# Northern Hunter-Gatherers Research Series
# Editor's Foreword

## Making animals tell stories about humans: Recent zooarchaeological studies in the Cis-Baikal region of Siberia

„Holocene Zooarchaeology of Cis-Baikal“ is the seventh volume published in the Northern Hunter-Gatherer Research Series and the second published jointly with the German Archaeological Institute as part of its Archaeology in China series. The Northern Hunter-Gatherer Research Series was founded specifically to disseminate research directly resulting from or related to the work conducted by the Baikal Archaeology Project (BAP), a long-term multi- and inter-disciplinary examination of Cis-Baikal's middle Holocene hunter–gatherers by a team of scholars based mainly at the University of Alberta (Canada) and Irkutsk State University (Russia) collaborating with numerous scholars from other Western and Russian research institutions.

Drs. Robert Losey and Tatiana Nomokonova and one of their co-authors (Lacey Fleming) are the first professional Western zooarchaeologists working on faunal remains from archaeological sites in the Cis-Baikal region of Siberia. The book summarizes roughly 10 years of research on collections procured recently by BAP (e.g., Shamanka II, Khuzhir-Nuge XIV, Kurma XI, Sagan-Zaba II and others) and on some older materials excavated by local Russian scholars previously (e.g., Lokomotiv, Ust'-Ida, Ust'-Khaita, Ulan-Khada, Berloga and Tyshkine). In some cases it was possible to conduct small-scale excavations to obtain data of higher quality to compliment the older materials (e.g., Ityrkhei). This body of work sets new standards for zooarchaeological research in this part of the world. It introduces Western methods of data collection, analysis and interpretation from a coherent theoretical perspective. It also makes clear the important point that quality zooarchaeological research begins with quality archaeological excavations. „Holocene Zooarchaeology of Cis-Baikal“ is based in part on several pieces published previously in refereed journals or included as chapters of masters' or doctoral research theses. All previously published studies have been revised with two points in mind: first, to reflect the current state of knowledge on the subject matter; and second, to build into them a common theme linking all the chapters together. The book is also interesting and original in that the analyzed materials come from two different kinds of sites-camps and cemeteries-each requiring slightly different analytical and interpretive approaches. Consequently there are two main themes to this book both directly related to BAP and one additional topic resulting from the chronological expansion of the core BAP research.

The first theme is the examination of faunal remains from Middle Holocene hunter–gatherer cemeteries. Such work has never been undertaken previously and is novel in its attempts to integrate more traditional interests in the use of animal remains in mortuary rituals with the insights they provide on matters related to subsistence. The chronological controls in this theme are generally quite good, as each investigated cemetery has been comprehensively dated by radiocarbon (Weber et al. 2015). In most cases every individual interred has a radiocarbon date from skeletal samples. Thus, all faunal remains associated with radiocarbon-dated skeletons also have solid chronological context. Due to this extensive program of dating there is very little ambiguity as to which chronological period (e.g., Early Neolithic, EN; Late Neolithic, LN; or Early Bronze Age, EBA) individual graves or entire cemeteries belong. Recently, in the Cis-Baikal region we have been able to improve upon this general approach to dating middle Holocene cemeteries through what we refer to as high-resolution chronologies (HRC), which permit examination of their history in much more detail than possible previously. Currently, the HRC model is available only for Shamanka II: an EN cemetery on Southwest Baikal (Scharlotta et al. 2016; Weber et al. 2016) with, incidentally, also the most abundant collection of faunal remains in the entire region. Models for a few other cemeteries are in progress. Since the development of HRC for Shamanka II post-dates preparation of this volume, these new results could not be integrated into the work on the faunal materials presented herein. The second theme is the examination of faunal remains from campsites. The available chronological controls here are not as good as those now in place for cemeteries. Paradoxically, however, it is the systematic dating of faunal remains from one such camp-Sagan-Zaba II on Lake Baikal-that has produced one of the most fundamental discoveries since the beginning of BAP, which, next, spearheaded work on HRC for cemeteries. More specifically, the dating of aquatic and terrestrial fauna from the same stratigraphic units clearly identified the presence of a freshwater reservoir effect (FRE) in Lake Baikal (Nomokonova et al. 2013a). This, in turn, has led to a program of dating human remains (affected by FRE) paired with samples of terrestrial herbivores (not affected by FRE) from sealed graves allowing for the development of equations to correct the FRE present in all radiocarbon dates on human remains from the Cis-Baikal region (Bronk Ramsey et al. 2014; Schulting et al. 2014; 2015).

That the chronology of Cis-Baikal's stratified campsites is not as well developed as that of its cemeteries is not only the product of much fewer available dates. Instead, it is primarily related to the fact that both kinds of sites are the product of very different site formation processes, both depositional and post-depositional. To keep the matter short and simple: cemeteries are aggregates of horizontally arranged and sealed archaeological features (graves) that are also spatially discrete and which can be viewed as time capsules of extremely short duration. Radiocarbon dating of such time capsules is typically not a problem as long as appropriate samples are available. Whether dated by radiocarbon or by typology, graves and, subsequently, entire cemeteries sort themselves into mortuary traditions (e.g., Kitoi, Isakovo, Serovo, Glazkovo etc.), each with specific chronological boundaries grouped further into culture historical periods such as the EN, LN or EBA. Incidentally, in the Cis-Baikal region, there is a huge chronological gap of ~1500 years between the EN and LN mortuary traditions and this gap has been labelled as the Middle Neolithic (MN) although its archaeological identity, of course, is much different from those of the preceding and succeeding periods (Weber 1995; Weber et al. 2002; 2015).

Campsites in Cis-Baikal, on the other hand, are aggregates of both horizontally and vertically arranged scatters of archaeological materials, typically pottery, lithics and animal remains, and rarely features, such as hearths and pits, that form vertically continuous sequences of archaeological deposits unless the cultural depositional processes are interrupted and separated vertically by natural depositional processes such as catastrophic floods, land slides etc. This has, at least, the following important consequences for the dating of stratified sites in Cis-Baikal. First, stratigraphic units at campsites typically offer only low chronological resolution in the range of centuries at best or millennia at worst, clearly not a good match for the resolution available through dating individual graves and human skeletons, which now can be measured on the decadal scale. Second, due to the fact that campsite formation processes vary from one place to another, there is no reason why cultural layers formed at stratified habitation sites should match in any systematic way the mortuary traditions and culture historical periods defined based on materials from cemeteries. Instead, only the general sequence from older to younger is expected to be the same, but difficult to monitor without the employment of detailed 3-dimensional provenience control methods, while specific groupings into stratigraphic layers should not be expected to display the same archaeological characteristics, including chronology, as the units defined based on mortuary materials. In other words, archaeological materials representing all four of the discussed culture historical units, grouped at each campsite into slightly different configurations are bound to confuse even the most knowledgeable and alert archaeologist, offering little hope to sort out this conundrum. Third, identifying time capsules of the kind similar to graves described above is very difficult at Cis-Baikal's habitation sites and finding organic material for radiocarbon dating that can be reliably associated with such time capsules when found is equally, and sometimes even more, problematic. Fourth, for all these reasons the MN, which doesn't have a mortuary site component, is extremely difficult to identify at campsites simply because, more often than not, its materials are likely to be compressed into one stratigraphic unit together with either EN or LN materials or both, and in some cases even EBA, rather than in a well-preserved MN layer neatly separated from the preceding and succeeding intervals.

In the history of Cis-Baikal Middle Holocene archaeology, much effort has been dedicated to the matter of correlating Neolithic and Bronze Age cemeteries and mortuary traditions with layers at stratified campsites (e.g., Georgievskaia 1986). In view of the above comments, this seems to be not a very practical exercise to engage with. Instead, each unit of whatever cultural composition, be it a mortuary site or a stratigraphic layer, should be examined on its own terms for insights it can provide about the nature of Middle Holocene hunter–gatherer strategies, variation in time and space, and processes of culture change. And this is exactly what the authors are doing as allowed by the data at hand, and they should be commended for not falling into the same trap that lured many before them.

