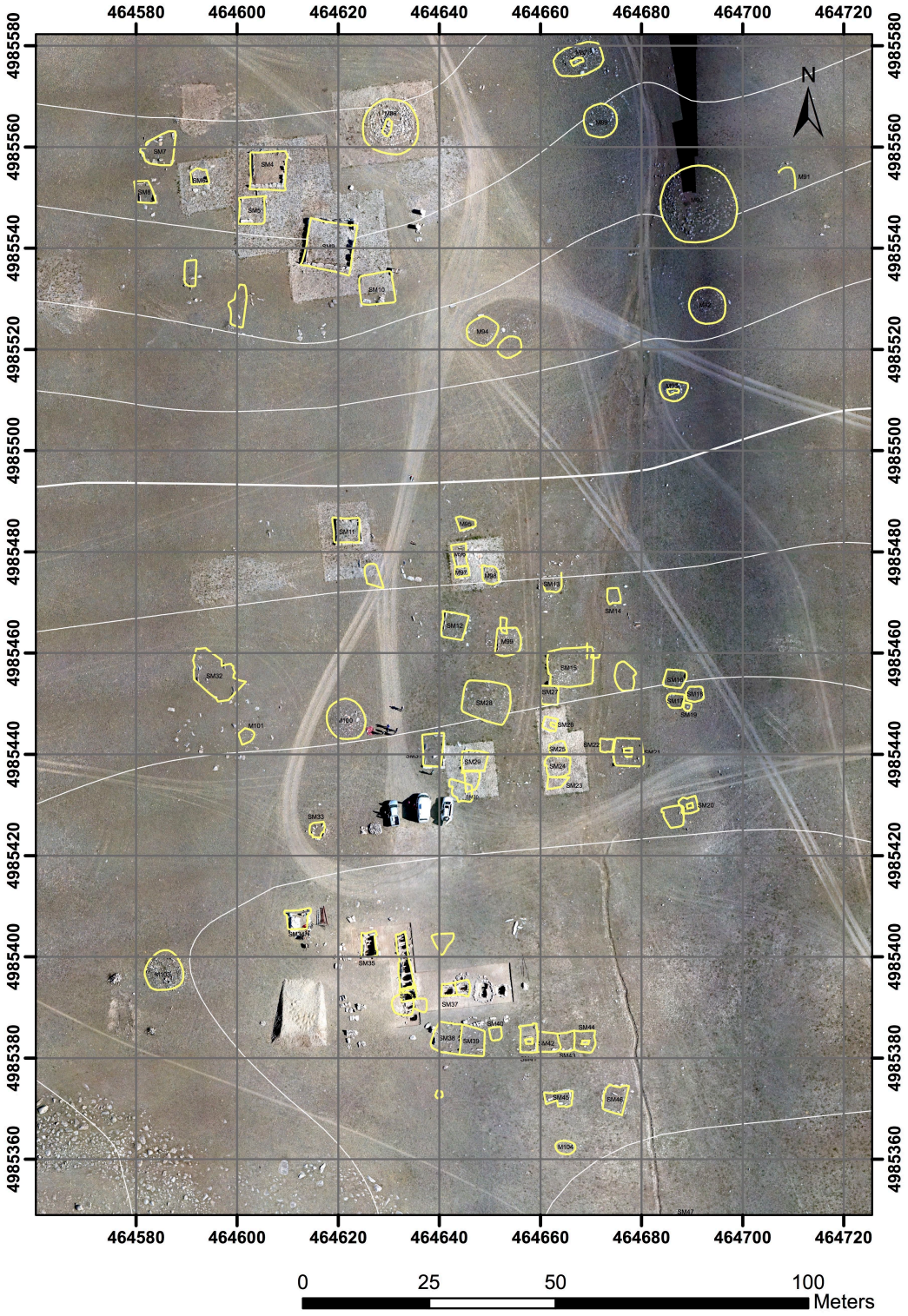


Fig. 3.23 Georeferenced site plan of Aduuchuluu Cemetery. The aerial image is georeferenced to the site plan in Institute of Archaeology et al. (2013: fig. 2). The contour lines are at 1m intervals.

Fig. 3.24 The stone slabbed enclosure wall of SM9 is supported by small stacked stones on the inside (looking northeast).

The purported cultural connection between the burial complex and the habitation structures of F1, F2 and F3 warrants the consideration of how a landscape with structures serving various funerary functions was designed. It appears that Aduuchuluu might have been an important nucleus for funerary and ritual activities in the Upper Bortala Valley. The architectural evidence suggesting the long-term use of the burial ground over multiple periods asserts its historical importance.

3.5.3 Photogrammetry of selected structures

The 3D models of burial structures SM35 (fig. 3.26a) and SM36 (fig. 3.27a) created by photogrammetry are provided below for a close examination of the sequence of construction and the structural configuration. Images were captured using pole photography and processed in PhotoScanPro by Agisoft, a 3D photogrammetry program. This software has proven to be an inexpensive, effective and user-friendly software for three-dimensional recording in archaeological studies that involves the documentation of stone structures (see, for example, Plets et al. 2012).

Fig. 3.25 Orthophoto of the relative positions of SM35, SM36, SM37, SM48 and SM49 (left to right) post-excavation in the 2014 field season.

SM35, SM36

These two burial formations (the left and center structures shown above on fig. 3.25) were excavated in the 2014 field season. They are made up of principally two building elements - stone slab and rounded stones - in different configurations.

Fig. 3.26a 3D model of SM35. The model is tilted to better display the internal structure of the graves. The y-axis is aligned with direction north.

SM35 (fig. 3.26a, fig. 3.26b) is a burial structure composed of three interments and an ancillary stone circle in the southwestern corner. The placement of stones and the stratigraphical relationship between SM35-1 and SM35-2 suggest that the southern grave (SM35-1) was constructed first. When SM35-2 was built, a pit was dug and cut into SM35-1. The profile of the pit wall between the two graves shows a cross-section consistent with post-depositional disturbance in the shape of the pit of SM35-2. The

chronology of these three interments is also suggested by the depth of the burial pits; that earlier burials have deeper pits is also observed in the burial arrangement of SM36. Based on the stratigraphical relation between the slabs erected on the perimeter and the burial pits, the boundary of the structure was set up at the same time the southern grave was built; the others were inserted into the enclosure later.

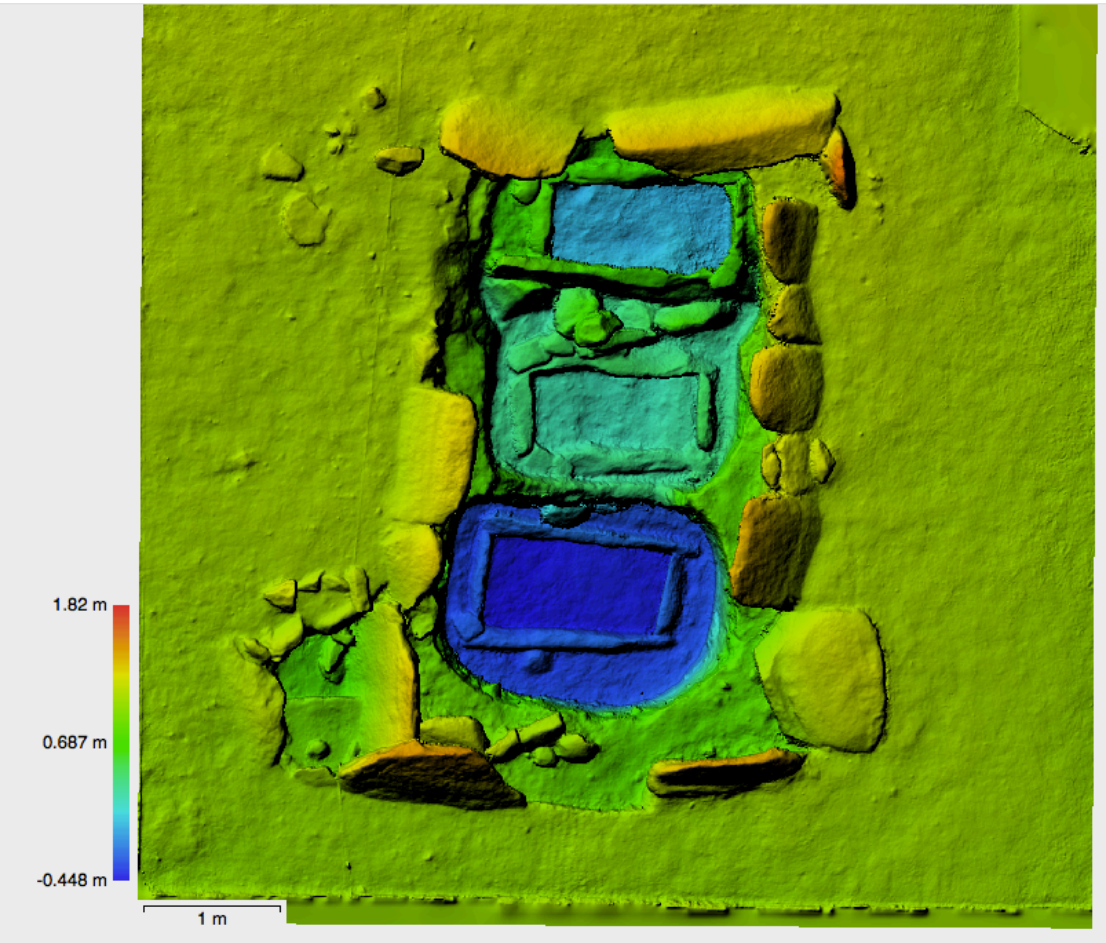


Fig. 3.26b Photogrammetric DEM of SM35. Stratigraphical profile shows that SM35-1 is built first, followed by SM35-2 and SM35-3, which were likely built at the same time. North points up.

interment	depth of pit (m)
SM35-3	0.25
SM35-2	0.5
SM35-1	1.33

Table 3.5 Dimensions of individual interments in SM35.

