1.1 Introductory Remarks

Anthropology, the study of human and diversity, has long focused its attention on foraging societies, or those whose subsistence relies largely or solely on hunting, gathering, and/or fishing (Kelly 1995:3). Research has increasingly concentrated on foraging efficiency and the mutability of adaptive strategies in the face of continually changing resource potentials (Hayden 1981a, 1981b). While hunter-gatherer existence was once thought to be “nasty, brutish, and short” (Hobbes 1957), this perception was overturned in the 1960’s, influenced in part by the 1966 “Man the Hunter” conference (Lee and DeVore 1968). The last several decades have seen extensive anthropological research on foraging adaptation, the result of which is an extensive body of data indicating considerable variation among hunter-gatherer societies. Rather than fitting a single preconceived pattern, foraging populations appear to vary significantly in terms of food selection and preference, nutritional quality, work load, mobility, and many other adaptive characteristics (Kelly 1995:3-6).

environmental and occupational hazards, exposure to pathogens and other disease processes, treatment of the infirm, and interpersonal violence (Larsen 1997:5). By considering whole populations, rather than individual cases within them, bioarchaeologists can reconstruct overall patterns and compare populations with one another in order to gain better insights into behavior, lifestyle, subsistence patterns, and other aspects of human adaptation. It is this population approach to bioarchaeology that is employed in the current study.

Compared to other boreal forest regions of the world, Siberia’s Cis-Baikal is characterized by an unusual wealth of mid-Holocene mortuary and habitation sites (Weber 1995, Weber et al. 2002). Despite archaeological research in the area spanning the past century (see Section 1.3.1), it has only been in the last decade that a significant feature of Cis-Baikal cultural history has been clearly revealed. It now appears that cultural progression was disrupted in the fifth millennium BC by a 700-year hiatus, after which biologically and culturally distinct people inhabited the region (Weber 1995). In this study, human remains from five Cis-Baikal skeletal populations – two pre-dating this hiatus and three post-dating it – are examined in order to characterize the health and lifestyle of the pre- and post-hiatus groups, respectively. Bioarchaeological methodology is employed not only to provide a better understanding of cultural adaptation throughout the Cis-Baikal Neolithic and early Bronze Age, but also to contribute valuable insights into the fifth millennium hiatus.

1.2 Biogeographical Context

Because this study examines mid-Holocene hunter-gatherer adaptation in the Cis-Baikal, it is helpful to summarize the region’s biogeographical features. Of particular interest to this research is the availability of food resources in the region, a factor substantially affecting the health and lifestyle of foraging peoples, whether
ancient or modern. While past environmental fluctuations and their effects on vegetation and fauna cannot be fully accounted for, the modern data outlined below constitute a plausible range of past variability.

Lake Baikal is located between 52 and 58 degrees North Latitude and 101 and 110 degrees east Longitude, in the southern part of eastern Siberia, Russia (Figure 1.1). The vast area surrounding the lake, the Baikal Mountain Region, is divided into the Cis-Baikal to the north and west of the lake, and the Trans-Baikal to the south and

Figure 1.1 Siberia and the Cis-Baikal Region
east. This research will consider the Cis-Baikal only, as the culture histories of the two regions are quite distinct (Khazonov 1994:91, Kuzmin and Orlova 2000). The geographical definition of the Cis-Baikal utilized here follows that adopted by Michael (1958:5). The region encompasses the basin of the Angara River from its source at the lake to Ust’-Illimsk, the drainage of the upper Lena River to Kirensk, and the west coast of Baikal itself, including its largest island, Ol’khon (Figure 1.2). In total, the Cis-Baikal encompasses an area of over 350,000 km$^2$.

Three discrete drainage basins comprise the Cis-Baikal: the Angara River, the upper Lena River, and Lake Baikal itself. The Angara River basin is part of the larger Yenisei River drainage system (Kozhov 1950), but only the upper 1000 km of its extent is contained in the Cis-Baikal region. The Angara River is the only outlet for the entire lake and drains about 80 km from its western end. The upper Lena River basin constitutes the upper 650 km of Siberia’s longest (4500 km) river. The Lena has its source on the western slopes of the Baikalskii mountain range, about 75 km north of Ol’khon Island, and gradually increases its volume as it flows north. Although the Lake Baikal basin could be included as part of the Angara-Yenisei system, its uniqueness usually warrants its separate consideration (Kozhov 1963, 1972). The basin comprises the lake and its approximately 400 tributaries, the largest of which are the Upper Angara (not to be mistaken for the Angara), the Barguzin, and the Selenga, all of which drain from the Trans-Baikal region (east and south of the lake).