Although the main chronological scope of the research presented in the book is on Middle Holocene hunter–gatherers, the third theme focuses on Iron Age pastoralists. This chronological expansion relates to the fact that many stratified campsites in Cis-Baikal also feature cultural layers post-dating the Neolithic and Bronze Age, hence the examination of these materials alongside the older deposits. The main questions here center on the role of aquatic food resources (fishes and the Baikal seal) and terrestrial game (moose, red deer, roe deer, etc.) in the subsistence activities and diets of these groups traditionally viewed as cattle and horse herders. Strata dated to the Iron Age usually yield a combination of fish, seal and game bones in addition to bones of domesticates, the latter typically a minor component of the entire faunal assemblage.

Taking all of the above into consideration, this book shall be considered a major milestone in zooarchaeological and archaeological research of the Cis-Baikal region and beyond. Since most of the materials discussed in the book date to the Neolithic and Bronze Age periods, it is only natural that its contribution to the hunter–gatherer middle Holocene archaeology of Cis-Baikal is the most significant. However, the work completed on the Iron Age pastoralists is a welcome addition to the main focus of the book. It is with great excitement and anticipation that we should be looking forward to more results from zooarchaeological research conducted by this team.

Andrzej W. Weber
Department of Anthropology
University of Alberta
Edmonton, AB T6G 2H4, Canada

Laboratoire Méditerranéen de Préhistoire Europe Afrique (LAMPEA) – UMR 7269
Aix-Marseille Université
5 rue du Château de l'Horloge – B.P. 647
13094 Aix-en-Provence Cedex 2, France

# Introduction and Acknowledgements

Robert J. Losey, Tatiana Nomokonova

Siberia, the vast interior region of North Asia within the Russian Federation, has been studied by archaeologists for well over a century, and the results of this work are becoming both more accessible and relevant to foreign scholars. The Lake Baikal area is one of the most archaeologically well-known regions of Siberia, partly as a result of a long history of research by Russian scholars, but also through the efforts of a larger international endeavor known as the Baikal Archaeology Project (BAP). This multidisciplinary project is led by Dr. Andrzej Weber of the University of Alberta, Canada, and focuses on the region's Middle Holocene hunter-gatherer archaeology. The BAP now has been in operation for nearly two decades, and has in many ways revolutionized archaeology in this region. One specific outcome of the BAP has been the emergence of modern zooarchaeology studies, which are summarized for the first time in this volume. While the region's Holocene faunal remains can be (and have been) analyzed from a number of different perspectives, our primary goal in this volume is to understand subsistence patterns and their regional and chronological variability. To accomplish this, the volume presents research on well over 200,000 faunal specimens recovered from twelve habitation sites and five cemeteries.

Western scholars may be surprised to learn that zooarchaeology is not a widely recognized discipline in the Siberian archaeological community. The vast majority of archaeological faunal remains from Siberia are analyzed by paleontologists who are paid modest fees to identify the taxa present. Most such basic analyses completed over the last few decades were done as part of salvage archaeological projects, and purely academic research is rare due to very poor funding. In fact, many of the region's archaeologists self-fund their academic research, often by drawing on the income provided by their contract archaeology projects; this has sometimes included studies of faunal remains. An additional set of challenges facing Russian archaeologists are the expenses of AMS radiocarbon dating services, the occasional lack of such services in this country, and the bureaucracy involved with sending samples to foreign dating labs. While it is easy to critique the under-development of zooarchaeological research and the sometimes poor chronologies available for sites in Siberia, the fact that any such research is being done is testament to the passion local scholars have for archaeology and the insights it can provide about the region's past. Some critique is nonetheless healthy for the discipline, and is offered in several places in the volume.

The first and only existing summary of Holocene faunal remains from the Lake Baikal region was published in 1978 by Nina M. Ermolova. This volume primarily provided basic taxonomic identifications for Late Quaternary terrestrial faunal remains from the Angara River valley immediately west-northwest of the lake. While valuable, Ermolova's volume is a good example of some of the challenges encountered when assessing the region's existing zooarchaeological record. First, sieving of site sediments for the recovery of faunal remains and other artifacts was, and continues to be, rare. This results in poor recovery of bones and teeth from small fauna, and ultimately a biased faunal record (see Losey et al. 2008; Nomokonova et al. 2009b). Second, the faunal remains discussed in Ermolova's volume come from sites that are typologically and stratigraphically dated—radiocarbon dates were unavailable. The accuracies of the chronologies presented for these sites and their assemblage are unknown, and obviously should be used with caution. Correspondingly, it is nearly impossible to correlate such data with what is known about Holocene climate change or the great deal of information now available on the region's human remains and cemeteries. Third, the faunal data are largely reported as simple lists of taxa present and were not quantified. Presence and absence data obviously only goes so far. Further, most of the collections described are now missing, rendering any additional study and quantification impossible. Finally, some classes of fauna are not described in Ermolova's volume, particularly fish and birds, but were certainly present in at least some of the sites she analyzed. None of these problems are of course unique to Siberia, but nonetheless demonstrate the need for new research.

The Baikal Archaeology Project has worked to address these and other issues through a series of habitation site excavations, radiocarbon dating programs, and detailed analyses of the region's faunal assemblages. The vast majority of this research has occurred only within the last 13 years or so, with some notable exceptions (Weber et al. 1993, 1998). Our work with the region's faunal remains began only in 2004. This year also marks the initiation of our efforts to build a comparative skeletal collection, which is now curated at the Irkutsk State Technical University. This collection is fairly comprehensive for both local mammals and fish, but contains only a few bird specimens. The bird remains from the region, most of which were excavated from cemeteries, were identified through the use of the bird osteological collection at the National Museum of Natural History, Smithsonian Institution, one of the largest such reference samples anywhere. In addition, some fragmentary remains were identified using comparative specimens located in the Zooarchaeological Reference Collection at the University of Alberta, Institute of Geochemistry of the Siberian Branch of the Russian Academy of Science, Irkutsk State Academy of Agriculture, Irkutsk State University, and Irkutsk State Technical University. Various manuals and guides also were consulted as necessary, but all identifications were ultimately confirmed by direct comparison to actual skeletal specimens.

The first two chapters of this volume provide background information for all of the subsequent chapters. In Chapter 1, the environmental and archaeological contexts of the study are described, and the primary questions to be addressed in the volume are provided. Chapter 2 describes the Holocene climate and vegetation history for the study area. Following these introductory chapters, the book is organized in three sections based on geography, namely Angara-Southwest Baikal, Priol'khon'e, and Northwest Baikal. The Angara-Southwest Baikal section consists of Chapter 3, which presents analyses of faunal assemblages from a series of habitation sites and cemeteries located along the southwest shore of the lake and the Angara River valley to the northwest. The Priol'khon'e section includes three chapters, as this region has been the focus of much of the Baikal Archaeology Project's research. Specifically, Chapter 4 describes the zooarchaeology of the Sagan-Zaba II, Chapter 5 the faunal remains from the nearby Bugul'deika II habitation site, and Chapter 6 a series of habitation site and cemetery faunal assemblages from the Little Sea shoreline and Ol'khon Island. Chapter 7 constitutes the Northwest Baikal section of the book and describes the faunal remains and their contexts at the Baikal'skoe III habitation site. Finally, Chapter 8 summarizes the results of the previous chapters by returning to the research questions first raised in Chapter 1.