Of the three graves in SM35, only the southern one contains a human burial, a small amount of burnt bone fragments were found in the middle burial and the northern burial has burnt bones and a complete ceramic vessel. Considering that the capstones of the middle and northern graves had been partially destroyed or removed, the scarcity of material finds is likely the result of looting. There are no material finds in the semi-circular arrangement and it is unclear what its function would have been. It was however noted that unlike any other area in the structure, the fill in the semi-circle is of a sandy texture and is completely devoid of small pebbles, suggesting that it might have served a special funerary function.

SM36 is a chain burial structure made up of 11 interments. They contain different types of inhumation in no apparent order. These are namely, as marked in the orthophoto below (fig 3.27a), C for cremation, P for primary burial and S for secondary burial (both P and S are non-cremation). The construction of SM36 shows that the inceptive burial is likely the third interment from the south (SM36-0), the largest enclosure in the conglomerate and the only one with four perimeter walls. The photogrammetric DEM (digital elevation model) (fig. 3.27b) shows that it has the deepest pit, measuring 2.88 m. Moving north, the depth of the burial pit shows a gradual decrease at the same time the

width of the structure narrows. The two burials to the south were found just below the ground surface.

No slab walls are positioned between interments from N1 to N6. The continuous arrangement of slabs along the N-S axis illustrates an architectural continuity from N1 to N6, suggesting that they were created in a single constructional phase, probably designed to accommodate members of the same lineage or social group. A possible partition is between N4 and N5 where pit depth and pit size decrease exponentially in the latter. The cists are also considerably shorter in width and length compared to N4, N2, and N1, which could be explained by the fact that they are used for secondary burials.

Fig. 3.27a 3D model of SM36. The model is tilted to better display the internal structure of the graves. The y-axis is aligned with direction north. The letters C, P, and S stands for “cremation”, “primary burial”, and “secondary burial” respectively.

It is clear from the shared wall between SM36-0 and N1 that N1 was an extension of SM36-0. The attaching of a burial space to an existing one is likely attributed to the presence of a social or lineal affinity between the deceased of the inceptive burial and the later. Whether the narrowing of subsequent constructions was intentional remains unknown but regard for one's ancestor and the observance of kinship in funerary practice may be the most likely explanation for this phenomenon at present.

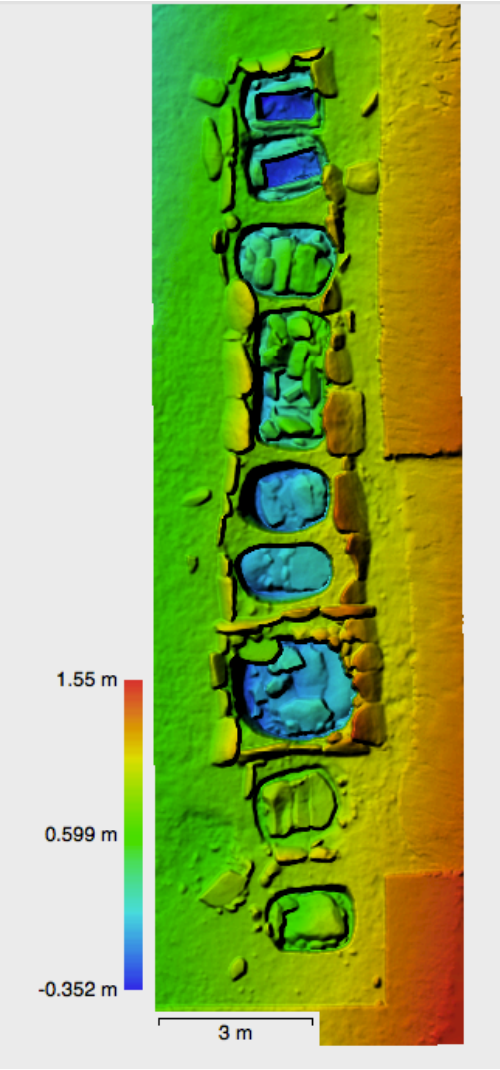


Fig. 3.27b Photogrammetric DEM of SM36. North points up.

In order from north to south:

interment	depth of pit (m)	width of southern edge (m)
SM36-N6	0.37	2.02
SM36-N5	0.41	2.22
SM36-N4	0.42	2.24
SM36-N3	0.58	2.34
SM36-N2	0.91	2.94
SM36-N1	0.75	2.8
SM36	0.87	2.88
SM36-S1		2.23
SM36-S2		1.83

Table 3.6 Dimensions of individual interments in SM36.

3.6 Summary

This chapter presented archaeological data from 214 sites with stone structures in the Bortala River Valley. The material was discussed on three spatial levels - the macro-regional analysis covers an area of 4500 km^2 including the valley grounds and the piedmont floors of the Bortala River; the micro-regional analysis examines what structures are present and how they are distributed at three selected sites, namely Aduuchuluu, Xiaohusita, and Etuokesai'er Turigen; and lastly, selected excavated habitation and burial structures at the site of Aduuchuluu were studied in detail for their layout and structural features.

The macro-regional analysis found that sites on a regional level show a statistically significant degree of clustering between a site and its first neighbor. All 16 habitation sites where Andronovo-typed slab enclosures are found are located in areas with the highest concentration of structures. 10 of the 16 are located within 2 km of the nearest watercourse. It appears that earlier habitation sites marked by Andronovo structures became heritage sites to which visits were frequently made in later periods for burials and other ritual ceremonies. It is also likely that the habitation structures continued to be used after the initial occupation, which led to interments nearby. The proximity of later burials to earlier habitation structures, especially at Xiaohusita, would support this hypothesis. The use of similar design and building components among structures of different periods could be explained by the continuous history of site use and the adherence to a strong funerary architectural tradition.

It was not possible to determine based on the data available if the habitation sites, in particular, were selected in consideration of visual inclusivity or exclusivity since lower-lying areas naturally favors visibility from a high vantage point. The location of sites at higher altitudes might have been decided by factors other than a good visual command; similarly, the higher occurrence of sites and structures in low-lying areas is more likely attributed to other environmental factors than simply a visual correlation with sites at higher altitudes. The effect of biomass on site selection could not be incorporated into this study without high-resolution vegetation data.

The micro-regional study showed that all three sites contain structures, most of them burials, that can be ascribed typologically to different time periods. At Aduuchuluu Cemetery, this kind of chronological difference is made distinct by the space between

structure clusters identifiable by point density values. The structures at Xiaohusita, distinguishable into three geographical zones, likely support different functions. There is a suspected large habitation complex on the alluvial fan between two hills around which clusters of funerary structures are found, numbering more than 100. The two wall-like structures on the hill-tops, which are great vantage points, suggest their likely use as a structure of defense or ritual importance. Lastly, the identification of 145 funerary structures of different forms on an elevated flat terrace of *ca.* 0.56 km^2 at Etuokesai'er Turigen shows that the locale was re-visited and used exclusively as a burial ground over a period of at least several centuries.

Excavations of the habitation structure at Aduuchuluu provided evidence for site reuse. Two occupational strata have so far been identified, with likely a third currently under investigation. Old building components were either built on top of or appropriated for later use, stone clusters of various shapes and sizes was superimposed on what appears to be a walled multi-purpose habitation structure containing storage pits, a child burial, and scattered bone deposits. Some time after the structure fell into disuse, a burial cairn was built on one of the corners, cutting into the original stone arrangement. The cumulative building pattern is consistent with what is observed at the cemetery where burial structures built as annexes to earlier enclosures are commonly found. The chain burial structure, for instance, shows the perpetuation of a burial tradition in the form of architectural consistency.

The following chapter considers these deductions and what they suggest about the land use patterns of early pastoral nomads in terms of their movement behavior and how they relate to the built environment of residential and burial traditions.

Chapter 4

The Places in Between: Stone Structures and the Architecture of Space

"J'aimerais qu'il existe des lieux stables, immobiles, intangibles, intouchés et presque intouchables, enracinés; des lieux qui seraient des références, des points de départ, des sources…"
Georges Perec, *Espèces d'espaces*, 1974.

Introduction

The organization and navigation of space is a critical spectrum that readily distinguishes nomadic livelihood. Thus, even with the paucity and ambiguity of material evidence for pastoral nomads in prehistory, for archaeologists today, pattern of space use remains a principal measure for detecting and assessing the extent and nature of their activities. One important aspect is how architecture and the built environment effect human behavior in time and space, but this is seldom explored in the context of pastoral nomadism because of the relative scarcity of archaeological evidence.

In the previous chapter, I identified the possible environmental criteria for positioning structures by measuring the correlation between site location and geographical properties, the degree of dependency among sites, the span of inter-visibility among sites and clusters, the layout of structures within a site, and the design of their built forms. Based on these results, this chapter discusses the role of architecture in creating and structuring physical, social, and conceptual spaces. It

questions how built forms or the lack thereof impact movement and patterns of activity. It aims to understand patterns and principles of space use and symbolic perceptions of the environment based on how these stone structures are configured locally and on a regional scale.

The chapter in structured as a two-staged discussion. First, I examine how space, place, and movement are interconnected in physical and conceptual dimensions. On the basis of this understanding, I then analyze the spatial properties of the stone structures in the Bortala River Valley in view of the concurrent development of pastoral nomadism. Specifically, I explore them in four different regards - degree of visibility, forms and aspects of ritual, cultural and social representations, and the various measures of monument and monumentality.

4.1 The Ontology of Space, Place and Movement

4.1.1 Space and Place

As George Perec verses in his celebrated essay, *Espèces d'espaces* (see quote at the beginning of chapter), how spaces and places are configured and conceptualized is a defining yet amorphous aspect of human geography. Though less explored in fields other than architectural and landscape studies of the urban environment, the perception of 'space' and 'place' is critical to understanding the diversity of human behavior and experience, both past and present. To study these activities, archaeologists analyze "place" as not only the context to past activities, but also the product (Rodning 2010: 187). It is also approached as "a medium through which social relations are produced and

reproduced" (Gregory and Urry 1985: 3; Pearson and Richard 1994: 3). Human behavior is nonetheless not bound by place. Anthropologist Tim Ingold (2011: 148-9) reasons that it develops along paths of movement where a convergence of activities may materialize into "place".