The Cis-Baikal boasts three mountain ranges, none of which exceeds 3200 m in elevation. The Primorskii range, which hugs the northwest coast of the lake from the Angara to Ol’khon Island, is the lowest of the three ranges. It varies in elevation from 1100 to 1700 m above sea level, and only rarely extends above the tree line. The Baikalskii mountain range also follows the northwest coast of the lake, beginning about 50 km north of Ol’khon Island. The mountains are markedly alpine in character and
Figure 1.2 Location of Cemetery Sites within the Cis-Baikal: 1 – Ust’-Ida I, 2 – Khuzhir-Nuge XIV, 3 – Lokomotiv, 4 – Shamanka II
extend up to 2650 m, well above the tree line. Finally, the Eastern Sayany mountain range, the highest in the Cis-Baikal, lies west of the southwest end of the lake and forms a natural southwest boundary for the region. Sayany mountain peaks ascend to 3000-3200 m, again high above the tree line. North and west of the mountain ranges, the Cis-Baikal is comprised of extensive rolling hills, part of the Central Siberian Plateau, intersected by the Angara and Lena rivers and their tributaries (Kozhov 1963, 1972).

Unfortunately, detailed environmental reconstructions of the mid-Holocene Cis-Baikal do not exist (Weber et al. 2002). While the patterns described below reflect the modern day, they also constitute a reasonable proxy for the potential range of past diversity. Because the Cis-Baikal is located in central Eurasia, it exhibits a noticeably continental climate with long five-month winters, short two-month summers, and relatively long transitional seasons. Winters are cold, with mean January temperatures of about -26 degrees C and ground freezing to depths of 120 to 220 cm. Summers, on the other hand, are mild and dry, with mean July temperatures of 20 degrees C. The growing season, in which daily average temperatures are at least five degrees C, lasts from mid-May until late September. Total annual precipitation in the Cis-Baikal is between 400 and 600 mm, including between 30 and 80 cm of snow cover. In general, the region is relatively sunny, experiencing approximately 2000 cloud-free daylight hours every year (Atlas SSSR 1984).

At present, the Cis-Baikal is located within the southern boreal forest or taiga biome, bordering the steppe-forest transitional zone on its southern extent. The taiga consists predominately of pine (Pinus), larch (Larix), cedar (Cedrus), spruce (Picea), and fir (Abies), but also some poplar (Populus), birch (Betula), and aspen (Salicaceae). Other vegetation includes alder (Alnus), bird cherry (Prunus padus), mountain ash (Sorbus aucuparia), rhododendron (Rhododendron), dogrose (Rosa
canina), and various grasses, ferns, shade plants, and mosses (Kozhov 1963, 1972). Of these, a wide variety of berries, pine nuts, and mushrooms are available seasonably, providing important sources of nutrients to boreal forest foragers, both ancient and modern. On the whole, the region exhibits a large variety of plant communities, the distribution of which is affected by variable factors such as latitude, altitude, precipitation, and slope exposure. While it is likely that plant communities throughout the Cis-Baikal were affected, at least to some extent, by climatic change during the Holocene, those in the south were probably most sensitive to environmental fluctuations and featured more dramatic shifts in their distribution due to the area’s partly transitional location (Adams and Faure 1998, Khotinskii 1984a, 1984b).

Terrestrial fauna in the Cis-Baikal is rich and diverse, as the area is a meeting point for three Eurasian faunal complexes – the European/Siberian, Central Asiatic, and Eastern Asiatic families. While over 100 mammalian and 300 avian species are known to the region, only those of potential value to boreal forest foragers will be mentioned here. Mammals, particularly ruminants, would have likely made up the bulk of hunter-gatherer food intake (Helm 1981, Levin and Potapov 1965). Red deer (Cervus elaphus), roe deer (Capreolus capreolus), moose (Alces alces), reindeer (Rangifer tarandus), musk deer (Moschus moschiferus), and Siberian mountain goat (Capra sibirica) all inhabit the Cis-Baikal. Of these six species, red deer, roe deer, moose, and reindeer are the most spatially diverse, and thus of greatest importance to foragers. Other mammals include boar (Sus scrofa), otter (Lutra lutra), brown bear (Ursus arctos), wolf (Lupus lupus), lynx (Felis lynx), wolverine (Gulo gulo), white sable (Martes zibellina), squirrel (Sciurus vulgaris), hare (Lepus timidus), Siberian polecat (Martes sibiricus), fox (Vulpes vulpes), ermine (Martes erminea), and chipmunk (Eutamias sibiricus). Because the geographic distributions of many of
these species co-vary with those of plant communities, they were also likely affected by climatic fluctuations throughout the Holocene (Kozhov 1963, 1972).