Funding for the archaeological research presented in the volume was graciously provided by the Social Sciences and Humanities Research Council of Canada: Major Collaborative Research Initiative grants (to A. Weber) 412-2005-1004 and 412-2011-1001; Standard Research Grant (to R. Losey) 410-2008-0402; Insight Development Grant (to T. Nomokonova) 430-2012-0099; and Insight Grant (to. R. Losey) 435-2014-0075. Additional financial support was provided by the Wenner Gren Foundation (to R. Losey) through grant #7801, two grants (AZ/20/AZ 07; AZ 06/ZA/13) from the Gerda Henkel Foundation (to R. Losey), and three grants from the Circumpolar and Boreal Alberta Research program at the University of Alberta (to T. Nomokonova). The climate and vegetation research presented here was financially supported via research grants from the Russian Foundation for Basic Research (RFBR № 15-05-01644), the Russian Science Foundation (RSF № 14-50-00036), the German Research Foundation (DFG TA 540/1, TA 540/5, MU 3181/1, ME 3266/3-1), and the Social Sciences and Humanities Research Council of Canada (412-2011-1001). Special thanks are offered to Dr. Christian Leipe (FU Berlin) for producing maps shown in Figure 2.1. R. Losey also acknowledges the Centre for Advanced Study, Norwegian Academy of Science and Letters, and the Arctic Domus project, funded by the European Research Council, for providing greatly needed writing time to complete this volume. Marianne Lien and David Anderson graciously supported R. Losey's participation in these latter two projects.

Special thanks are offered to Andrzej Weber for his numerous comments and edits on this manuscript, and his continuing support for our research in the Baikal region. Lacey Fleming, Katherine Latham, and Angela Lieverse also provided useful feedback on several of the chapters. Andrea Hiob graciously supported and assisted us on numerous occasions, which was most appreciated. Aaron Coons is thanked for producing the maps used in Chapter 1. We also would like to acknowledge the considerable help provided to us in Irkutsk by the following individuals, who greatly contributed to our success in a number of different ways: S. Cheremisin, G. Nomokonova, V.I. Bazaliiskii, O.I. Goriunova, A.G. Novikov, N.A. Savel'ev, A.V. Kharinskii, E.M. Ineshin, and Iu.A. Emel'ianova.

# Chapter 1.
# Background, Methods, and Questions Posed

Robert J. Losey, Tatiana Nomokonova

## Environmental Context

This book focuses on the Lake Baikal area of Eastern Siberia in the Russian Federation (Figure 1.1). More specifically, all of the sites analyzed in the following chapters are from Cis-Baikal, defined here as the western portion of the Lake Baikal region encompassing the Angara River basin down to Ust'-Ilimsk, the drainage of the upper Lena down to Kirensk, and the islands and entire western shoreline of the lake. This definition differs slightly from that used in other BAP publications in that we specifically include the lake's northwest shoreline. Within Cis-Baikal, our zooarchaeological research has focused on three micro-regions.

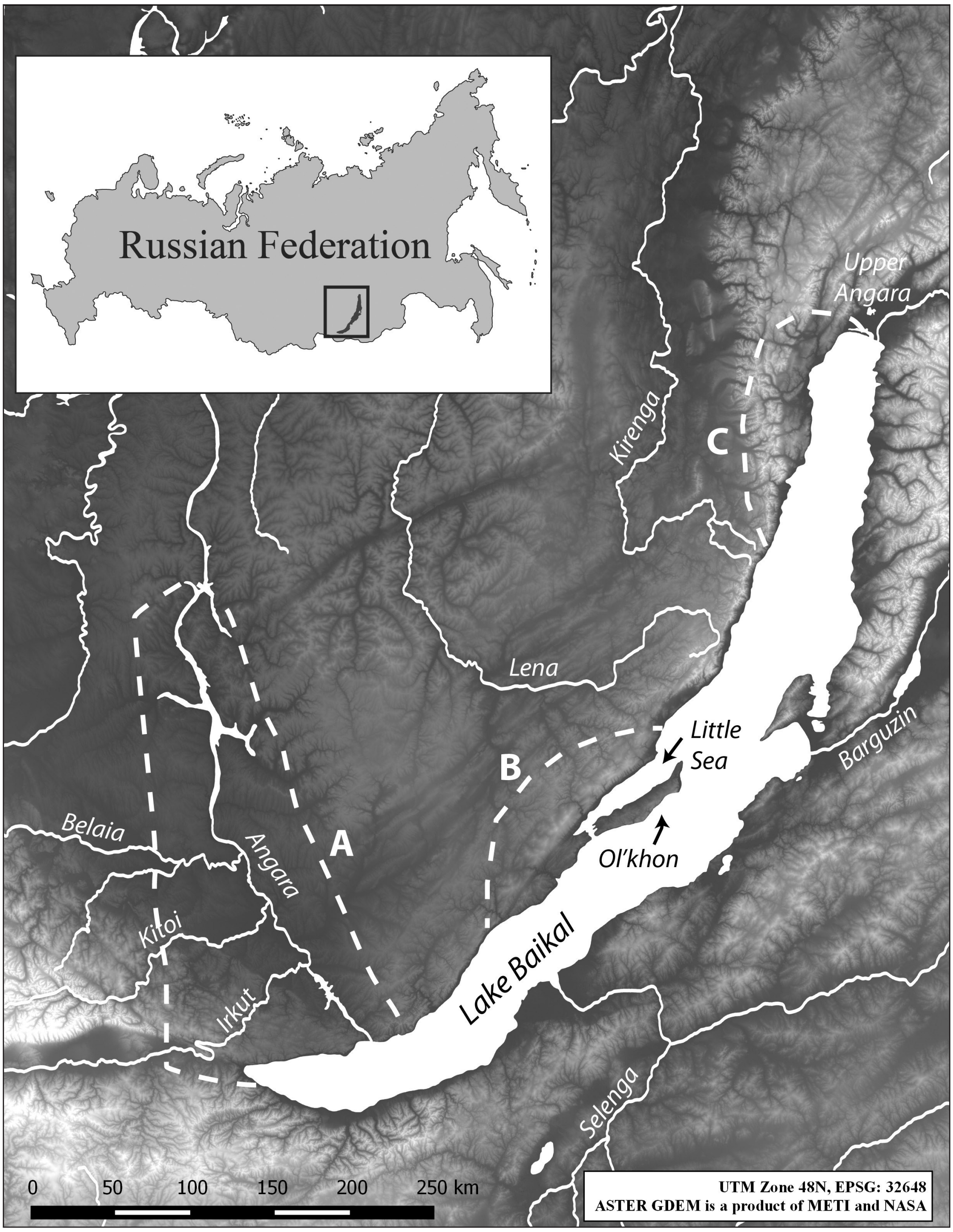


*Figure 1.1. Map of the Lake Baikal region of Eastern Siberia, Russian Federation. Study micro-regions shown with dotted lines. A is Angara-Southwest Baikal; B is Priol'khon'e; C is Northwest Baikal.*