On the pertinent question of the difference between space and place, geographer Yi-fu Tuan (2001: 179) in a definitive work on the subject, *Space and Place,* considers a temporal spectrum. He argues that places are the "static" in space what "pauses" are in time. As such, place is seen as an enclosed system and a discrete entity. Henri Lefebvre, one of the most influential sociologists on social space, considers the meanings of space and place more interchangeably. In his seminal work, *The Production of Space,* he describes "place" as simply represented *space*, which may be delineated physically, conceptually, or even through narrative. "Place" is a derivative of "space", or essentially a named space, upon which social relations are superimposed (Lefebvre 1991: 193, Pearson and Richard 1994a: 4). In this sense, it is akin to Tuan's (2001: 179) definition of "place" as "an organized world of meaning".

Scholars seem to agree, nonetheless, that the difference between space and place may not be the presence of structures. Like Tuan, Amos Rapoport who is an architect in environment-behavioral studies, considers physical demarcation conducive to place-making, but not essential. Architecture can delineate spaces by implementing boundaries (Kent 1990: 2) that help clarify social roles and relations in the built environment (Tuan 2001: 102) but the meanings of space are not necessarily confined physically. Rather, it is the symbolic that engenders the place (Rapoport 1980: 50). Rapoport's research into Australian Aborigines' epistemology of physical and symbolic

space is a good example. The territorial boundaries and land ownership of Australian Aborigines are not contingent on sedentary occupation, instead, "without building axes, sacred precincts, buildings or cities", they were "able to make the world theirs through symbolic means and achieve a stable world consisting of place" (Rapoport 1980: 49). As Lefebvre (1991: 41) also points out, spatial symbolisms can be highly organized but they may not always possess a geometric dimension. In other words, space can be mediated through cultural symbolisms that are not often visible. Especially in nomadic communities where permanent structures are scarce, the meanings of space may be abstract and privy to those with the prerequisite spatial knowledge (Rapoport 1977: 13; Rapoport 1980: 38; Tuan 2001: 78). Lefebvre adds that three types of space may be distinguished - practical space, navigational space and symbolic space (what he calls, *l'espace perçu, l'espace conçu*, and *l'espace veçu*) (Nakoinz and Knitter 2016: 7), and argues that early agricultural and pastoral societies did not differentiate between practical and symbolic spaces (Lefebvre 1991: 141).

At the same time, Rapoport (1980: 38) also considers a more exclusive and categorical definition for "place". He sees it as that which emerges from the juxtaposition of two standpoints - "inside" versus "outside", being "here" rather than "there". Outlining the physical location and properties of a place seems to be consistent with how he dissects the built environment into space, place, meaning, and communication in archaeological research of domestic architecture and activity areas (Rapoport 1982; 1990: 15; Kent 1990).

4.1.2 Movement

Movement is central to the human experience of space and place (Llobera 2000: 66; Ingold 2011). It entails a physical relocation from one place to another, as such, detecting movement by distance, ease, frequency, and logic, etc. reveals the environmental spectrum of space use. The influence of the built environment on movement, and vice versa, has been extensively explored through space syntax (Hillier and Hanson 1984) which explores the social logic of spatial organization; architectural topology; proxemics, which evaluates degrees of separation, integration and accessibility; and semiotics, which relates to symbols and the system of communication; and territoriality, which involves the examination of physical and conceptual boundaries (Steadman 1996: 67). I later introduce in this chapter a number of hypothesis built on these social theories of space use and proposes avenues of further research.

Geographer Yi-fu Tuan (2001: 180) describes nomads' spatial logistics as following more or less circular paths within a circumscribed area that likely spans less than 200 miles, pausing to camp at intervals. He (2001: 182) contends that the paths and the camps show little change over time, and they each mark places that are experienced differently and in varying degrees. In the archaeological study of pastoral nomads, the temporality of occupation and migration is a critical element in modeling spatial patterns of vertical transhumance (Honeychurch et al. 2007; Frachetti 2008), a key herding strategy in the mountainous steppe zone of Eastern Central Asia that involves the seasonal relocation of herds between summer and winter pastures located at different altitudes.

Forces for mobility are, in particular, an important aspect in the study of migration as a key strategy for adaptation to changing land productivity (Honeychurch and Makarewicz 2016: 347). For example, in two recent articles, Makarewicz and her co-authors (Wright and Makarewicz 2015: 268; Honeychurch and Makarewicz 2016: 347) review the rationale for migration in contemporary Inner Asian pastoral societies. They note that prudent decisions made for movement are not contingent on pasture qualities alone, the ability to navigate within harmonious social networks is also critical (Wright and Makarewicz 2015: 268, 272). However, movement is not simply a means to raise economic output and productivity, it also allows pastoral communities to cultivate and expand their social and political networks and develop long-distance trade (Honeychurch 2015, Honeychurch and Makarewicz 2016: 347-8).

Forces hindering mobility is an acute issue in Inner Asian pastoral nomadism today. I noted in chapter 1 (section 1.3) the social and ecological repercussions of state sedentarization policies on the sustainability of traditional pastoral nomadism. The strategy of revitalizing pastures by inhibiting movement has proven ineffective, instead, it has exacerbated the problems of overgrazing and uneven distribution of fodder (Yeh 2008, Liao et al. 2014).

4.2 Spatial properties of stone architecture in pastoral landscape

I propose four ways of exploring the characteristics of space use that define the architecture of these structures in the Bortala Valley. I consider these aspects for two reasons: that they can be measured and modeled by methods of spatial and statistical

analysis and that they are most pertinent to discerning how these structures might have functioned in space and through time.

4.2.1 Visibility and (in)visibility

Visibility can be perceived in two dimensions: how well an object can be seen - which is measured by distance and prominence; and if it can be seen, which may not be contingent on the viewer's visual capacity but the creator's design and intention.

It is generally assumed that stone structures in the steppes, being "visually outstanding" (Seitsonen et al. 2014: 85, see also Fitzhugh 2009a) and supported by a heavy investment of human and natural resources (Allard and Erdenebaatar 2005) are monuments of ritual significance. Conversely, it stands to reason that important locations, such as sites with religious architecture, would be positioned in clear view because they are designed for the purpose of garnering audience and publicizing ideals.

It is difficult to argue, however, in the case of the Bortala Valley where there are over 200 sites, comprising over 10,000 structures, that visibility was a dominant factor at every location. And even if it was, it was likely not of the same type and level of visibility, given that the structures served different and perhaps multiple functions, and across different time periods. It is also hard to isolate visibility as the sole or primary factor for building structures on higher grounds, since it presupposes an intended audience at a lower position for whom the conspicuousness of the structure was intended. Result of the viewshed analysis of three of the main clusters of sites in the Bortala Valley was inconclusive (section 3.2.3.2), it was not possible to establish, without the control of

other environmental parameters, that viewing condition was a determinant of site location or territoriality.

An exception may be when conditions of the physical environment are unfavorable for the building of structures on higher grounds, but this can only be established on a case-by-case basis. One example is the standalone quasi-quadrangular structure atop of a hill at the site of Heishantou. Fragments of animal bones and ceramic sherds were discovered in a recent excavation. Climbing the graveled slope of *ca.* 30˚ in gradient regularly would be impractical. It is likely that the structure was intended as a ritual or ancestral landmark, marking either boundaries of symbolic spaces and/or offering navigational support.

Nevertheless, conspicuousness is not a quality indicated only by scale; it may occur in different forms and expressed in varying degrees. In other words, visibility may not necessarily be rendered *visibly* and impartially. Even for buildings intended as monuments, the visual experience could be secondary (Lefebvre 1991: 225). Thus, the meaning of a place may not be expressed in architecture, and therefore invisible to an outsider. In some instances, only those for whom the ritual knowledge is intended are disclosed the location and meanings of the structure. Scared grounds can only be accessed by those who subscribe to the religious values to which the site is dedicated; access to burial locations is often restricted to the kin of the deceased. It is unclear if stone structures in the Bortala River Valley were positioned for maximal visibility but the fact that structures are built in the same location in different time periods suggests the symbolic importance of these sites as well as the prominence of these locations in the ritual landscape.

That the symbolic meanings of these sites or what appear to be non-sites are privy to those who possess the prerequisite spatial knowledge is characteristic of the understanding of land ownership among mobile peoples. The Australian Aborigines's perception of territoriality, as previously discussed, shows that places of ancestral importance are not necessarily visible. Their ritual rights to the land takes precedence over economic rights, and the spatial dimensions to which they ascribe meanings are not measured or contained by physical spaces but defined by customs of land use (Rapoport 1980: 42- 43). This type of territory, referred to as 'estate', follows a spatial range separate from routes of procurement, but is fundamental to how they locate their "home" or "dreaming place" (Tuan 2001: 157). Similarly, the Bedouins of the Sinai regard the tombs of sheikhs or saints as indicators of land ownership but their specific cultural role is not readily "legible" to those who do not know the code. Those who do, however, would understand that these tombs "act as meeting places that reinforce tribal identity and foster interaction and communication among dispersed and nomadic groups" (Rapoport 1982: 191). Similar examples of structure-less spatial cognition can be found among other mobile groups, such as the Eskimos and the Comanches of the Great Plains, who also form sacred, symbolic ties to their land despite their practice of annual migration (Tuan 2001: 157).

The idea that land ownership or right of access is delineated to a larger or an equal extent by the symbolic rather than the economic landscape (Rapoport 1980: 42) is also observed in the steppe of Mongolia. Seitsonen et al.'s (2014: 96-7) study of the inter-visibility and distance between Bronze Age occupations and khirigsuurs in the Khanuy Valley suggests that settlement sites might have been positioned in view of at

least one khirigsuur and within a certain distance from it. They also observed that assuming control of a pre-existing territoriality is as important a criteria, if not more, as pragmatic topographic conditions for settlement site placement. Thus, khirigsuurs were likely markers of territorial boundaries that consequently influenced where settlement sites were placed as well as routes of migration.