Aquatic fauna is equally rich in the Cis-Baikal, being concentrated in the three main drainage basins outlined above. Aquatic resources appear to have played a more important role in mid-Holocene hunter-gatherer subsistence than in other boreal forest regions of the world, as suggested by both archaeological and human bone chemistry data (Katzenberg and Weber 1999, Okladnikov 1950, 1955, Weber and Katzenberg 1998). Furthermore, the ecological stability of the lake itself (Kozhov 1963, 1972) may have buffered aquatic organisms in both Baikal and the upper portion of the Angara River against climatic fluctuations throughout the Holocene (Weber et al. 2002). About 12 species of Baikal fish were exploited historically as important food sources (Kozhov 1963, 1972, Sorokin and Sorokina 1988). Most of these, such as Baikal whitefish (*Coregonus lavaretus baicalensis*), perch (*Perca fluviatilis*), northern pike (*Esox lucius*), grayling (*Thymallus* spp.), and Baikal sturgeon (*Acipenser baerii baicalensis*), are littoral or limited to the shallow, coastal areas of the lake, while one, omul' (*Coregonus autumnalis migratorius*), is partly pelagic. Baikal seal (*Phoca sibirica*) is also abundant on the lake, although availability to foragers varies significantly with season (Weber et al. 1993, 1998). The diversity of fish species in the first section of the Angara River (between its source and its first major tributary, the Irkut River) is comparable to that in Baikal, but as the river flows towards its confluence with the Yenisei, fish abundance and variety begin to mirror those of Siberia’s other large – and highly productive – rivers. These species include Siberian dace (*Leuciscus baicalensis*), arctic grayling (*Thymallus arcticus*), burbot (*Lota lota*), humpback whitefish (*Coregonus oidschian*), lenok (*Brachymystax lenok*), taimen (*Hucho taimen*), and ide (*Leuciscus idus*). In the Lena River, fish volume and species diversity increase steadily as the waters approach the Arctic Ocean. Because of this,
the portion of the river contained within the Cis-Baikal exhibits relatively poor productivity compared to the Angara and the shallow, coastal areas of Baikal. Species present include taimen (*Hucho taimen*), lenok (*Brachymystax lenok*), arctic grayling (*Thymallus arcticus*), and Lena tugun (*Coregonus tugun lenensis*).

The Cis-Baikal during the mid-Holocene was undoubtedly hospitable, offering a wide range of potential food resources, much as it is today. Terrestrial flora and fauna provided important sources of plant and animal nutrients to hunter-gatherers throughout the region, although abundance and diversity varied with specific local environments and, in the case of the former, season. While terrestrial mammals, particularly ruminants, likely supplied the majority of human dietary needs, the contributions of aquatic fauna were also significant. In fact, fishing may have played a more important role among foragers of the mid-Holocene Cis-Baikal than among boreal forest foragers elsewhere in the world. Aquatic resources were likely richest in the Angara River and the shallow (coastal and Ol’khon) regions of Baikal, and somewhat sparse in the upper Lena River. Climatic fluctuations throughout the Holocene may have affected, at least to some extent, the distributions of terrestrial plant and animal resources. In contrast, aquatic resources, specifically those in Baikal itself and in the upper Angara River, were probably less sensitive to environmental changes due to the remarkable stability of the lake.

### 1.3 Archaeological Context

#### 1.3.1 History of Archaeological Research and Culture History Debate

As early as the first half of the eighteenth century, Russian exploration of the Cis-Baikal revealed archaeological finds (Michael 1958:7). However, it was not until the end of the nineteenth century that systematic archaeological research was conducted in the area. Some notable early projects were the 1880’s excavations of the
Kitoi cemetery site by Vitkovskii and the 1912-13 fieldwork at the habitation site of Ulan-Khada by Petri (Khlobystin 1969). During the early twentieth century, a number of culture history models were proposed in an attempt to construct syntheses for the area’s Neolithic and Eneolithic periods. As most of these models were based on incomplete and dispersed data (Michael 1958:9, 25-28), their discussion is not warranted here.

The most dominant figure in the study of the Siberian Neolithic is Aleksei Pavlovich Okladnikov. Prior to his time, scholars were able to identify only two major periods, reflecting the absence and presence of metal objects, respectively, from the rich archaeological record. In the 1950’s, Okladnikov proposed a new model of prehistoric Cis-Baikal cultural development based on typological classification (Michael 1992, 1958:7-9). He had spent the previous decades re-examining previously collected material and conducting extensive fieldwork of his own, though most of his field work focused on mortuary rather than habitation sites. The abundance of burial data, coupled with the generally ambiguous information collected from the few habitation sites, naturally resulted in a culture history model based largely on mortuary variation. Okladnikov’s model proposed a four-stage unilinear progression through the Cis-Baikal Neolithic and early Bronze Age. Unlike the case in western archaeology, the Siberian Neolithic and Bronze Age are not characterized by agriculture and sedentism, but rather by the contemporaneous appearance of pottery, bow and arrow technology, and stone polishing techniques in the case of the former, and bronze and copper objects in the case of the latter (Chard 1974:60-63, Khlobystin 1978). Okladnikov’s four consecutive cultural stages were the Isakovo, Serovo, Kitoi, and Glaskovo cultures (Derevyanko 1994, Haüsler 1968, Michael 1992, Okladnikov 1959:12-14, 27-29, Tolstoy 1958, Weber 1994, 1995). Each was
identifiable in terms of specific mortuary practices, technologies, subsistence patterns, and social structures.

Despite its dominant position in Lake Baikal archaeology, Okladnikov’s model of unilinear cultural evolution exhibited numerous methodological and theoretical shortcomings. Its chronology was devised on the basis of relative dating techniques, specifically the comparison of material culture typologies and mortuary rituals, rather than on absolute dating techniques, as most assemblages lacked stratigraphic control and radiocarbon dating was, as yet, unavailable in the area (Chard 1974:60-62, Michael 1992, Weber 1994, 1995). Okladnikov initiated his chronological sequence with the Isakovo culture, because of its crude pottery and simple lithic manufacturing techniques, and terminated it with the Glaskovo culture, because of its employment of metallurgy. The Serovo culture, exhibiting similarities with both the Isakovo and the Kitoi, and the Kitoi culture, exhibiting the most similarities with the Glaskovo, were placed second and third, respectively. Absolute chronology, particularly for the younger stages of the sequence, was determined through archaeological analogies with adjacent regions (Weber 1994, 1995). Ethnographic analogies, for various cultural interpretations, were also extensively utilized. More detailed information regarding Okladnikov’s model and the ensuing culture history debated is discussed by Weber (1995).