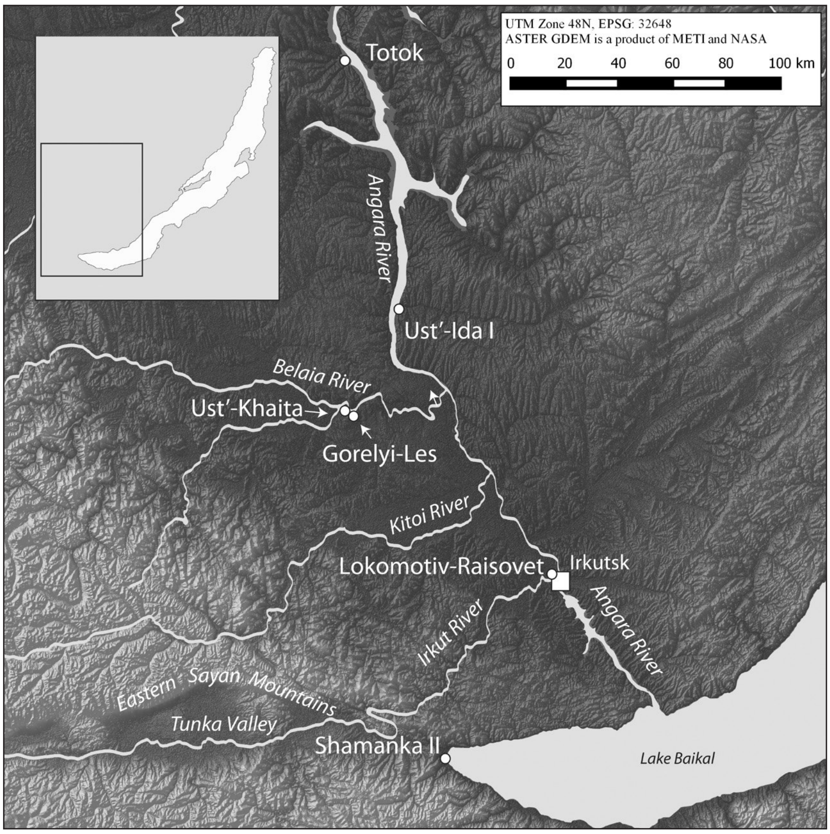


*Figure 1.2. Map of the Angara-Southwest Baikal micro-region. Faunal remains from the habitation sites and cemeteries indicated on the map are discussed in Chapter 3.*

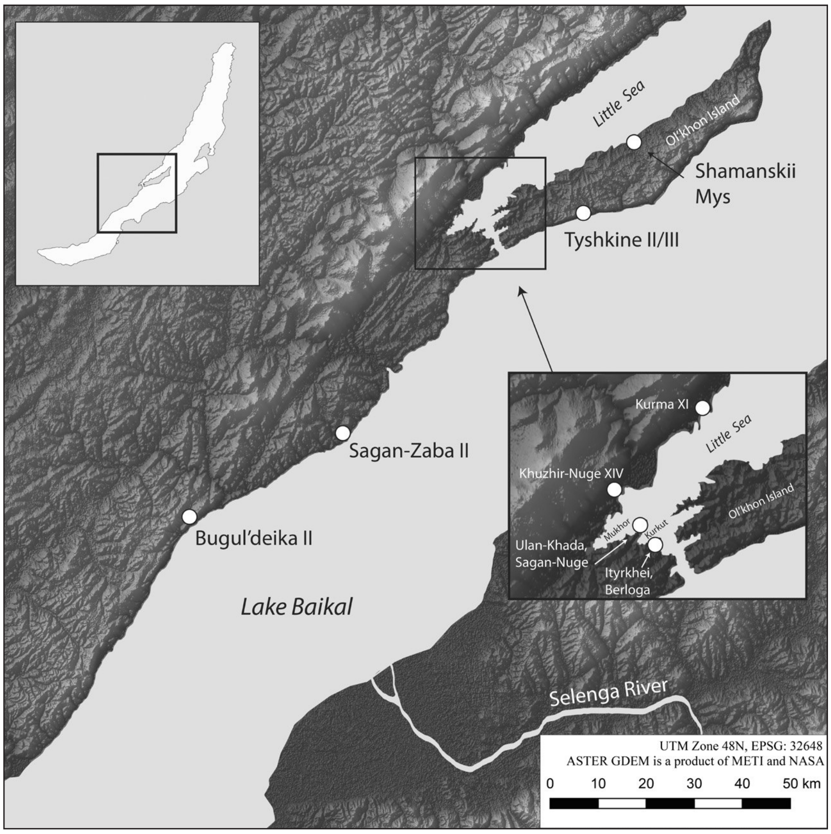


*Figure 1.3. Map of the Priol'khon'e micro-region. Faunal remains from Sagan-Zaba II are discussed in Chapter 4, Bugul'deika II in Chapter 5, and all of the sites in the southern Little Sea (Kurma XI, Khuzhir-Nuge XIV, Ulan-Khada, Sagan-Nuge, Ityrkhei, and Berloga) and on Ol'khon Island (Tyshkine II and III, Shamanskii Mys) in Chapter 6.*

The first is the Angara River basin and the south shore of the lake, referred to as Angara-Southwest Baikal (Figure 1.2). The second is Priol'khon'e, which roughly encompasses the west shore of Lake Baikal from the Bol'shaia Bugul'deika River in the south, to Cape Elokhin (on Ol'khon Island) in the north, and includes the lake's largest island, Ol'khon, as well as the section of the lake between this island and the western lake shore, known as the Little Sea (Goriunova and Svinin 1995; Figure 1.3). The third area is Northwest Baikal, the region stretching north from the Elokhin Penninsula to the delta of the Upper Angara River and extending inland from the shore of Baikal to the crest of the Baikal'skii Mountain Range (Figure 1.4). The Upper Lena basin constitutes a fourth study area for the BAP but is little discussed in this volume, as we have no faunal samples from this region.

Lake Baikal was created millions of years ago by tectonic forces (Horiuchi et al. 2003) and is massive, measuring 636 km by 79 km in maximum length and width. Its greatest depth is 1741 m, and Baikal's total surface area is 31,500 km$^2$ (Lut 1978). This lake is located in the center of a mountainous region known as the Baikal Rift Zone that is marked by a series of ranges that flank the lake on all sides. These include the Barguzinskii, Ulan-Burgazy, and Khamar-Daban ranges along the eastern and southern shores, and the Eastern Sayan range west of the southern tip of Lake Baikal. The Baikal'skii range descends directly into the lake on the northwest shore, while the Primorskii range stretches along its southwest portion. 'Coastal plains' are narrow (no more than a few km) or entirely absent along the entire western shoreline due to the position of the ranges close to the lake (Galazii and Molozhanikov 1982; Lut 1978).

Lake Baikal is turbulent, as winds create powerful horizontal currents and vertical water circulation, especially during the autumn when stormy days outnumber calm days. Strong winds often blow from the land out across Baikal making boat travel hazardous. Waves in the lake can be as high as six meters in early winter before ice coverage, but usually do not exceed 2–3 m in summer and 4–5 m in fall (Kozhova and Izmest'eva 1998).

The lake contains 30 islands, but most of these are too small to have been inhabited for any substantial length of time. As mentioned, the lake's largest island is Ol'khon, which is ~72 km long. The lake also holds three large 'gulfs' or 'seas', with the Barguzinskii and Chivyrkuiskii being on the east shore (in Trans-Baikal, the region just east of the lake), and the Little Sea located between Ol'khon Island and the lake's western shore. The Little Sea in Priol'khon'e is ~78 km long and has a maximum width of 18 km, with a total surface area of ~800 km$^2$. The depth of the southern Little Sea generally does not exceed 5 m, whereas its northern end reaches ~200–300 m.

While several hundred streams and rivers flow into Lake Baikal, the Angara River is its only outlet, which prior to the construction of the dam in Irkutsk was a rapidly flowing braided river. The Irkut, Kitoi, and Belaia rivers are large tributaries of the Angara, all draining the Easter Sayan Mountains west of the south end of the lake. The largest rivers entering the lake, the Selenga, Upper Angara, Kichera, Barguzin, and Turka, all drain areas outside of our study area in Trans-Baikal. The rivers and streams draining into the lake within Cis-Baikal are small by comparison—essentially none are navigable and all can easily be waded across.