The degree of site visibility is also a practical problem in archaeology, as previously discussed in Chapter 1 (section 1.2.1). Since perishable building materials are characteristic of nomad architecture, it is rare and difficult to locate nomadic structural remains in archaeological contexts. Until the modern era, across Central Asia, felt is the traditional material used to cover yurts and tents built of a wooden frame among many communities (Laufer 1930). Descriptions of felt-covered tent structures (yurts) are commonplace in 13th and 14th century travelers' accounts and medieval Chinese annals and historiographies (Gervers and Schelpp 1997). Thus, the likely problem of the "absence of evidence" needs to be taken into the account when considering the visibility of structures in a nomadic landscape. This is also an important consideration when surveying areas, such as the alluvial fan, that are prone to post-depositional weathering and transportation of discarded materials by natural or anthropogenic agents, which might create sampling biases (*cf.* Hitchcock 1987, Honeychurch et al. 2007, Markofsky 2013).

4.2.2 A matter of ritual

The human experience of architecture and the built environment may be explicated from the perspective of ritual. Ritual, in the form of prescribed and regular

action, can be reflected in routine access to and resource investment in a location. It could also translate into fidelity to an architectural tradition.

4.2.2.1 Access and congregation

The *oboo* (*ovoo*), for example, encapsulates the process and product of a collective ritual performance by the agency of a built form.

Fig. 4.1 A worshipper tying a prayer flag to the oboo. It is most common to sprinkle beer or sorghum liquor (*baijiu* 白酒). The bottles in the foreground are *baijiu* bottles.

A ubiquitous religious landmark of the Mongol tradition since the 17th century that likely originated in Tibetan Buddhism, it is a site of worship and a territorial marker (Atwood 2004: 414-415). It is constructed of stone heaps piled up over time on hilltops and topographically pronounced locations. The worship of *oboos* is still widely practiced in Bortala Prefecture today. Worshippers stop en-route to pay tribute in a process that involves adding stones, colored fabrics, etc. to the cairn, sprinkling alcohol, and walking three times around the mound clockwise (fig. 4.1). Because the *oboos* are cumulative, working structures whose physicality and symbolisms are continuously (re) modeled and (re) interpreted by willing and qualified participants, architecture and landscape merge into a medium through which ideologies and identities are negotiated, established and enhanced (Tuan 2001: 159).

Continuous investment in the physicality of location reflects a heightened awareness that may be correlated with visibility or other structural or geographical symbolisms (see discussion on p. 4.2.3). At Begash, a site in the Koksu Valley in Kazakhstan, archaeologists discovered the construction of cist tombs and stone foundations in multiple time periods from the Bronze Age to the late 1st millennium CE. It was speculated that the sites were repeatedly visited because these were well-known locations (Frachetti 2006; 2008; Steadman 2015: 88).

The building of new structures in locations with pre-existing structures is observed at Aduuchuluu. Early building elements of habitation structure F1 were re-purposed for later use. Several stone clusters are superimposed on what is likely a multi-purpose structure with burial chambers and storage pits. The extension of the perimeter of F2 from the northeastern double slab walls shows that the later occupants

were aware of F1 and chose to appropriate the existing construction for their own use. The choice of returning to the same location is also evident in the configuration of burial structures in the cemetery *ca.* 2 km away. Burials appended to existing enclosures (e.g. SM29-30, SM23-24-25, SM36) are found in structures of the same form but slightly different construction standards. The later enclosures are less regular in shape and the size of the building slabs is considerably less uniform. Many of the slabs on the perimeter are slanted likely because the effect of soil creep was made worse by lax construction techniques. Secondary burials and the displacement of primary burials are also discovered, suggesting that funerary arrangement for the deceased was a logistical decision made in advance. The cemetery contains structures that are spatially and chronologically organized into three clusters, further supporting the notion that Aduuchuluu was recognized for a long time as an important funerary and ritual location.

Houle's (2010) study in the Mongolian steppe suggests that stone structures such as slab burials and khirigsuurs are often territorial markers that delineate areas of access. On the basis of this and further research, Seitsonen et al. (2014) propose that these so-called ritual monuments are not necessarily nodes on least cost paths, they play a more important function as a place marker that then attracted later settlements. This hypothesis is congruous with ethnographic observations that show territorial demarcations in mobile communities to be more pronounced at religious sites (Rapoport 1980: 42). These sites could have even marked access to natural resources, such as pasture, that these communities rely on for subsistence. In the Bortala River Valley, the occurrence of sites in close proximity to routes of communication, such as along water courses, might have coincided with territorial demarcations.

The criteria for ritual prominence in site placement often go hand in hand with selecting sites with a favorable association with natural features in the environment. Thus, preferences in site selection can be used to differentiate cultural identities and social behaviors. In the case of pastoral nomads, they involve a set of environmental criteria, both social and physical, that affect decisions about migration and location of habitat. These processes, which are directed by "the rules and culture of a group" (Rapoport 1977: 16), underlie what is conceptually understood as design. Studying how built forms relate to physical features of the environment could offer important insight into choice processes that are likely culturally derived.

In the Bortala Valley, there is a clear preference for locations in close proximity to water courses, as suggested by the positive correlation between distance to nearest stream and the degree of site clustering (factoring in structure count). Of the 16 habitation sites, 10 are located within 2 km of the nearest stream. Of the 3 sites that are found more than 4 km away, one was Aduuchuluu. This could be attributed simply to having access to a primary subsistence resource. Ready availability of water not only ensures that humans and animals are well provided for, it allows groups to establish territorial boundaries within which only group members are granted access to fertile pastures or sanctified lands. In this sense, the clustering of later burial and ritual sites around the earlier habitation sites would suggest a declaration and consolidation of group identity.

Clustering is the use of environmental symbols, in this case, built forms, to minimize the physical and social distances with whom one identifies, allowing for close interaction and easier communication; it also creates boundaries by effectively increasing the subjective distance to those considered outside of the group (Rapoport 1977: 335).

These "symbolic relations between groups", as Lawrence and Low (1990: 466) explicate, are faciliated by built forms and site plans, which "act as communicative or mnemonic devices".

In the Bortala Valley, except for Aduuchuluu, most habitation structures are found in areas where there is a high density of burials and other forms of stone structures, usually of a later period. What the neighborhood dependency analysis (section 3.3.4.3) has shown is that these sites are likely not distributed at random but are positioned with significant consideration of the location of existing sites, namely, the first neighbor, thus creating clusters.

That said, the drastic shifts in clustering patterns across the sampling region (fig. 3.7) suggest that the result may need to be further assessed to normalize the sampling biases introduced at the macro-regional level. Future research would also seek to clarify chronological relations within the clusters to better understand the guiding principles of spatial organization.

4.2.2.2 Conservatism in architectural form

Conservatism in architectural form is a feature that tends to manifest in buildings designed for rituals, which are associated with regulated behavior and doctrines of thought (Tuan 2001: 104). The result is a standardized architectural order that includes repetition and redundancy in the spatial layout because ritual essentially “eliminates the random” “to conserve and re-express its form” (Hillier 1996: 193). This is perhaps most evident in the church, one of the most popularized form of ritual architecture whose spatial design has been standardized over time through its engagement with the practice

and its audience (Hillier 1996: 306). In their study of Neopalatial buildings in Crete, Letesson and Driessen (2008) note that the layout conveys a disposition of networks of circulation in favor of ritual processions. What they also discovered is that an architectural design was introduced to increase access control to places of ritual. It is unlike the architecture of earlier periods where expansive open spaces presumably encouraged short-lived and more egalitarian forms of gathering, i.e. parties.

Stone structures in the Bortala River Valley that have been identified as burials or commemorative structures make up a cohesive style profile of architectural form that shows limited variations in space and time. The three clusters of burial structures at Aduuchuluu Cemetery exhibits the evolution of a funerary architectural style that has nonetheless remained faithful to its earliest design. While the later structures are characterized by less uniform building elements and a cruder construction (slanting and dislodged slabs and uneven perimeters), the geometry of the design is the same as that of the earlier structures. It also appears that, on occasion, efforts were made to ensure that the architectural design perpetuates the intended funerary tradition. Take SM35 for example, the three graves are aligned on a north-south axis, the slab walls of the enclosure were built at the same time as the southern grave but before the center and northern graves were dug. This suggests that the original design had taken care to reserve space for future internments. This kind of funerary pre-planning is likely intended for descendants or contemporary members belonging to the same clan; the deliberate spatial assignment reflects the codification of spatial order in the interest of social inclusivity/ exclusivity. The decline in structural soundness in the later clusters suggests that building

standards were subsequently relaxed but it was still important that the structural connection to the earlier burials was maintained.

4.2.3 Architecture and built environment as cultural and social representations

It is generally agreed that the extent to which culture can be extrapolated from built form is limited to the way regularities in the organization of space, time, meaning and communication emerge from the system that is culture. It is difficult to ascertain, however, exactly which aspect(s) of culture is accountable for these regularities, not least because "culture" is itself a nebulous term, comprising myriad components both material and intangible (Kent 1990: 2; Rapoport 1977: 14; 1990: 10). Steadman (1996: 96, see also Steadman 2015), who studies human use of space in domestic architecture, also asserts that "it is not possible to *recognize* a culture by its architecture or built environment". This, however, does not discount the importance of built form to understanding human-environment relations, which remains an interested subject in ethnoarchaeological studies.

I have discussed in Chapter 2 that the cultural scheme of Andronovo, albeit useful for collating and sorting material traits, is not necessarily conducive to producing meaningful archaeological interpretations of behavioral patterns. Stone-slab habitation and burial structures discovered in Bortala are ascribed to Andronovo Culture based on their structural similarities to other Andronovo buildings in the Eurasian steppe and the fact that they contain Andronovo-typed ceramic sherds and metal objects. But to simply classify architecture culturally by more or less homogeneous physical elements (in the case of Bortala, these are either stone slabs or rounded stones) is hardly meaningful, as

Rapoport (1977: 15) argues. Instead, what appears to be the discrete values of built forms are often identified by the way architecture engages with human behavior, which can be outlined by “the relationship among elements and the underlying rules” (Rapoport 1969). In the last chapter, I attempted to identify some of these rules by using spatial analysis to examine the properties of these structures in relation to their environment. Here below, I explore other approaches to deciphering representations of human behavior in the built environment by borrowing theories from architecture and spatial planning.