Okladnikov’s synthesis was well received by the Soviet archaeological community and survived, with little modification, until recent times (Derevyanko 1994, Weber 1994). However, it was never without its critics. The first, and perhaps most effective, challenge to Okladnikov’s model came from his contemporary, the biological anthropologist M.M. Gerasimov. In 1955, Gerasimov proposed an alternative culture-history model. Contrary to Okladnikov, he believed that the Isakovo and Serovo cultures exhibited no significant differences, and should thus be
united as one culture, the Serovo. He also maintained, on the basis of similarities between the Serovo and Glaskovo, that the latter immediately succeeded the former, simply representing a further cultural evolution. Finally, utilizing both archaeological and human skeletal evidence, Gerasimov determined that there were substantial biological and cultural differences between the earlier Kitoi and the later Glaskovo peoples, representing a distinct chronological hiatus between the two cultures. His resultant culture history sequence was Kitoi, Serovo (including Okladnikov’s former Isakovo), and Glaskovo (Gerasimov 1955, Michael 1992, Weber 1995). Gerasimov’s culture history model was significant not only because it placed the Kitoi at the beginning of the sequence, but also because it suggested a lack of biological and cultural continuity between the Kitoi and the Serovo-Glaskovo stages. Unfortunately, because Gerasimov’s model relied heavily on craniometric data and was less comprehensive in scope than that of Okladnikov, it was not further developed by archaeologists (Weber 1994, 1995). Nevertheless, it set the stage for the culture history debate that surrounded Cis-Baikal archaeology for the next several decades.

In the years following Gerasimov’s initial critique, extensive archaeological fieldwork in the Cis-Baikal continued and a number of alternative culture history models were proposed. The ensuing debate focused primarily on the chronological position, origin, and role of the Kitoi culture, but also on the correlation of the burial and habitation complexes for the region (Weber 1995). Scholars involved included L.P. Khlobystin (1964a, 1964b, 1965, 1969, 1978), G.V. Sinitsyna (1986, 1987), N.A. Savel’ev (1982, 1989), G.M. Georgievskaja (1974, 1979, 1989), V.S. Zubkov (1982), and O.I. Goriunova (1983, 1984a, 1984b, 1991). Their alternative models, varying solely in terms of the succession and contemporaneity of the four developmental stages, were all similar in that they advocated continuous habitation of the region throughout the Neolithic and early Bronze Ages (Weber 1995).
Until the past decade, Okladnikov’s culture history model remained largely unchallenged at the forefront of the controversy, while others had only limited impact on the archaeological community. The model was a remarkable advancement for Cis-Baikal Neolithic/early Bronze Age archaeology, regardless of its shortcomings, because it represented the first and most effective classification and explanation of the variable and abundant archaeological material accumulated in the region (Weber 1994). Alternative syntheses were typically much narrower in scope and, with few exceptions, focused largely on chronology. Compared with Okladnikov’s model, most others were viewed as much less comprehensive and often speculative. In fact, even after radiocarbon dating distinctly contradicted Okladnikov’s sequence, there were no major attempts at its revision until the 1990’s (Weber 1994).

Not only did Okladnikov’s model profoundly influence Soviet and Russian notions of the Cis-Baikal Neolithic and early Bronze Ages, but it monopolized non-Russian perceptions as well. Until recently, western understanding of Cis-Baikal prehistory was shaped predominantly by a few Russian translations (e.g., Okladnikov 1959) and the works of several western scholars (e.g., Michael 1958, 1992, Tolstoy 1958, Chard 1974) who basically reiterated Okladnikov’s interpretations. Furthermore, as most of these dated to before 1970, they did not incorporate more current archaeological research from the area. Fortunately, archaeological advancements in the last decade have finally overturned Okladnikov’s synthesis and rejuvenated the Cis-Baikal culture history debate among Russian and non-Russian scholars alike (Weber 1995, Weber et al. 2002).

In the mid-1990’s, a re-evaluation of the abundant archaeological data, as well as the incorporation of radiocarbon dates which had been accumulating since the 1970’s, led Andrzej W. Weber (1995) to propose a revised culture history model for the area. This model, which has largely invalidated all previous ones, was
significantly different in that it proposed discontinuous cultural development in the region. More specifically, it disclosed a 700 year hiatus during the fifth millennium BC, after which both culturally and biologically distinct people occupied the area. Weber’s model advocates the following sequence for the Cis-Baikal Neolithic and early Bronze Age: Kitoi culture (6800-4900 BC, calibrated), biocultural hiatus (4900-4200 BC, calibrated), Serovo culture, including the former Isakovo (4200-3000 BC, calibrated), and Glaskovo culture (3000-1700 BC, calibrated; Weber 1995, Weber et al. 2002).