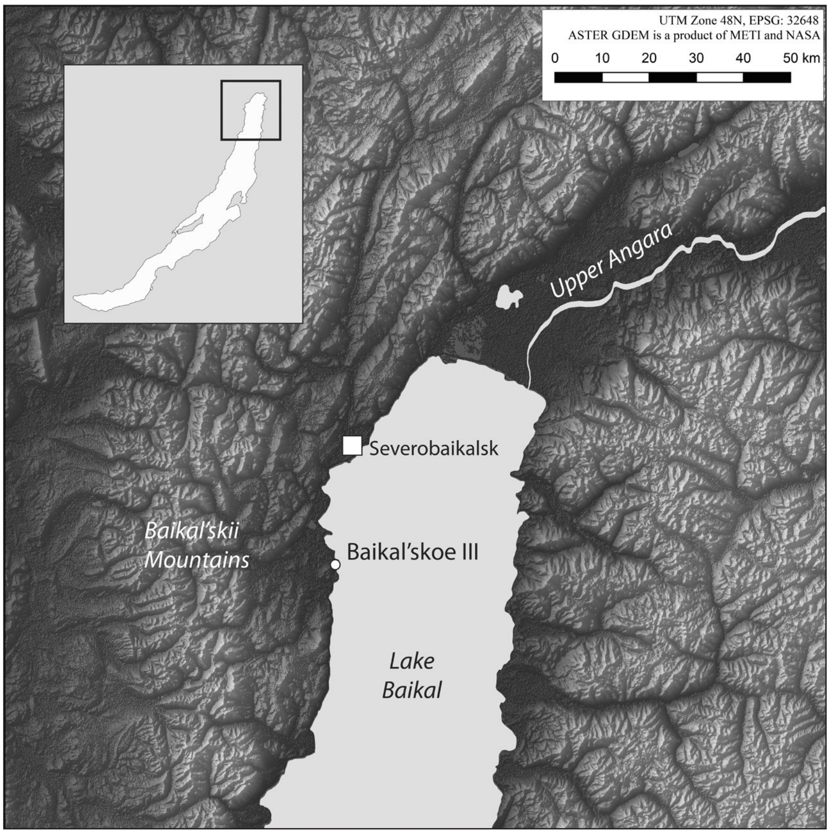


*Figure 1.4. Map of the Northwest Baikal micro-region. Faunal remains from Baikal'skoe III are discussed in Chapter 7.*

The climate in the Lake Baikal region is continental but varies in relation to a number of different factors including geographical location, specific atmospheric circulation, topography, and the influence of the lake. Winters are cold and last approximately five months, while summers, approximately two months in length, are warm. July and August witness about half of the yearly precipitation in the form of rain. Temperatures during summer may reach 33–35° C, but in winter sometimes drops as low as –40° C. In general, the climate is drier and more variable on the western shore, and wetter and cooler on the east (Galazii and Molozhnikov 1982). The eastern shore is generally downwind of the lake and it is most subject to lake-effect precipitation and the cooling effects of winds that have passed over Baikal. Overall, the Baikal region experiences little precipitation, averaging ~300 mm per year.

Priol'khon'e has a unique microclimate due to its proximity to the Primorskii mountains to the west and the open waters of the lake to the east. Baikal has a warming effect on Priol'khon'e in autumn and winter and cooling effect in spring and summer. In addition, the Primorskii range produces a rain-shadow on this micro-region, resulting in less frequent cloud cover and less precipitation than in surrounding areas. As such, Ol'khon Island is somewhat arid, receiving on average only 169 mm of precipitation annually (Berg 1950; Galaziy 1993).

The average water temperature of Lake Baikal is 4° C, but substantial variation occurs depending on location, season, and depth. For example, while the thermal regime of the northern portion of the Little Sea is similar to that of the open water in the center of Lake Baikal, the shallow areas in the south, such as Kurkut and Mukhor bays, are much warmer. In stark comparison to the cold waters of the open lake, these portions of the Little Sea can reach a high as 20° C in summer (Sorokin and Sorokina 1998). In winter the lake gradually freezes, beginning in the shallow bays at the end of October and encompassing the entire lake during the first few months of winter. The Little Sea is usually completely ice covered by the third or fourth week of December. The melting process on average begins around the third week of May (Kozhova and Izmest'eva 1998).

The Lake Baikal region is also characterized by a high degree of differentiation in vegetation, especially between the lower elevation areas and the mountains (Galazii and Molozhnikov 1982). Vegetation complexes include steppe, forest-steppe, taiga and alpine-tundra environments (Berg 1950). Common steppe and forest-steppe zone vegetation includes fescue, koeleria, feather grass, and steppe sedge. In some locales, such as southeast part of Ol'khon Island, portions of the Kuda Valley, and stretches along the Upper Lena and Angara, the landscape is steppe, with little tree cover present, except for the occasional larch (*Larix sibirica* and *L. dahurica*) (Kas'ianova 1993).

The taiga vegetation complex is the most widespread in the region, and includes mainly larch, Scots pine (*Pinus sylvestris*), Siberian pine (*Pinus sibirica*), spruce (*Picea obovata*), and fir (*Abies sibirica*), along with some poplar (*Populus suaveolens*) and aspen (*Populus tremula*). Alpine areas are characterized by a diversity of mosses, lichens, grasses, and willows, with meadows being common (Bezrukova 1999; Kozhova and Izmest'eva 1998). Wild food plants commonly used in this region today include Siberian pine (pine nuts), raspberry (*Rubus idaeus*), strawberry (*Fragaria* spp.), blueberry (*Vaccinium uliginosum*), red huckleberry (*Vaccinium vitis-idaea*), bird cherry (*Prunus padus*), wild garlic and onion (*Allium sp.*), burnet (*Sanguisorba alpina*), and canker-rose (*Rosa* sp.).

The mammals of the Lake Baikal region include 67 indigenous species (Liamkin 2002). Terrestrial fauna that were likely important as major sources of food, clothing, and other raw materials include various groups of ungulates and fur-bearing animals. The majority of the ungulates are Cervidae, including red deer (*Cervus elaphus*), roe deer (*Capreolus pygargus*), Eurasian elk (*Alces alces*), and reindeer (*Rangifer tarandus*; Lavov 1974). Musk deer (*Moschus moschiferus*), Siberian snow sheep (*Ovis nivicola*) and wild boar (*Sus scrofa*) are also present in smaller numbers. Common fur-bearing mammals include hare (*Lepus timidus*), Eurasian red squirrel (*Sciurus vulgaris*), Eurasian ground squirrel (*Urocitellus undulatus*), marmots (*Marmota* spp.), and various carnivores. This latter group includes gray wolf (*Canis lupus*), red fox (*Vulpes vulpes*), brown bear (*Ursus arctos*), lynx (*Felis lynx*), sable (*Martes zibellina*), wolverine (*Gulo gulo*), ermine (*Mustela erminea*), several weasels (*Mustela* spp.), steppe polecat (*Mustela eversmanni*), and Eurasian badger (*Meles meles*). Domesticated mammals are now common in the region, including cattle, sheep, goats, pigs, and dogs, and domesticated reindeer are kept in some mountainous regions, including portions of the Easter Sayan range. Historically, camels were also present in small numbers (Zhambalova 2004).

Aquatic mammals in this region consist only of the Baikal seal (*Phoca sibirica*) and the otter (*Lutra lutra*). The latter mainly inhabits rivers (Stroganov 1962) but occasionally can be seen in the lake. Beaver (*Castor fiber*) previously were present in his region, but were extirpated more than 100 years ago (Nekipelov et al. 1965). Baikal seals, locally known as nerpa, are endemic to Lake Baikal, and their preferred habitats are the deep, open sections of the lake. They are an ice-adapted seal, most closely related to the arctic ringed seal (*Pusa hispida*) (Amano et al. 2000; Pastukhov 1993).

Well over 400 species of birds have been documented in the Baikal region (Dorzhiev and Elaev 1999; Fefelov 2001). Lake Baikal and its tributaries are inhabited by a variety of waterfowl, including an array of ducks (e.g., *Anas* spp., *Bucephala clagula*, *Aythya* spp., *Mergus* spp.), common cormorant (*Phalacrocorax carbo*), geese (*Anser* spp.), swans (*Cygnus* spp.), gulls (*Larus* spp.) and terns (*Sterna* spp.). Eurasian bittern (*Botarus stellaris*) and demoiselle cranes (*Anthropoides virgo*) are also occasionally seen along the lake shore. One of the important habitats for waterfowl migrating south in autumn is the 15–20 km stretch of the Angara River immediately downstream from the lake, which often remains largely free of ice in winter (Kozhova and Izmest'eva 1998). The mountain taiga is home to birds such as woodpeckers (*Picidae*), wood-grouse (*Tetrao* spp.) and partridge (*Lagopus* spp.), while the forest zones harbor heath-cock (*Tetraster bonasia*), wood-grouse, tomtit (Paridae species) and woodpecker. The steppe patches are home to partridge, wheatear (*Oenanthe* spp.) and lark (Alaudidae)(Dorzhiev and Elaev 1999; Galazii and Molozhannikov 1982).