Although architecture is an important agent of the social production and reproduction of space (Pearson and Richard 1994: 3), the systematics of appearances, as Hillier and Hanson (1984: 2, 4-5, 8) argue, may not be congruent with the degree of “social meaning” invested in each spatial configuration. Rapoport (1990: 18) has likewise maintained, “Behavior is contained [only] *loosely* by architecture”, and prefers to use a term he coined “activity systems” which transcend architecture and connect to cultural landscapes that cut across time and space. It may be understood therefore that the variations in built form do not constitute a fair representation of the multiplicity of space that is conceptually conceived. "To what factors", then, as Lawrence and Low (1990) ask, "can variations in built form within a particular society be attributed?"

Ethnographic studies have observed how the layout of domestic architecture in nomadic pastoralist groups reflects social stratification and household relations (Lawrence and Low 1990: 465). Particularly interesting to archaeologists are site layout and structural segmentation since they are proxies for assessing sociopolitical complexity in the forms of social stratification, political hierarchy, and activity specialization (Fletcher 1977, Kent 1990, Steadman 1996, 2015). The body of work in activity area

research spearheaded by Susan Kent comprises research findings, for instance, by Dana Oswald (1987) whose comparative study of short-lived and free-standing Zulu homesteads to those of the Kurds and the Hausa illustrates the relationship between residential mobility, site layout and building types. Robert Hitchcock's research among the Basarwa populations in the eastern Kalahari also attests to the effect of mobility on site organization although his findings have shown that the correlation is not consistent and the outcome cannot be predetermined (Hitchcock 1987: 375, 408-9). Instead, he has found activity type, duration, and behavior patterns resulting from changes in economic, kinship, and other social ties to be reliable proxies for the pattern of site organization (Hitchcock 1987: 397, 414-415).

The data from Bortala presented in this thesis do not exactly lend themselves to interpretations of social and political stratification or activity specialization. It can be observed, however, from the arrangement of burial enclosures and the clustering pattern of structures as discussed in previous sections (3.2.3.1 and 4.2.2.1), that kinship or some form of group identity is strongly recognized in funerary practice.

To answer the question of what the built environment represents, an alternative, and perhaps more relevant approach for the Bortala landscape of stone structures, is architectural semiotics, which consider sign systems and codes conveyed by the built environment (Lawrence and Low 1990: 471). It is based on the concept that the built environment represents "culturally rendered systems of communication" (Steadman 1996: 67). It can be considered, therefore, a form of symbolic technology (Pearson and Richards 1994) that communicates meaning and action in a nonverbal manner.

The artistic media in the Bortala River Valley, which include petroglyphs, stone statues and built forms, appear to reflect a symbolic construct. Petroglyphs are commonly discovered in the vicinity of structure clusters, decorated with motifs that are perceptibly associated with the same aesthetic that produced other art forms in stone. It was observed that some of the structures and their internal elements (e.g. cist) were positioned in alignment with cardinal directions and features of the physical landscape. It may be argued that what these patterns show is that the organization of spatial order was likely strongly influenced by animistic beliefs and subjective perceptions of the natural environment (Jacobson-Tepfer 2015: 12) though the principles of place-making, the criteria for raising monuments and their effect on movement are yet to be clarified. Future research in the Bortala River Valley will therefore incorporate other forms of stone remains, including stelae and petroglyphs, and the internal structural elements of burials.

Similarly, Esther Jacobson-Tepfer's (2015) extensive appraisal of motifs and pictorial narratives of petroglyphs, stele, and objects of art discovered in the Mongolian Altai and beyond has revealed the workings of a mystic landscape in which all elements of art are structurally connected and evolving in unison. She explains, "the construct composed of image/object + pictorial context + physical context functions as a kind of living entity, its effect shifting depending on the physical context and psychological perspective of the viewer" (Jacobson-Tepfer 2015: 11). By signifying its role in the larger context, each art form contributes itself to and becomes a part of the symbolic landscape.

In the past few decades, applications of semiotics in archaeology have been most critically developed by studies in materiality (e.g. Meskell 2008, Miller (ed.) 2005,

Hodder 2011) and phenomenology (e.g. Tilley 1994, Bender 2006), which represent two important axes of the post-processualist movement toward understanding objects as active agents in cultural and social processes of change. The use of phenomenology is prevalent in the study of landscapes of megalithic monuments in Northern Europe (Tilley and Bennett 2004, Laporte and Scarre 2015), it considers the built environment from experiential perspectives. This may be a feasible approach to "reading" the landscape of Bortala in future research given more data could be systematically collected at the level of micro-regional surveys.

Space syntax is another viable method of studying social processes through the built environment. It is built on a structuralist premise of analyzing architecture and its spatial forms not merely as "a by-product of some extraneous determinative factor, such as climate, topography, technology or ecology" but "relational systems embodying social purposes" (Hillier and Hanson 1984: 4, 2). Although the transparency of such relations varies from one cultural system to another, this method allows the structure of human space to be examined in more quantifiable and figurative terms such as scale, degree of integration, symmetry, centrality, and accessibility.

A successful application in archaeology is Letesson and Driessen's (2008) comparison of Neopalatial architecture with structures prior to its time. Their result shows that social encounters in Neopalatial architecture are codified in the form of more defined and standardized spaces and a transitional space was implemented between the inside and the outside to keep in check "undesirable intrusions" (Letesson and Driessen's 2008: 211). Another example is Dawson's (2002) analysis of Central Inuit snow houses, which shows how structural properties translate into differences in household structure

and kinship relations. It has also been applied to the study of the networks of space on larger geographical scales. Ferguson's (1996) study of the architecture and settlement of the Zuni Indians in New Mexico, for example, demonstrates that changes in their settlement and domestic space can be attributed to the need for defense.

The structural properties of the Bortala architectural landscape may be further analyzed through space syntax. I posit that the network of structures demonstrates an allocentric, rather than egocentric approach of spatial cognition (Klatzky 1998, Hillier 2012). What this means is that path selection and placement choices for habitation sites and burials are drawn from a spatial frame of reference built on an object-object relationship, instead of a viewer-object relationship. Exactly how this relationship is played out requires further research but two key preliminary observations would support a further examination of this hypothesis.

First, research has shown that site placement is not necessarily an economic decision but is strongly influenced by land use traditions that are connected to the presence of monuments. Sites of later periods therefore pivot toward natural and man-made physical features that are made reference points for territorial demarcations and the organization of symbolic landscapes. This accounts for the clustering of sites in which structures attributed to different typological periods are found. Second, navigating a relatively structure-less landscape by these place markers is indicative of an allocentric cognition pattern that defers to a topological perception of the landscape. This way of processing locational information would seem consistent with the observance of territoriality and architectural tradition that stems from a shared and communal repository

of geographical knowledge that is aimed at maintaining certain codes of social and settlement behavior.

4.2.4 Where are the monuments?

Monuments are by definition designed to commemorate. They accentuate geographical spaces to publicize narratives of the past (Nelson and Olin 2003: 2). As a most readily discernible form of monument, architecture holds the power to effect social and cultural change (Rodning 2010: 187; Osborne 2014: 8) by offering an accessible medium for caching and restoring memories of an ancestral collective (*cf.* Wu 1995: 8).

It has been widely discussed that one important function that monuments serve is political and social control (Osborne 2014: 5, 7) although the monument itself generally does not accommodate any administrative or other pragmatic functions of governance. It is premised on the direct correlation between the ability to procure resources and political power, through which a power dynamic that distinguishes the dominant from the subordinate is established and reinforced (Osborne 2014: 5, 7).

Detecting monumental buildings on the basis of scale and amount of energy expenditure remains the prevalent logic in archaeological studies of ancient structures, and the most widely tested (Osborne 2014: 5). This, however, rests on a presupposition that large-scale and heavily invested structures are by default monumental. Although scale is a strong indicator of monumental construction, it needs to be, as Frost and Quilter (2012: 234) caution, evaluated in relevant cultural contexts and in relation to "the range of variability of sites and constructions" geographically and temporally, as their research into monumental architecture in pre-Hispanic landscapes shows.

In contrast to the dissociation of ritual symbolism from physical structures in mobile societies, architecture is an inevitable medium for ritual performance in high civilizations; the scale and form of these buildings are often intended to aggrandize said civilizations (*cf.* Wu 1995). There are extensive parallels between the attributes of ritual structures and those of monuments, probably because it is common for activities facilitated by the former to exert an impact meriting the latter. The physical prominence of these structures, thus, qualifies them as monuments.

In existing literature on steppe landscapes, "monuments" are generally synonymous with ritual structures. For examples, it is recognized that monuments of Bronze Age Mongolia consist of khirigsuurs, deer stones and slab burials (Allard and Erdenebaatar 2005, Fitzhugh 2009b). In the case of khirigsuurs, scale is a defining criterion for "monument". As Allard and Erdernebaatar's (2005: 551) excavation at khirigsuur Urt Bulagyn found, "roughly half a million stones" would have been used to build the monumental complex, which consists of multiple components including a central mound, satellite mounds, stone circles, slab burials, and stone paths. In the Bortala Valley, it may be argued that certain large-scale multi-component structures, such as the chain cairns at Etuokesai'er Turigen (fig. 3.16), would fit the scale criterion for "monuments". There is currently insufficient evidence to suggest these structures were intended for social or political control although it may be argued that they served as territorial markers.

Future field research would consider conducting a systematic study of the various forms of structures and their patterns of distribution on a local scale to identify the structure type(s) and spatial attributes considered to be the hallmarks of "monument". It

seems a more tenable approach to consider "monument" as an acquired and aggregate attribute, one that is not restricted to certain physical features, but may be revealed by its spatial relationship to other structures and forms of material culture, such as petroglyphs, and to topographic conditions.