Weber’s model has proven to be significant not only because it successfully overturned Okladnikov’s long-accepted synthesis, but also because it disputed continuous cultural development in the Cis-Baikal. The most important issues introduced by Weber were the placement of the Kitoi culture at the beginning of the sequence and the disclosure of the fifth millennium BC biocultural hiatus separating it from the later Serovo (Weber 1995). This discontinuity was visible archaeologically by the distinct paucity of burial sites dating to this period and the appearance, with the origin of the Serovo culture, of physically and culturally distinct people and several technological innovations. This apparent transitional period has instigated much research and controversy regarding the prehistory of the area. Thus, the new model has dramatically shifted the focus of the Cis-Baikal culture history debate from the ‘origin of the Kitoi culture’ to the ‘decline of the Kitoi, the origin of the Serovo, and the Serovo-Glaskovo continuity’ (Weber 1995).

1.3.2 Current Understanding of Cis-Baikal Culture History

The new culture history model proposed by Weber (1995) advocates the following sequence for the Cis-Baikal Neolithic and early Bronze Age: Kitoi, Serovo, and Glaskovo, with a distinct biocultural hiatus separating the Kitoi from the succeeding Serovo peoples. The Mesolithic period (9000-5800 BC) gave rise to the
first of these cultures, the Kitoi. The Mesolithic is sometimes also called the Epi-
Paleolithic by Russian scholars because, to a great extent, it was a continuation of the
late Upper Paleolithic lifeway into the Holocene. The late Upper Paleolithic (16-9000
BC) was a period of Siberian recolonization following a significant population decline
during the height of the Sartan glacial. By 14-12,000 BC, the Cis-Baikal was largely
resettled by mobile foraging groups utilizing tools that were lightweight (microblades
and wedge-shaped cores) and expedient (larger cobble tools made on locally available
raw materials). A similar lithic assemblage is characteristic of the Mesolithic, with
one important addition: the appearance of fishing paraphernalia such as net sinkers

The Kitoi culture originated during the late Mesolithic, around 6800 BC
(calibrated). In fact, lithic assemblages dating to this time exhibit both Mesolithic
components – prismatic blades and various tools on them (burins, borers, composite
blades), wedge-shaped cores, and flake tools such as end scrapers and burins – and
elements of the approaching Neolithic, such as some ground stone implements.
Fishhooks and net sinkers were abundant and frequent, not only at living sites, but also
in the mortuary record. Kitoi graves were reliably identified by their liberal use of red
ochre, deep pits lacking associated stone features, and grave goods emphasizing the
importance of fishing (Khlobystin 1969, Okladnikov 1950, 1955, 1959, Weber 1994,
1995).

The Neolithic transition was characterized by gradual cultural change with
retention of the Kitoi foraging mode of subsistence. It was ushered in about 5800 BC
(calibrated), predominately by the appearance of pottery. The Net-Impressed I Style,
characterized by relatively crude miter- and oval-shaped vessels, was not only known
from the Cis-Baikal, but essentially all of Siberia (Glushkov and Glushkova 1992).
Pottery was most commonly found at habitation sites, and less often among grave
goods. Also marking the initiation of the Neolithic were the presence of arrowheads, the regular appearance of ground stone tools such as adzes, and the modification of microblade manufacturing techniques (characterized by a decline in core preparation, with replacement of wedge-shaped cores by amorphous ones). Kitoi mortuary protocol remained consistent, and fishing paraphernalia continued to be frequent and abundant in both burial and living sites (Khlobystin 1969, Okladnikov 1950, 1955, 1959, Weber 1994, 1995).

The geographic origins of the Kitoi people are somewhat controversial. Most scholars agree that they were physically distinct from the later Serovo-Glaskovo people, as indicated by their more ‘archaic’ cranial characteristics (e.g. increased alveolar prognathism, large supraorbital tori, receding foreheads, and robust mandibles and faces; Gerasimova 1991, Mamonova 1983). On this basis, scholars adhering to earlier culture history models suggesting the contemporaneity of the Kitoi with the Serovo culture contend that the former were intruders into the Cis-Baikal (Mamonova 1983). Others believe that the Kitoi originated in the Upper Paleolithic (Gerasimova 1991). This latter view is supported by preliminary dental morphometric analyses: the Kitoi appear to be a very ancient Siberian population with obvious Asian features (Haeussler 1993).

The Kitoi culture, in both the late Mesolithic and the early Neolithic periods, can be characterized by two important features which distinguish it from the later Serovo-Glaskovo cultures, and which may have contributed to the fifth millennium hiatus. The first feature is a relatively narrow subsistence base with an emphasis on fish, even when this was not the most abundant or accessible resource. Although encompassing the entire Cis-Baikal region, most Kitoi sites are generally found near river mouths, shallow coves, or river confluences, with site density corresponding to (modern) fish availability. Both fish availability (abundance and diversity of species)
and site density are highest in the upper Angara River and the shallow parts of Lake Baikal, particularly the ‘Little Sea’ region west of Ol’khon Island, and lowest in the upper Lena river (Figure 1.2) (Kozhov 1950). Fishing paraphernalia were frequent and abundant among grave goods and within Kitoi habitation horizons, particularly when compared to the later Serovo-Glaskovo cultures (Khlobystin 1969, Okladnikov 1950, 1955, 1959). Also, stable isotope values (particularly δ15N values) obtained from human skeletal material suggest a greater reliance on fish by the Kitoi compared to the later Serovo-Glaskovo cultures. However, some of these isotopic differences appear to reflect proximity to Lake Baikal itself, with adjacent populations throughout the mid-Holocene utilizing more aquatic resources than distant ones (Lam 1994, Katzenberg and Weber 1999, Weber et al. 2002).