While 55 native fish species are present in Lake Baikal, only fourteen are historically documented as important food resources (Kozhov and Misharin 1958). One of the most prominent of these is the sturgeon (*Acipenser baeri baicalensis*), an inhabitant of the region's rivers and some areas of the lake itself. Most of the other fish species, such as perch (*Perca fluviatilis*), pike (*Esox lucius*), dace (*Leuciscus leuciscus baicalensis*), ide (*Leuciscus idus*), and roach (*Rutilis rutilis lacustris*), spend a significant part of their lifecycle in the littoral or open shallow habitats of the lake (Sideleva 2003). They are also common in the warmer sections of the region's rivers.

The historically documented food fish of the open water environment of Lake Baikal include a number of cold water species such as white-fish (*Coregonus lavaretus baicalensis*), two forms of grayling (black and white grayling; *Thymallus arcticus baicalensis*), lenok (*Brachymystax lenok*) and taimen (*Hucho taimen*). The latter two species are widely distributed in the lake only in summer, but are found in rivers and river mouths during the remainder of the year. Whitefish and burbot (*Lota lota*) move into the rivers only during the spawning season (Kozhov 1972), while some subspecies of whitefish spawn in the shallow waters of the lake itself. White grayling live mainly along the lake's eastern shores and spawn primarily in larger rivers such as the Selenga. Black grayling are widely distributed in the lake and spawn in early spring in smaller rivers along the lake's western shore. These fish also used the Angara between Irkutsk and the lake for spawning prior to dam construction (Kozhova and Izmest'eva 1998).

The omul′ (*Coregonus migratorius*) is the most commercially important fish in the Lake Baikal area today. Omul' is the only species known to inhabit almost all habitats of Lake Baikal, including open coast littoral, pelagic, and deep waters (Bronte et al. 1999). Because of its feeding behaviors, omul' tend to be found closer to shore in the southern parts of the Little Sea (but at depths of 30–50 m) in spring and summer. Around the middle of June adults concentrate in large shoals and move to river mouths for spawning. The omul' spawning period occurs from the end of August until the beginning of October. In October-November, omul' migrate to the deep regions of the lake for wintering (Kozhova and Izmest'eva 1998).

**Archaeological Context**

The Holocene culture history of Cis-Baikal varies geographically and temporally, with some micro-regions and periods being far better documented than others. The most refined chronologies presently exist for the Middle Holocene (Holocene subdivisions are described below) burials in Angara-Southwest Baikal and Priol'khon'e, and to some extent for those of the Upper Lena; burials of this age are largely undocumented in Northwest Baikal. Habitation sites in all regions generally have poorly established chronologies, with the few exceptions described in this volume. Typically, most such sites have only a few radiocarbon dates, and these tend to be on bulk sediment carbonates or unidentified bones, and have large margins of error. Such sample types have been clearly demonstrated to be poor choices for establishing precise and reliable archaeological chronologies, both in this region and elsewhere (see Nomokonova et al. 2013a and references therein). Further, in the habitation sites that have been extensively radiocarbon dated (multiple dates from each strata), such as Sagan-Zaba II, Bugul'deika II, and Ust'-Khaita (see Chapters 3, 4, and 5), some mixing of materials between strata is almost always indicated. As such, there is good reason to expect that re-dating the region's habitation sites would result in significant revisions in their occupation histories, and in turn would (or should) lead to the redefinition of the culture history units themselves. In other words, there are few temporally 'pure' habitation site layers, although this is commonly assumed to be the case. Further, radiocarbon dates on both human and faunal remains from the region are potentially affected by a significant freshwater reservoir effect caused by the consumption of region's aquatic fauna. This effect was recently discovered while analyzing the Sagan-Zaba II site, described in Chapter 4 (see also Nomokonova et al. 2013a). Methods for correcting for this old carbon effect have now been published (Bronk Ramsey et al. 2014; Schulting et al. 2014, 2015) and have been used to revise the region's Middle Holocene mortuary site chronologies (Weber et al. 2015).

The traditional hallmarks of Siberia's culture history periods are the presence of certain technologies (pottery, bronze ornaments, iron tools; Weber 1995). However, radiocarbon dates on human remains are the data used to establish the chronologies for nearly all of Cis-Baikal's major culture history periods. In other words, mortuary traditions, not technologies, define these periods. The only exceptions are portions of the Late Holocene, when historical records provide some means of independently assessing period timelines. Given the challenges mentioned above with most habitation site chronologies, this reliance on mortuary traditions and their radiocarbon dates is warranted. However, it should be realized that when terms such as Early Neolithic (EN; described below) are used, the chronologies for it are based on dates on human burials, not on pottery, which is one of the supposed markers of the period. In nearly all of the English-language literature, culture history period names are commonly (but often unconsciously) being used as shorthand for one or more mortuary traditions from a select time period. These mortuary tradition time periods could eventually prove to not match up well with changes in other forms of material culture and practice.

The Holocene subdivisions we use follow those of Walker and colleagues (2012), who place the Early to Middle Holocene boundary at 8200 cal. BP and the Middle and Late Holocene boundary at 4200 cal. BP. The culture history chronology (Table 1.1) utilized for the Early and Middle Holocene is from Weber et al. (2015), while that for the Late Holocene is taken from Kharinskii (1995; 2001a). The culture history model present below is a simplified one, which does not delve into the various chronological differences between each micro-region. The ages used in the Middle Holocene chronology presented below are all *modeled dates* from the trapezium model presented in Weber et al. (2015).

The Early Holocene in Cis-Baikal, referred to as the Mesolithic, is traditionally characterized by the widespread use of microblade technologies and the absence of pottery and cemeteries (Kol'tsov and Medvedev 1989). Weber et al. (2015) place the end date of the Mesolithic at ~7500 cal. BP (Table 1.1). Notably, it now seems that pottery was present in Cis-Baikal in the Mesolithic, as small quantities have been found northeast of the lake along the Vitim River dating to 10-11,000 cal. BP (Kuzmin and Vetrov 2007), and in Sagan-Zaba II on the west shore of the lake by ~8000 cal. BP. Additionally, a few human burials in Cis-Baikal clearly date to the Late Mesolithic, or ~8275 to 7500 cal. BP (Weber et al. 2015). These burials are classified as the Khin' mortuary tradition (Bazaliiskii 2010; Okladnikov 1950), but it is unclear how or if Khin' mortuary practices, including the types and styles of artifacts interred with the dead, differ from those of the Early Neolithic (Weber et al. 2015).