While "monument" has tangible attributes, "monumentality" appears to be a more fluid and subjective concept (Wu 1995; Nelson and Olin 2003: 7; Osborne 2014: 4). But, it is futile, argues art historian Wu Hung (1995: 3), to seek "general abstractions or syntheses" for the definition of monumentality. Instead of understanding "monumentality" as a historical continuum, he suggests defining it in its relevant cultural and political contexts. For Wu, although "monumentality" is idiosyncratic and specific to its place and time in history, it cannot exist as an isolated phenomenon. This is a theory he has critically applied in assessing how giant clocks, drum towers and clock towers in ancient Chinese cities fulfill certain social and political roles.

Lefebvre (1991: 223-4) offers a useful alternative perspective from which to contemplate the monumental. He posits,

> "Monuments should not be looked upon as collections of symbols (even though every monument embodies symbols - sometimes archaic and incomprehensible ones), nor as chains of signs (even though every monumental whole is made up of signs). A monument is neither an object nor an aggregation of diverse objects, even though its 'objectality', its position as a social object, is recalled at every moment… It is neither a sculpture, nor a figure, nor simply the result of material procedures. The indispensable opposition between inside and outside, as indicated by thresholds, doors and frames, though often underestimated, simply does not suffice when it comes to defining monumental space. Such a space is determined by what may take place there, and consequently by what may not take place there (prescribed/proscribed, scene/obscene)."

By specifying what a monument is *not,* Lefebvre effectively brings the duality of monumentality into question. His theory also urges readers to consider where

"monumentality" is located, so to speak. According to Lefebvre, monumentality in architecture is a set of processes that are experienced in the space of social practice and is not affixed to any plastic qualities (Lefebvre 1991: 225). In this sense, his theory agrees with Wu's (1995: 4) interpretation of the lack of a default form in Chinese ritual art and architecture where monumentality, characterized by "conspicuous consumption" and an inextricable connection to dynastic power, is continuously being reinvented in different periods of history.

It seems therefore that the meaning of "monumentality" finds definition in spans of time and space, and is not bestowed upon a single object, a delimited space or a moment in time. At the same time it is tethered to a physical entity, it is a value negotiated socially and through culture (Nelson 2003: 7, Osborne 2014: 13). As such, it grants agency to the object that bore it. In this framework of analysis, the monumentality of the stone structures in the Bortala Valley may be better measured in time, rather than in scale. The chronology of structure clustering and building annexes suggest that the locations became monumental through time.

The significance of these structures does not stem from the scale or size of a single construction, but the fidelity to a building custom that is reinforced over time by consistently reproducing structures of similar architectural forms in the same locations. Monumentality in this context is also communal. It embodies a shared spatial knowledge anchored to the topology of a nexus of not only stone structures, but also petroglyphs, anthropomorphic stelae and other art and architectural forms. In this sense, the pastoral landscape is cartographically cumulative, adaptable, and transformative. It therefore carries important connotations for understanding the evolution of pastoral behavior,

particularly in regard to choice of route and site location, through different periods in history.

4.3 Summary

This chapter is structured as a two-staged discussion. First, I examined how space, place, and movement are interconnected in physical and conceptual dimensions. On the basis of this understanding, I then analyzed the spatial properties of the stone structures in the Bortala River Valley in view of the concurrent development of pastoral nomadism. Specifically, I explored them in four different regards - degree of visibility, forms and aspects of ritual, cultural and social representations, and the various measures of monument and monumentality.

This chapter explores the likelihood that architecture, through its form and its location, may mediate important meaning and symbolisms the pastoral landscape carries. I presented my arguments by first underlining the ontological conceptions of space, place and movement and how they inform studies in human geography and environment-behavior relationship. I found that while architecture is conducive to place-making, it is not necessary. Especially in mobile communities, movement may be more readily directed by perceptions of spatial geography that are not delineated by physical structures, namely social relations and animistic beliefs.

I then explored the spatial properties of the landscape of stone architecture in the Bortala Valley in four respects. First, I found that places of locational significance do not necessarily correlate with areas with favorable view sheds. I also noted that while

conspicuousness directly contributes to the heightened awareness of a locale, it is just as likely that symbolisms of the landscape are invisible to outsiders. The ubiquity of stone structures in the Bortala Valley and the structures' correspondence with the natural viewing conditions determined by the topographic outline of the valley make it difficult to determine the importance of visibility as a locational criterion. The second aspect I examined is ritual in the forms of repeated routes of movement and repeated designs in architecture. I contended that the products of these rituals are largely responsible for perpetuating the architectural profile that characterizes the landscape of Bortala. Third, I considered the extent to which social and cultural representations may be deduced from architecture. I noted the benefit of employing architectural semiotics to study a stone-aesthetics-laden landscape such as that of the Bortala, and highlighted the potential of applying space syntax to understand social processes through the geometry of the built environment. Lastly, I assessed the importance of these structures in relation to how the landscape evolved in time and space by drawing on measures of monument and monumentality. I contended that the influence of these structures on routes of movement among early pastoral societies manifests collectively and on a diachronic scale.

Conclusion

This dissertation has examined an important aspect of human behavior that is largely absent from discussions of how pastoral nomadism developed in Inner Asian prehistory for reasons that are archaeologically challenging. It has probed into the elusive and unappreciated connection between nomads and architecture. I summarize my findings below and consider their significance in Inner Asian studies of early pastoral nomads. I also outline viable lines of inquiry that warrant further investigation in future research.

In **Chapter 1**, I surveyed developments in theories and archaeological methods in the last century that have helped focus on the development of pastoral nomadism in Inner Asian prehistory. I noted that while pastoral nomadism is now better discerned empirically than in the 20th century, outlining the scope of their behavioral variability has become more challenging. In other words, as I argued in Chapter 1, "pastoral nomadism gained definition, but what the term designates has also become more complex". Specifically, reconciling patterns observed ethnographically with what can be observed in the archaeological record remains problematic. When studying structural remains of past pastoral nomads, we are further confronted with the issue of "absence of evidence" that is both a methodological hindrance and a theoretical conundrum. Nevertheless, with a closer scrutiny of ethnographic and historical data, we are in a better position to extract useful information to test archaeologically. This is where methods of spatial analysis come into play. They help identify the environmental and anthropogenic variables that have influenced patterns of human behavior as well as how architectural structures are

placed and designed. This is the approach this thesis adopts to analyze the archaeological data collected from the Bortala River Valley in Xinjiang.

Chapter 2 attempted to address the fundamental issues of interpreting archaeological data from Xinjiang. It is centered on the critique of the Andronovo as a problematic premise for deducing cultural and social behavioral patterns from material remains. I presented a selected corpus of materials that current local literature draws upon to identify the Andronovo presence in Xinjiang. The goal of the chapter was not to discredit typology as a method of classification but rather to argue a more methodical and integrated way of practice that is amenable to recovering and preserving archaeological contexts for research in comparative and inter-regional perspectives. I emphasized my argument of approaching my field data by way of spatial analysis instead of the current archaeological typology, which requires consolidation.

I presented in **Chapter 3** archaeological data I collected through survey and excavation over four summers of fieldwork in the Bortala River Valley in Bortala Mongol Autonomous Prefecture, Xinjiang, as a member of a project hosted by the Institute of Archaeology, Chinese Academy of Social Sciences. I divided my analysis into three levels of analysis to accommodate the varying degrees of data resolution and to provide a representative sample of the structural remains.

The macro-regional analysis examines the distribution pattern of 214 sites relative to different environmental parameters. I noted that besides the practicality of choosing locations that are topographically favorable, what stands out as placement pattern is the degree of dependency between one site and its first neighbor. The Ripley's K function was applied to look beyond the nearest neighbor to detecting point patterns across the

entire study area. The result shows statistically significant clustering at sporadic intervals but also suggests possible sampling biases in terms of how site areas are delineated. The strong clustering of sites of different periods near main water courses suggests the effect of pre-existing structures on choice of new ones, a decision rooted in long-established traditions.

A closer look at the arrangement of structures in the micro-regional analysis of three selected sites (Aduuchuluu, Xiaohusita, and Etuokesai'er Turigen) provides further evidence for site reuse. The chronology of spatial clustering is most prominent at Aduuchuluu where 22 burial structures at the cemetery site have been excavated. The topographic singularity of Xiaohusita (structures scattered on alluvial plain bordered by two occupied hills) and Etuokesai'er Turigen (burial ground atop of a flat terrace bound by steep hillsides) further highlights the monumentality of these locations on a diachronic scale.

In the site-based analysis, I focused on remains of settlement structure and selected burial structures excavated at Aduuchuluu. I used photogrammetry to reconstruct buildings and their topographic environment in 3D models. I discovered that the settlement structure was occupied in multiple time periods and certain building elements were removed or appropriated for different functions at later points in time. A similar observation was made at the cemetery. It was customary to attach later graves to earlier enclosures; the temporal distinction is evidenced by the lowering of building standards and a likely intentional reduction in structural dimensions relative to the earlier, preexisting structure as a way to show some kind of ancestral deference.

Chapter 4 considered results of the analysis in the preceding chapter. Drawing on theories of architectural planning and environment-behavioral studies, I consider the relation between pastoral nomads and architecture, physically and conceptually. I established that the relationship among the elements of space, place, and movement may not be physically distinguishable but are nonetheless culturally and socially informed. I then proposed four approaches to deciphering the spatial properties of the architectural landscape of Bortala. I argued that locational significance or awareness does not necessarily translate into visibility, or *vice versa*. Instead, given the ubiquity of stone structures in the Bortala Valley, landscape perception is likely derived from other faculties and means of spatial recognition.

The distribution pattern of stone structures in Bortala strongly bespeaks ritual. The chronology of spatial use attests to a kind of cartographic palimpsest, with frequented routes and customary designs in architecture and other stone media. The study of a symbolic landscape may also be receptive to the approach of architectural semiotics, which explores meaning in built forms. I recommended the use of space syntax to explore the relation between human movement and how spaces are configured, as well as the distinctive spatial properties of a landscape. This is a method that favors the analysis of allocentric spatial representations, which I argue are compatible with my inference that the architectural landscape is a collective and cumulative endeavor through time. I concluded my discussion by arguing that "monument" and the "monumentality" of a locale embody spatial attributes that may be better explored diachronically. This may lend an important perspective from which to consider the logistics and cultures of space use among early pastoral societies.