The second key characteristic of the Kitoi culture is limited mobility and high isolation between groups. Archaeological site density suggests that the Kitoi population of the Cis-Baikal was about one quarter the size of the succeeding Serovo-Glaskovo population (Weber et al. 2002). An emphasis on localized fish resources would have resulted in this small population having small ranges focusing on one of the three major aquatic drainage systems in the region – the lake itself, the Angara River, and the upper Lena River. Small localized ranges would have also decreased inter-group contact, particularly if few people were present in the region to begin with. Stable isotope analyses have documented noticeable differences in both δ13C and δ15N values among skeletal material from different Kitoi sites, two of which are located only 100 km apart. In contrast, isotopic variation among the Serovo-Glaskovo samples is minimal across the entire Cis-Baikal (Katzenberg and Weber 1999, Weber et al. 2002).

At the beginning of the fifth millennium BC, Kitoi population density in the Cis-Baikal declined significantly and remained low for about 700 years. The fact that
substantially fewer radiocarbon dates are associated with this period is likely not an artifact of the archaeological record, but rather a reflection of an actual cultural phenomenon. Although the nature of this hiatus is not fully understood, it is the focus of a current multidisciplinary research project which includes this study, and progress is being made on its elucidation (Weber et al. 2002). What is known for certain is that, by about 4200 BC (calibrated), a culturally and biologically distinct group – the Serovo – populated the region and occupied it for the next few thousand years.

The advent of the Serovo culture was marked by a number of archaeologically visible characteristics. First, Kitoi mortuary protocol was replaced by an equally consistent one distinguished by stone-filled pits and grave goods dominated by hunting gear such as bows and arrows, spears, knives, and ground slate or nephrite adzes. Next, new technology appeared in Serovo cultural horizons, including composite bows, new arrowhead styles such as tanged points, and fish lures and harpoons, all likely reflecting new food procurement techniques. Finally, variation in pottery styles increased significantly at the end of the fifth millennium. Net impressions became obliterated (Net-Impressed II Style), and decorative motifs expanded to include comb impressions, geometric designs, and stab-and-drag (e.g., Posol’sk and Comb-Impressed Styles). One of these pottery styles – the Posol’sk – has been found as far west as the Yenisei River Basin, suggesting links to this region. Unlike the previous Kitoi period, pottery was often included in Serovo grave inventory (Khlobystin 1969, Okladnikov 1950, 1955, 1959, Weber 1994, 1995.)

The Cis-Baikal Bronze Age was initiated by the appearance of bronze and copper around 3000 BC (calibrated). Although the Bronze Age is associated with the Glaskovo culture, the actual transition between the two was gradual and characterized by a slow departure from Serovo patterns. Technological changes included copper or bronze objects such as fishhooks, needles, knives, and rings, new arrowhead styles
such as leaf-shaped and laurel leaf-shaped points, and *Ust'-Belaia Style* pottery, characterized by oval vessels with stab-and-drag and sometimes comb impressions. Mortuary protocol changed slightly, with body orientation becoming more consistent within cemeteries, and grave goods incorporating copper and bronze objects and often excluding pottery. Because of the direct continuity and gradual transition between the Serovo and Glaskovo cultures, they have been interpreted as two horizons of the same cultural complex (Weber *et al.* 2002, Weber 1995). This complex is referred to simply as Serovo-Glaskovo.

The geographic origins of the Serovo-Glaskovo people are also debatable. The two were not physically distinguishable from one another, but most scholars agree that they were distinct from the earlier Kitoi folk. The Serovo-Glaskovo people were more heterogeneous in appearance, had fewer ‘archaic’ cranial characteristics, and exhibited more ‘Europoid’ features (e.g. decreased facial prognathism and higher, more rounded cranial vaults). Again, scholars advocating the contemporaneity of the Kitoi and Serovo cultures contend that the latter originated in the Cis-Baikal Mesolithic or early Neolithic (Mamonova 1983). Others believe that Serovo-Glaskovo diversity was the result of gene flow from the west during the Middle Neolithic (Gerasimova 1991). The latter hypothesis seems more plausible, considering that Kitoi-Serovo contemporaneity is not supported by archaeological evidence (Weber 1995) and that the Kitoi appear to have had deep roots in Siberian prehistory (Haeussler 1993).