Numerous habitation sites with Early Holocene or Mesolithic components have been identified in the study area, including several discussed in detail in the following chapters. In the Angara River valley, some important sites with Mesolithic components including faunal remains are Ust'-Belaia, Ust'-Khaita, and Gorelyi Les (Klement'ev et al. 2005; Medvedev 1969; Savel'ev et al. 2001; Weber et al. 2002). Ust'-Khaita has the largest and

| Culture History Period | Approximate Age in Calibrated Years BP | Mortuary Tradition |
|---|---|---|
| Mesolithic | 11,700 to 8275 BP | Absent/Unknown |
| Late Mesolithic | 8275 to 7500 BP | Khin? |
| Early Neolithic | 7500 to 7025 BP | Kitoi |
| Middle Neolithic | 7025 to 5570 BP | Absent |
| Late Neolithic | 5570 to 4600 BP | Serovo |
| Early Bronze Age | 4600 to 3725 BP | Glazkovo |
| Late Bronze Age | 3400 to 3000 BP? | Absent/Unknown |
| Early Iron Age | 3000 (?) to 2300 BP | Butukhei |
| Early Iron Age | 2300 to 1200 BP | Elga |
| Late Iron Age | 1400 to 500 BP | Kurumchin, others |
| Early Mongolian Time | 800 to 500 BP | Early Mongolian |

*Table 1.1. A simplified culture history for Cis-Baikal, with the approximate age of each period provided, and the associated mortuary traditions also listed where possible. The Early and Middle Holocene culture history periods are from Weber et al. (2015), while that for the Late Holocene is from Kharinskii (1995; 2001a).*

most well-dated faunal assemblage among these sites, and is described in detail in Chapter 3. Many Priol'khon'e sites (Sagan-Nuge, Berloga, Ityrkhei, Ulan-Khada, Sagan-Zaba II, and Bugul'deika II) have Mesolithic layers containing small to moderate sized faunal assemblages and are described in Chapters 5 and 6. Northwest Baikal and the Upper Lena also have sites dating to the Mesolithic (e.g., Kurla in Northwest Baikal and Makarova I and II and Kistenovo I-IV on the Upper Lena), but we are unaware of any description of faunal remains from these sites, and the collections from them may now be lost. Few if any overarching statements about Early Holocene subsistence patterns in Cis-Baikal have been made in the literature, but it is clear even in previously published site reports that some diversity was present, with a few assemblages being dominated by ungulates, and others by Baikal seal or fish.

The Neolithic period spans much of the Middle Holocene, from ~7500 to 4600 cal. BP (Weber et al. 2015), and is divided into three parts: Early, Middle, and Late (Table 1.1). The Siberian Neolithic in general is defined by the widespread use of pottery and ground stone items such as nephrite adzes and ornaments. Domesticated plants and animals (excluding the dog), hallmarks of the Neolithic in other regions of the globe, are not present here until at least ~3000 cal. BP. In Cis-Baikal, the Early Neolithic, which spans from ~7500 to 7025 cal. BP, is identified by a marked increase in human burials, many of which are found in large cemeteries (Weber et al. 2010, 2015). This mortuary tradition is termed Kitoi, and is best documented in the Angara-Southwest Baikal micro-region at cemeteries Shamanka II and Lokomotiv-Raisovet (hereafter simply Lokomotiv). The fauna from these cemetery sites are described in Chapter 3. The Middle Neolithic (MN), or the period from ~7025 to 5570 cal. BP, is defined by the absence of human burials in Cis-Baikal. The Late Neolithic (LN) sees the reappearance of human burials in Cis-Baikal, and dates from ~5570 to 4600 cal. BP (Weber et al. 2015). The most widespread mortuary tradition of this period is termed Serovo. This period is not particularly well-represented in BAP's studies, as most sites of this age were excavated prior to dam construction on the Angara River and the collections from them are now mostly lost (Okladnikov 1974a, 1975, 1976; Weber and Bettinger 2010).

Most significantly, the Middle Neolithic mortuary hiatus is marked by a cultural and biological discontinuity (Weber 1995; Weber et al. 2010). For over a decade, it has been widely accepted that populations of the EN and LN were genetically discontinuous (Mooder et al. 2005, 2006). Notably, more recent genetic research (Moussa 2015) and studies of human dental and cranial phenetic traits (Movsesian et al. 2014; Waters-Rist et al. 2015) have complicated this picture to some degree, arguing for the possibility of at least some continuity between the pre- and post-hiatus populations. The mortuary practices and material culture of these pre- (Early Neolithic) and post-hiatus (Late Neolithic) groups however clearly differ, a pattern also first noted decades ago (Weber 1995; Weber et al. 2002).

Before describing subsistence patterns during the Neolithic, it is necessary to introduce the Early Bronze Age (EBA), as this period's forager groups are thought to be descendant from the local Late Neolithic population (Weber et al. 2015). Further, their cemeteries have been a major focus of BAP research (Goriunova et al. 2012; Weber et al. 2008, 2012), and are commonly used in comparisons with cemeteries from the Neolithic. The EBA dates from ~4600 to 3725 cal. BP (Table 1.1) and is defined by the occasional presence of bronze and copper items, including objects of personal adornment and some implements (Weber 1995; Weber et al. 2015). New mortuary practices are also evident, with the most well-known referred to as the Glazkovo tradition. Cemeteries of this period are particularly well documented in Priol'khon'e (Khuzhir-Nuge XIV, Kurma XI, Uliarba II), but some studies also have been done on EBA cemeteries along the Angara (Ust'-Ida I) and Lena rivers (e.g., Makrushina, Obkhoi; Goriunova et al. 2012; Weber 1995; Weber et al. 2008, 2012).

The BAP's overarching goal is to understand the mechanisms that accounted for the biocultural discontinuity in the region's Middle Holocene past (Weber et al. 2010). Correspondingly, considerable efforts have been made to understand dietary patterns in Cis-Baikal, particularly through the analyses of human stable carbon and nitrogen isotopes (Katzenberg and Weber 1999; Katzenberg et al. 2009, 2010, 2012; Weber et al. 2002, 2011). Several trends are apparent in this data for the Angara-Southwest Baikal micro-region. First, all groups here consumed a mix of aquatic and terrestrial fauna, but the nature of this mix varied by micro-region, time period, and individual. Second, Early Neolithic groups appear to have consumed more aquatic foods than those from the Late Neolithic. Third, there is a temporal trend in the stable isotope values of many of the EN burials from the Angara-South Baikal micro-region indicating an increasing reliance on aquatic foods through time. For the Shamanka II cemetery (the only South Baikal sample), Weber et al. (2015, 2016) argue that this trend is largely related to increasing consumption of fish. When one combines the Angara Valley's Late Mesolithic and EN burials into a single sample, the trend towards an increasing reliance on aquatic foods spans nearly a millennium, which Weber et al. (2015) attribute to a progressively greater reliance on riverine food resources (i.e., river fish) in this area.

In Priol'khon'e, Middle Holocene populations also clearly consumed a mix of terrestrial and aquatic foods, but no temporal shifts in diet are so far evident in this micro-region's stable isotope data. Notably, the number of EN and LN human burials with such data in Priol'khon'e is relatively limited, as most samples from this micro-region date to the EBA. However, two dietary groups have been identified, one with protein diets composed mainly of terrestrial mammals and fish, the other with a diet of terrestrial mammals, fish, and Baikal seal. The latter diet appears to be a local one, whereas the fish-terrestrial mammal group may be nonlocal (Weber and Bettinger 2010; Weber et al. 2011; Weber and Goriunova 2013). The Upper Lena human stable isotope data show that Middle Holocene individuals living there relied less upon aquatic foods than most individuals from the other two micro-regions, depending instead on relatively more terrestrial fauna. No such stable isotope data are available for Northwest Baikal.

BAP scholars have completed numerous osteological studies of human remains dating to the Neolithic and EBA, and only the most pertinent are reviewed here. Several chronological differences are apparent in these data. First, EN (Kitoi) children experienced more physiological stress compared to those from the LN and EBA (Lieverse et al. 2007a; Lieverse 2010; Waters-Rist et al. 2011). Second, EN infants appear to have been weaned more abruptly and at a later age than those from the two later periods (Waters-Rist et al. 2011). Third, mobility and/or activity patterns also differed between these groups, with EN groups having more robust upper and lower limbs, the former probably indicating extensive watercraft use, the latter higher terrestrial mobility (Lieverse et al. 2007b, 2009, 2011, 2013, 2015; Stock et al. 2010; Stock and Macintosh 2015). Watercraft use is considered highly likely for all three time periods, but was perhaps most extensive during the EN. Some spatial trends are also evident. EN individuals buried at the Lokomotiv cemetery on the Angara appear to have been more mobile and active than at any other location studied, markedly more so than even at the South Baikal Shamanka II cemetery (Lieverse et al. 2013, 2015). Conversely, the Late Neolithic and Early Bronze Age individuals buried in Priol'khon'e exhibited the lowest scores for mobility.