Appendix 1

Data sets for Statistical Analysis in Chapter 3

Table 1.1 Breakdown of structure count at each site in three altitudinal groups. Data collated for Kruskal-Wallis test of relation of site size (number of structures) to altitude (fig. 3.2) .

<1500 m	1500-2000 m	>2000 m
1	62	27
53	40	67
45	10	102
76	170	11
10	19	157
39	47	35
158	26	20
33	28	23
99	9	150
28	38	61
74	43	100
7	43	1
77	35	61
7	73	16
48	31	34
28	5	78
13	158	7
3	145	34
36	14	20
58	32	87
2	1	51

53	48	14
80	27	56
28	25	11
61	26	47
1	15	26
52	38	12
5	140	71
21	74	32
23	79	17
97	28	15
7	29	91
77	60	12
71	23	33
41	93	1
41	60	25
38	2	75
61	22	164
23	91	156
78	41	19
34	21	81
47	30	150
37	69	48
40	40	
20	37	
12	33	
5	43	
52	26	
12	38	
30	19	
48	48	
8	11	

3	93	
7	48	
150	59	
8	1	
27	33	
47	76	
2	36	
67	11	
44	27	
99	92	
18	51	
32	50	
6	19	
26	48	
2	19	
15	3	
110	24	
62	37	
47	93	
126	93	
94	43	
32	46	
71	1	
39	266	
80	11	
5	67	
2	29	
6	60	
20	18	
34	75	
84	82	

15		
22		
107		
62		

NB: The site with 402 structures in the <1500 zone appears as an outlier. It is therefore excluded from the analysis to avoid skewing the result.

Table 1.2 Breakdown of structure count at each site in six distance groups. Data collated for Kruskal-Wallis test of relation of site size (number of structures) to distance from nearest stream (fig. 3.2).

0-1000 m	**1000-2000 m**	**2000-3000 m**	**3000-4000 m**	**4000-5000 m**	**5000-6000 m**	**>6000 m**
87	20	40	76	40	77	23
99	33	41	47	24	48	71
47	5	107	157	62	102	39
170	32	93	48	48	93	11
23	28	7	37	62	22	27
30	61	41	51	19	48	11
14	61	110	30	32	92	78
23	19	158	43	26	36	
12	11	38	3	2	82	
1	266	38	47	19		
34	33	6	75	34		
33	43	44	94	7		
40	45	29	32	67		
11	10	91	93	77		
20	78	76	48	71		
27	5	18				
38	164	74				
74	11	60				

50	145	32				
35	53	28				
56	2	59				
158	21	9				
73	28	67				
28	5	18				
79	10	22				
93	1	84				
140	97	52				
3	33	27				
48	52	67				
28	43					
36	61					
19	17					
34	12					
41	46					
1	91					
19	1					
39	126					
80	1					
21	1					
15	20					
2	23					
69	34					
26	35					
62	402					
60	7					
43						
150						
26						

12						
1						
58						
81						
2						
25						
100						
71						
12						
99						
156						
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27						
37						
80						
8						
150						
7						
8						
6						
38						
150						

Appendix 2

Image Inventory of Selected Sites with Habitation Structures in the Bortala Valley

To allow for easy referencing, the site numbers below follow the caption in fig. 3.6.

Sites: 1. Aduuchuluu 2. Hu'ertuoleha 3. Xiaohusita 5. Sabibuliuke Turigen 11. Bure Village. 12. A'aote 13. Gulijiaba 15. Wusutebiezhen

Fig. 2.1 Aduuchuluu habitation structure (looking south).

Fig. 2.2 Hu'ertuoleha (looking east)

Fig. 2.3 Xiaohusita sub-site, Dahusita (looking northeast)

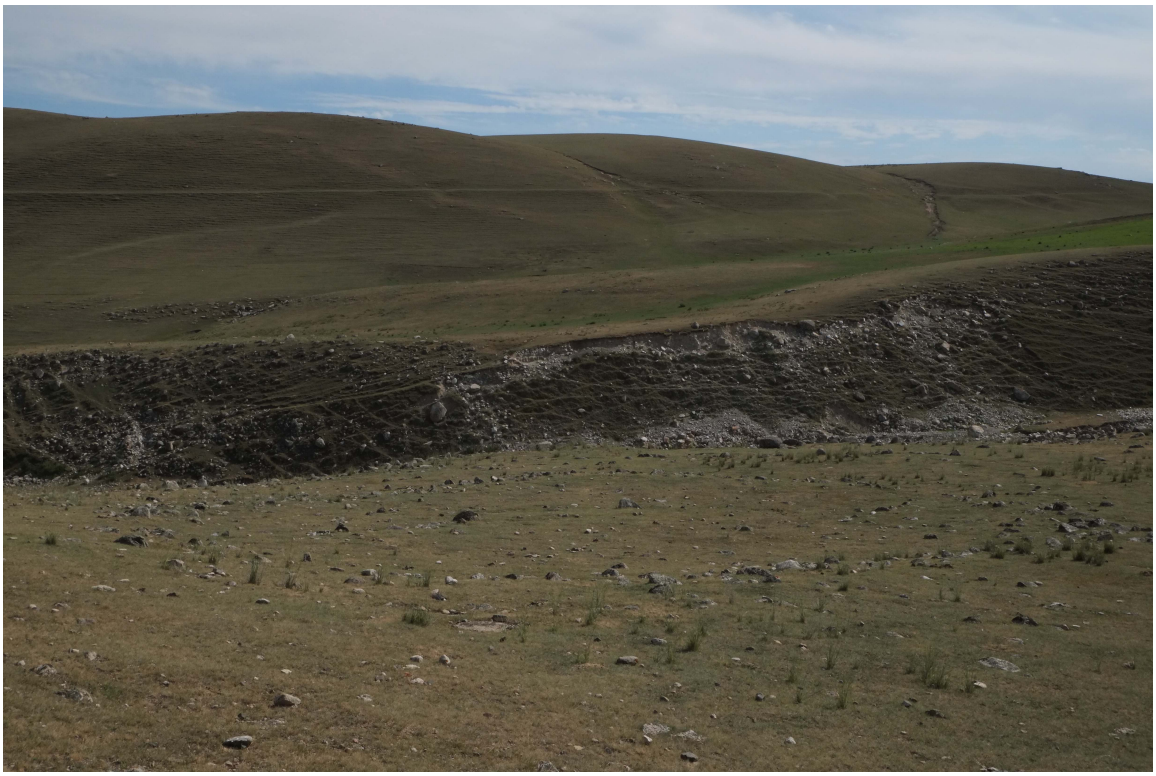

Fig. 2.4 Sabibuliuke Turigen (looking west)

Fig. 2.5 Bure Village (looking north).

Fig. 2.6 A'aote (from Xinjiang Bureau of Cultural Relics 2011b: 70, direction unknown).

Fig. 2.7 Gulijiaba (direction unknown).

Fig. 2.8 Wusutebiezhen (looking northwest).

Appendix 3

Description of Material Finds at Aduuchuluu, Bortala River Valley

Chronology

Three AMS (Accelerated Mass Spectroscopy) radiocarbon dates of charcoal remains - 3331±38 BP, 3270 ± 27 BP, 3403 ±28 BP (Institute of Archaeology et al. 2013: 29) - from the first stratigraphical layer under the topsoil in F1 situate the latest occupational phase of F1 at 15th century BCE, a period attributed to the Andronovo Cultural Complex of Central Asia that spans an area from the eastern edge of the Pontic steppes, across Kazakhstan, into southern Siberia and the Asian steppes. Pending dating results from lower occupational layers, the structure was likely in used through the first half of the second millennium BCE, sometime between 1800 - 1600 BCE (Institute of Archaeology, CASS et al. 2013).

The stratigraphic order of building elements shared by F1, F2 and F3 suggests that F2 was constructed after F1, and F3 after F2. Only a small number of material finds were found in F2 and F3, however, and because they were not uncovered in situ, precise dates cannot be obtained for F2 and F3.

Grave	Material	Date
SM 9	Wooden stick	3447 ± 31 BP
SM 4-2	Remains of wooden parts of	3337 ± 32 BP

	the coffin	
SM 50-1	Charred wood	3266 ± 34 BP
F1	Charred wood	3331 ± 38 BP
F1	Charred wood	3270 ± 27 BP
F1	Charred wood	3403 ± 28 BP

Fig. 3.1 AMS radiocarbon dates of wood remains from the Aduuchuluu Cemetery and F1 (Institute of Archaeology et al. 2013: 29, fig. 4)

As seen in the table above, wood remains from burials in the northern zone of the cemetery yielded similar radiocarbon dates. Considering also that they have the same type of slab wall construction on the perimeter, it seems all the more likely that these two clusters of structures, less than 2 km apart, belong to the same monumental complex.

The structures in the central and southern zones are of a different construction. Compared to those in the central and southern zones, the stone slabs in the northern zone are taller and more upright and are of more uniform dimensions. The slabs become more lower-lying and have a steeper incline further to the south. Some are even laid flat. It is likely that these different building structures represent different periods of funerary architectural tradition.

Distribution

Habitation Structures F1, F2, and F3

A small amount of artifacts has been found in F1. The most significant finds are in the northwestern quadrant where there is a standalone building in the first occupational layer that measures 7.2m by 6m, occupying at least ¼ of the surface area of F1. This area has the highest concentration of animal bones and teeth, from equids and caprids and ceramic fragments within F1 (Institute of Archaeology et al. 2013: 26). A canine mandible belonging to a domesticated species (based on preliminary examination) was also discovered here. In addition, four millet grains were uncovered in the ash deposit.

Two small cairns each containing a set of child skeletal remains under a stone slab were found inside F1. It appears that they were constructed on top of the original stone structure. The burials are oriented NW to SE, in the same orientation as the burials in the cemetery to the south (Cong 2016)

A small amount of animal bones - which include caprid astragali and fragmented pieces of long bones - as well as ceramic fragments were found in the quadrants in the southeastern (*ca.* 2.6 m in radius) and southwestern (*ca.* 4 m in diameter) corners of F1, which are delineated by double stone rows (Kaogu Yanjiusuo 2013: 26).