The Serovo-Glaskovo cultural complex can be characterized by two key features which are in contrast to those outlined above for the Kitoi culture. The first is a broad subsistence base with an emphasis on a variety of terrestrial and aquatic resources. Although fishing continued to be practiced, its role in Serovo-Glaskovo subsistence decreased. On the other hand, the roles of hunting – predominately of ruminants such as red deer (*Cervus elaphus*), roe deer (*Capreolus capreolus*), musk
deer (*Moschus moschiferus*), and moose (*Alces alces*) – and sealing increased in importance, although the latter remained secondary to both hunting and fishing (Weber *et al.* 2002, 1998, Weber 1995). Tool kits and grave goods were largely represented by hunting paraphernalia such as bows, arrowheads, harpoons, and spears (Klobystin 1969, Okladnikov 1959). Stable isotope values (particularly $\delta^{15}$N values) obtained from human skeletal material suggest a greater reliance on terrestrial foods by the Serovo-Glaskovo people compared to the earlier Kitoi, although again, some of these differences reflect relative proximity to Lake Baikal (Lam 1994, Katzenberg and Weber 1999, Weber *et al.* 2002). Seal remains (*Phoca sibirica*) were much more abundant among Serovo-Glaskovo sites located near or on Lake Baikal than among Kitoi sites in the same areas. Analyses of seal canine sections indicated that most animals were harvested in the spring and early summer, a period when they were least mobile and most available to hunters in the region (Weber *et al.* 1993, 1998).

Zooarchaeological analyses of Cis-Baikal faunal collections are limited, but an examination of one site (Gorelyi Les) indicated that ruminant remains were not more abundant in Serovo-Glaskovo horizons than in Kitoi ones. In light of other evidence indicating that Serovo-Glaskovo people did indeed consume more terrestrial foods than their predecessors, this has been interpreted as the result of carcass processing at other locales (Weber *et al.* 2002).

The second important Serovo-Glaskovo characteristic is relatively high mobility and low isolation between groups. Archaeological site density suggests that Serovo-Glaskovo population size exceeded that of the Kitoi, possibly by as much as four times (Weber *et al.* 2002). An emphasis on a variety of terrestrial and aquatic resources would have resulted in large foraging ranges throughout the Cis-Baikal, including long distance migrations between or among the three major drainage systems. These large ranges, paired with a relatively high population density, would
have increased inter-group contact. Stable isotope analyses have indicated that there is minimal variation in either $\delta^{13}$C or $\delta^{15}$N values among Serovo-Glaskovo skeletal material across the Cis-Baikal. This uniformity could be explained by interregional travel or a broad and diverse diet. It is likely that both are true of the Serovo-Glaskovo (Katzenberg and Weber 1999, Weber et al. 2002).

The culture history of the Cis-Baikal region, as it is now proposed, introduces as many questions as it answers. Most of these questions focus on the fifth millennium hiatus, including the fate of the Kitoi people and the origins of the Serovo-Glazkovo. Particular attention has been paid to the possible role of cultural differences in the development of the hiatus, specifically the vulnerability of the Kitoi and the adaptability of the Serovo-Glazkovo. Research in a variety of fields (e.g., archaeology, bioarchaeology, human genetics, paleoenvironmental studies) will continue to shed light on cultural adaptation during the Cis-Baikal Neolithic and early Bronze Age.

1.4 Research Objectives

No comprehensive bioarchaeological examinations of mid-Holocene Cis-Baikal human remains have been undertaken, despite the fact that the bulk of our information about this period has been obtained from mortuary sites. Of the few recent studies conducted on skeletal and dental material, most focus on morphological variation, particularly with regard to ancestry and the peopling of the Americas (e.g., Gerasimova 1991, Haeussler 1993, 1996, 1999, Mamonova 1983). Only one study, the pioneering work of David W. Link, has investigated Cis-Baikal human remains in an attempt to better understand adaptation and culture change (Link 1996, 1999, Weber et al. 2002). Link’s research made significant contributions to our understanding of Neolithic and early Bronze Age lifeways, particularly the
circumstances surrounding the fifth millennium hiatus. However, because it was rather limited in scope and suffered from several methodological and other shortcomings (see below), it was not a comprehensive bioarchaeological investigation.

Link’s research focused on the examination of human skeletal and dental material from two Cis-Baikal cemetery sites: the pre-hiatus Kitoi site of Lokomotiv and the post-hiatus Serovo-Glaskovo site of Ust’-Ida I. The purpose of his study was to “shed light on the processes of the hiatus, and to investigate older claims regarding Kitoi and Serovo lifeways” (Link 1996:ix). Results suggested significant differences between the two populations in terms of both demography and overall health, with the pre-hiatus Kitoi allegedly experiencing population decline, and the post-hiatus Serovo-Glaskovo, population growth. Demographic analyses indicated that, compared to Ust’-Ida I, Lokomotiv exhibited lower birth rates, higher weaning ages, lower life expectancies, and gender inequality, with fewer females being present than males. Furthermore, health data implied that Kitoi females were nutritionally disadvantaged compared to males, and that Kitoi people exhibited a higher prevalence of enamel hypoplasia (an indicator of nonspecific stress) and an earlier onset of degenerative osteoarthritis (suggesting increased physical activity) compared to Serovo-Glaskovo people. Link attributed the apparent Kitoi decline and Serovo-Glaskovo success to differing cultural practices such as gender inequality, birth spacing, and weaning age (Link 1996, 1999, Weber et al. 2002).

Despite its valuable and ground-breaking contributions to Cis-Baikal archaeology, Link’s research exhibited a number of limitations. Their discussion here is warranted for two reasons. First, it is necessary to account for the substantial differences between his work and the current study, as the latter is not simply a duplication of the former. Second, because the present research examines human remains from the same two cemetery sites investigated by Link, and in some cases
borrows data collected by him, it is essential to explain why the results presented here are not identical to, and in many cases are markedly different from, those obtained previously.

The first concern with Link’s work was its relatively limited scope. Rather than evaluating human remains in an attempt to understand all possible aspect of hunter-gatherer behavior, health, and lifestyle (Larsen 1997:5), he focused on two main objectives. The first was to examine the validity of previous concepts of Kitoi and Serovo lifeways, most notably their substantial differences, and the second was to help explain the fifth millennium BC hiatus (Link 1996:23-38). While a third objective was to contribute to the understanding of hunter-gatherer variability, Link focused predominately on the first two objectives, specifically Kitoi and Serovo-Glaskovo dissimilarity. Additionally, whereas both demography and health were investigated, conclusions focused primarily on the results of the demographic analyses at the expense of other indicators of overall community health and lifestyle. This is particularly noteworthy since health data suggested only minimal disparity between the two groups, while demographic patterns suggested significant differences (Link 1996, 1999, Weber et al. 2002).

Link’s research also suffered from several other limitations. First, the post-hiatus cemetery site (Ust’-Ida I) examined by him represents individuals from both the Serovo and Glaskovo cultures. While the general consensus is that these represent two horizons of the same cultural complex (the Serovo-Glaskovo), it may not be prudent to assume that they exhibit identical cultural and biological characteristics and to group them together as one discrete population. In doing so, Link may have introduced additional errors into his study, further complicating, and possibly invalidating, his results. The last issue involves curatorial problems and their negative effects on the accuracy of his data. Since their excavation, poor quality curation of the
Lokomotiv and Ust’-Ida I human remains has resulted in extensive commingling, misplaced skeletal elements (particularly those exhibiting pathological or otherwise unusual conditions), inadequately cleaned remains (obscuring many important features), and in some cases, entirely missing individuals. While these problems have recently been rectified, they were a considerable obstacle when Link examined the remains in 1995, and significantly reduced the accuracy of much of his data collection. The correction of many of these problems has now resulted in the modification and enhancement of his data, in many cases substantially. For this reason, both Lokomotiv and Ust’-Ida I are re-introduced and included in the present study.

The objective of the current research is to apply bioarchaeological methodology to the Cis-Baikal skeletal and dental record in order to characterize the health and lifestyle of the mid-Holocene foragers of the region. By doing so, this study provides an independent means of understanding behavior, subsistence patterns, nutritional adequacy, and other aspects of the human condition, with particular interest in the circumstances surrounding the fifth millennium BC biocultural hiatus. Human skeletal and dental data representing 308 individuals from four Cis-Baikal cemetery sites – two pre-dating the hiatus and two post-dating it – are evaluated. Data are separated into three broad categories which together reflect various aspects of cultural adaptation including diet, nutritional quality, nonspecific physiological stress, physical activity and mobility, environmental and occupational hazards, exposure to pathogens and other disease processes, treatment of the infirm, and interpersonal violence. Comparisons among sites, particularly among those representing different temporal periods, provide further insights into culture change in the Cis-Baikal, including that of the fifth millennium hiatus.

The four cemetery sites examined in this study – Lokomotiv, Ust’-Ida I, Khuzhir-Nuge XIV, and Shamanka II – are located both along the Angara River and
directly on the coast of Baikal itself (Figure 1.2). As mentioned above, Lokomotiv and Ust’-Ida I were examined earlier by Link (1996, 1999), but recent modifications and enhancements to his original data have warranted their re-evaluation here. The second two sites – Khuzhir-Nuge XIV and Shamanka II – are newly excavated and previously unanalyzed. Lokomotiv and Shamanka II are pre-hiatus Kitoi sites (any ‘intrusive’ individuals have been excluded), and Ust’-Ida I and Khuzhir-Nuge XIV are post-hiatus Serovo-Glaskovo sites. While Khuzhir-Nuge XIV is represented solely by the Glaskovo culture (one Serovo burial has been omitted from analyses), Ust’-Ida I is represented by both, a factor which could substantially affect the outcome of analyses.

In order to account for possible cultural and biological differences between the two cultures, Ust’-Ida I has been split into two components – Ust’-Ida I Serovo and Ust’-Ida I Glaskovo – for this study. Thus, for all intents and purposes, this research investigates five Cis-Baikal cemetery sites rather than four.

The body of this dissertation is divided into three chapters, each an individual research paper intended to stand on its own. Each chapter discusses a specific aspect of bioarchaeological investigation and the human behavioral and biological insights gained from it. Chapter Two examines enamel hypoplasia, Chapter Three, osteoarthritis, and Chapter Four, paleopathology. Because these three aspects are distinct, they feature their own objectives, methodologies, results, discussions, and conclusions. For this reason, it is most effective to present them as individual papers, each a succinct discussion of a particular bioarchaeological line of inquiry regarding adaptation and cultural change in the mid-Holocene Cis-Baikal.