Only a few animal bone fragments and surface lithic finds were found inside F2 and F3, which were both excavated in 2013. It does not appear that these two enclosures were used for habitation.

The scarce and dispersed finds of animal bones, ceramic fragments, and chipped stone tools within the settlement structures of F1, F2 and F3 are not indicative an intensive occupational history. The evidence suggests the likelihood of F1, F2 and F3 being used for non-domestic activities, such as rituals and burials.

Cemetery

The common grave goods are ceramic vessels and bronze ornaments. There is usually a ceramic vessel in the northwestern corner of the grave. Complete vessels uncovered from SM 4-2, SM 37-2, SM 35-3, SM 36 N-2, SM 36 N3-3, SM 38, SM 39, SM 40, SM 50 are largely homogenous and they provide important information on the type of ceramic tradition associated with the burials.

The vessels are coarse grey-brown or grey-black wares impressed on the exterior with patterns such as chevrons and short vertical lines. The patterns are concentrated on the neck or shoulders of the vessels. There is no slip or paint. The vessels have an unrestricted orifice, a flat base, a convex body and a gentle constriction that defines the neck. The maximum width of the vessel is at the shoulders and it measures roughly the same as the mouth of the vessel, and is larger by about one-third than the base of the vessel. The orifice is characterized by either a direct rim or an everted rim. The form, texture, and decoration of the Aduuchuluu ceramics conform to the pottery types classified as Andronovo (Kuzmina 2007: 273; Kuzmina 2008: 167-172). Andronovo style pottery has also been found in other areas of Xinjiang, such as Tacheng 塔城 (Mei and Shell 1999), attesting to the eastward spread of the Andronvo Culture from its hub in northern and central Kazakhstan, probably via the Dzungarian Gate that crosscuts the Dzungarian Alatau, to the northern Tian Shan region.

The Andronovo connection is corroborated by the characteristics of the bronze objects discovered in the burials, which are predominantly small, ornamental pieces. These include bronze earrings, which have been found on three individuals separately in

SM 4, SM 36-S1, and SM 37-1. Two of these pairs are gilt-bronze. These earrings have a trumpet-shaped end that is characteristic of the Andronovo earrings found in the Fedorovo timber-grave burials in Kazakhstan (Kuzmina 2007: 241). Bronze beaded bracelets and anklets, perforated small bronze adornments (likely affixed to clothing), bronze mirrors, and small daggers have also been found. There is a thick surface layer of copper oxide due to heavy chemical weathering, which makes the material highly brittle. Future metallurgical analysis of the bronzes would provide information on their chemical content to allow comparison with the purportedly contemporary Andronovo bronze which contains 3% - 10% tin and is created through a copper sulphide reduction process (Mei 2000). The latter shares a similar distribution as the Andronovo ceramics in Xinjiang, having been found at other sites including Tacheng 塔城, Xintala 新塔拉 and Tianshanbeilu 天山北麓 (Abuduresule and An'niwa'er 2014).

Animal bones were found inside these burials but in very small quantities. The adult male of *ca.* 30 years of age in SM4-2 was buried with caprid astragali along with gilded bronze earrings and a ceramic vessel. A notable find of animal remains in burials is in SRM1 and SRM2, which are two enclosures adjacent to each other with a similar construction. The only artifact uncovered in both enclosures is a caprid scapula buried in the western half of the enclosure; there are no other buried remains. Although these two enclosures have yet to be dated, the finds attest to the specific purpose animal bones served in ritual and funerary presentations of this stone architectural tradition. Fragments of red deer (*Cervus elaphus*) antler have also been found, such as in SM4 and SM51, where they are located in a context separate from the human burial. It should also be

noted that the scattered finds of animal remains throughout the cemetery all are species of ruminants.

Primary burial, secondary burial, and cremation are found in the cemetery. A single slab grave enclosure could have more than one type of burial. In SM4 for example, the southern grave holds a complete articulated skeleton of a young adult male with various kinds of grave goods but its northern grave contains cremated remains of what appears to be a young adult with a broken ceramic vessel at the western end of the grave. The chain burial of SM36, with 11 connected graves, is another good example. There are primary burials, secondary burials, and cremation, but these different types of inhumations do not exhibit any discernible spatial or chronological pattern. According to the results of the excavation to date, there is no apparent relationship between mortuary practice and the structural features of the enclosure.

Complete and articulated skeletal remains are found in several of the burials. In SM4, for example, an adult male of over 1.8 m in height was found buried in the foetal position, with a pair of bronze earrings and a ceramic pot and a few caprid astragali. In SM 35-3, SM 36S-1, remains of a young adult male were found buried in the foetal position. A child skeleton also buried in the foetal position was uncovered in SM36 N-2. More than one set of remains was found in SM50-2, which contains an incomplete articulated skeleton of a young adult (25-30 yrs) female and the skull, scapulae and ribs of an infant (Institute of Archaeology et al. 2013: 29).

Other burials, such as SM36 N-4 and SM37-1 yielded disarticulated and incomplete skeletal remains in contexts that had been subject to post-depositional natural or cultural disturbances. Several of these graves that were evidently disturbed by humans (i.e. with

damaged or missing capstones) had only a few bones scattered inside the pit; SM35-3 and SM36 S-2 are good examples.

It is often difficult, however, to determine if the disturbed contexts are the result of secondary burial or looting. Secondary burial describes the situation where skeletal remains have been moved from their original location and re-interred in a second location. Evidence of secondary burials may include disarticulated set of remains with missing bones, and tombs with almost no bone remains except for grave goods. SM36 N-5 is an example of secondary burial. Disarticulated bones are found scattered in the slab-lined grave in disorder. These bones include scapulae, pelvis, femurs, humeri, tibiae, radii, ulnae, ribs, phalanges, and a mandible with preserved lower teeth. Evidently, many bones are missing and based on the burial conditions, it can be surmised that these bones were reburied here after being exhumed from their initial location.

Fig. 3.2 SM36 N-5, a secondary burial.

SM36 S-2 is likely a primary burial whose interred remains were removed for secondary burial elsewhere. The capstones are intact but the only remains found in the grave are a few phalanges and a ceramic vessel.

Where capstones are intact, the disturbance of human remains might have been the result of post-depositional weathering or animal burrowing, which is substantiated by the presence of burrowed tunnels and rodent remains in multiple burials. The displacement of capstones, such as in the case of SM 9, SM 36-N5, is a clear sign of post-burial anthropogenic disturbances such as looting and exhumation, since the graves are covered by heavy capstones that would have been difficult to displace without mechanical aid or substantial physical effort.

Cremation was found in a number of graves. In SM 5, burnt sediments were found in a burial pit covered by capstones. SM 36 N-2 is another exemplary case of cremation. Fragments of burnt bones and burnt sediments were deposited in the grave with 14 bronze objects. The burnt remains cover almost the entire area except for the northwestern corner. The burnt remains located in the center grave of SM 36 were also from primary cremation. SM 38, SM 39, and SM 40 all contain cremated remains with small bronze objects and fragments of a ceramic vessel.

Where the condition of the skeletal remains has allowed for identification, preliminary observations of their craniology and dentition suggest that these individuals are Caucasoid. Unpublished DNA results have also matched their mitochrondrial DNA to a European haplogroup (personal communication with project director). Analysis of human remains from two graves of the chain burial of SM 36 yielded a C4 signal, which is consistent with the carbonized millet find southwest of the entrance of F1 (Cong 2016).

Appendix 4

Summary of Excavated Structures and Material Finds

at Aduuchuuluu Cemetery, Bortala River Valley

Structure ID	Structure type	Burial type	Material remains	Human remains
SM9	Stone slab burial lined on the inside with stacked stones	Secondary burial. Exhibits signs of extensive disturbance.	Remains of wood.	Complete child skeleton found atop of cist. A small number of bones inside cist.
SM4	Standalone quadrangular slab burial, mouth of pit marked with small stones	One cremation, one interment.	One contains fragments of a ceramic vessel and other a pair of bronze earrings, a ceramic vessel and a few caprid astragali.	One contains cremated remains of a young adult, and the other a burial of an adult male of over 1.8 m in height in the foetal position.
SM5	Standalone quadrangular slab burial			
SM6	Standalone quadrangular slab burial			
SM49	Quadrangular slab enclosure adjoining SM50			

SM50	Quadrangular slab enclosure adjoining SM49	Two interments	Fragments of a ceramic vessel in one, and a ceramic vessel in the other.	One contains the cremated remains of a young adult, the other is possibly a joint burial, with a set of female skeletal remains aged 25-30 buried in the foetal position and bone fragments of an infant.
M88	Cairn with concentric stone arrangements			Fragments of human bones
SM29	Quadrangular slab enclosure adjoining SM30			
SM30	Quadrangular slab enclosure adjoining SM29			
SM24	Quadrangular slab enclosure adjoining SM25			
SM25	Quadrangular slab enclosure adjoining SM24 and SM26			
SM26	Quadrangular slab enclosure adjoining SM25			
SM35	Standalone quadrangular slab burial	Three interments containing primary burial, secondary burial and	Ceramic vessels	One of the burials contains remains of a young adult male in the foetal position.

		cremated remains.		
SM36	Chain burial with 11 adjoining enclosures	Primary burial, secondary burial, and cremation	Ceramic vessels, bronze ornaments	Complete skeletons of two young adult males and a child, two sets of disarticulated remains, and four cremated assemblages.
SM37	Multiple adjoined burial			Disarticulated male remains
SM51			Fragments of antler	
SM52		Two interments		
SM38	Stone enclosure adjoined with SM39	primary cremation	Ceramic vessel, small bronze objects	burnt remains
SM39	Stone enclosure with three cists, adjoined with SM38	primary cremation	Ceramic vessel, small bronze objects	burnt remains
SM40	Stone enclosure with cist	cremation	Ceramic vessel, small bronze objects	burnt remains
SRM1	square enclosure with inner stone circle, accompanied by anthropomorphic statue	n/a	caprid scapula	absent
SRM2	square enclosure with inner stone circle	n/a	caprid scapula	absent

NB: SRM1 and SRM2 fall outside the area mapped in fig. 3.23.

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