Lieverse et al. (2013) have linked higher mobility among the EN groups to depletion of local food resources due to overuse, which required people (often men) to travel greater distances for both hunting and fishing when compared to LN and EBA individuals. Higher population levels in the Angara River Valley compared to South Baikal, and in turn higher rates of competition for food resources, are argued to be related to the higher mobility/activity observed at the Lokomotiv cemetery (Lieverse et al. 2015). Both of these ideas are linked to Weber and Bettinger's (2010) assertion that the fewer but larger cemeteries of the EN are indicative of fewer but larger residential communities compared to the EN and EBA. These authors also stress that the depletion of terrestrial animals ("game") as related to "the termination of the EN, LN, and EBA periods of hunter-gatherer complexity (Weber and Bettinger 2010)".

While nearly all of the habitation sites examined in this volume have Neolithic or EBA components, very little faunal data from such sites were published prior to the research done for this volume. One exception is Weber and colleagues' (1993, 1998) research on Baikal seal use in the early stages of BAP. This work involved studies of seal canine thin sections for the purposes of ageing and season of death determinations, and used samples from previously excavated sites in Priol'khon'e. This research suggested that seal hunting at Lake Baikal focused on the early spring period when the seals basked on the lake ice, that sealing was most intensive during the Bronze Age (at that time considered to be from ~5000 to

3400 cal. BP). However, the rest of the faunal assemblages from which the canines were obtained remained unstudied. As a result, it was impossible to assess the relative importance of seals at these sites, nor was it clear how representative the canines were of the overall seal assemblages. Furthermore, the vast majority of the analyzed canines were from poorly documented contexts, most of which were only typologically dated. The challenges presented by this dataset spurred BAP's efforts to modernize zooarchaeological studies in the region, particularly of the seal-rich assemblages at Sagan-Zaba II, Bugul'deika II, and Baikal'skoe III (see Chapters 4, 5, and 7).

Arguably the most poorly known and least well-defined period of the Holocene in Cis-Baikal is the Late Bronze Age (LBA), or the period immediately following the termination of the Glazkovo mortuary tradition. Goriunova (Goriunova and Smotrova 1981; Goriunova et al. 2004) has typologically identified two LBA mortuary traditions. However, it appears that burials from neither tradition have been demonstrated to post-date Glazkovo (i.e., EBA) burials (Berdnikova et al. 1991; McKenzie 2006; Svivin 1981; Weber et al. 2010). Weber et al. (2015) assign a single individual (grave #106) from the Shamanka II cemetery to the Late Bronze Age. Its calibrated age range at two standard deviations, after correction for the freshwater reservoir effect, spans from ~ 2850 to 2440 cal. BP, which is well within the age range commonly accepted for the region's earliest phase of pastoralist occupation (see below). In fact, in some models Cis-Baikal's earliest pastoralist mortuary tradition is said to straddle the LBA and the Early Iron Age transition, but its chronology is not well established (see below; Kharinskii 2001a, 2005; Nomokonova and Goriunova 2013c). For this volume, we consider the LBA to span from ~3400 to at least 3000 cal. BP (Table 1.1). Subsistence patterns during this period are equally poorly-known, but it is possible that both foraging and pastoral groups (who also hunted and fished) were present.

The first migration of pastoralists to the region, perhaps originating in Trans-Baikal, is identified through the presence of the Butukhei ("slab-grave constructors") mortuary tradition, particularly in Priol'khon'e (Kharinskii 2001a; Nomokonova and Goriunova 2013c). While one grave assigned to this tradition has produced a radiocarbon age of ~3300 cal. BP, all other dated Butukhei graves post-date ~3000 cal. BP (Nomokonova and Goriunova 2013c). As such, here we define the mortuary tradition as dating from ~3000 to 2300/2000 cal. BP (Table 1.1). Notably, no pastoralist burials from any period have so far been subjected to stable carbon isotope studies, so it is unclear how the radiocarbon dates on them might be affected by the freshwater reservoir effect. Regardless, Butukhei graves have been assigned to either the LBA or the 'Transition to Early Iron Age' culture history period, depending on the model followed (Kharinskii 2005). For the sake of consistency with earlier periods and definitions, we assign the Butukhei tradition to the Early Iron Age. Domesticated horses, sheep, goats, and cattle first enter the region during this period, as does iron tool production and use (Kharinskii 2005). Sites described in this volume with significant faunal components dating to this period are Sagan-Zaba II and Bugul'deika II (see Chapters 4 and 5). Notably, both appear to show that early pastoralists in Priol'khon'e were using a suite of domesticated and wild fauna, including fish and Baikal seal (c.f., Nomokonova et al. 2010). We suspect the consumption of at least some of these fauna by the region's pastoralists means that radiocarbon dates on their skeletal remains are at least a few centuries too old.

The second period of pastoral occupation is defined by the presence of the Elga mortuary tradition, which dates from 2300/2000 to 1400/1200 cal. BP (Table 1.1; Goriunova and Pudovkina 1995; Kharinskii 2005). This mortuary tradition is thought by some researchers to be tied to a northward migration of pastoralist groups in response to the formation of the Xiong-nu (Hsiung-nu) confederation in Mongolia and Trans-Baikal (Goriunova and Pudovkina 1995; Kharinskii 2005). Burials of this age are relatively rare in the study region, but both Sagan-Zaba II and Bugul'deika II contain components from this general period with abundant remains of domesticated animals and other fauna. We tentatively place this mortuary tradition in the Early Iron Age.

Cis-Baikal's third pastoralist period has been linked to the formation of Turkic states in the Mongolia area starting around 1400 cal. BP (~A.D. 600; Grousset 2005), which may be associated with a migration to the region of a group of people known as the Kurykane (Svivin 1976). This population left a significant archaeological record of graves, ritual construction, fortified settlements, rock art, and habitation sites that are known as the Kurumchin archaeological culture of the Late Iron Age, dating from 1400/1200 to 500 cal. BP (A.D. 600/800–1400; Table 1.1)). The Kurykane were famous horsemen and warriors, and were known among nearby steppe populations as producers of excellent horses (Dashibalov 1995). Sagan-Zaba II, Bugul'deika II, and Totok (Chapters 3, 4, and 5) provide our best samples from this time period.

Finally, the appearance of Mongols, including ancestors of modern Cis-Baikal Buriat populations, began in neighboring Trans-Baikal at ~1250 cal. BP (~A.D. 700; Rumiantsev 1962). In Cis-Baikal the first graves of early Mongols appear significantly later, at ~800 to 500 cal. BP (A.D. 1100–1400). This period is referred to in the regional literature as the Early Mongolian Time (Table 1.1; Imenokhoev 1992). The process of Mongolian penetration in Cis-Baikal appears to have been characterized by a period of coexistence followed later by assimilation and gradual replacement of the Kurykane, many of whom eventually settled far to the north-northwest. Sagan-Zaba II and Bugul'deika both have some fauna from this period as well (Chapters 4 and 5).

## General Methods

In most cases, faunal remains are quantified using number of identified specimens (NISP) or minimum numbers of individuals (MNI) values following Lyman (2008). Baikal seal (*Phoca sibirica*) remains were aged using two methods, the first involving the assignment of individual skeletal elements to age categories based of degree of fusion of epiphyses. The age categories used were those from Storå (2000), which are a generalized classification for Phocidae seals based on skeletal element fusion, and include the categories yearling, juvenile, young adult, and older adult (age groups 1 through 4). To more precisely age the seal remains at the site, and to determine the animals' seasons of death, canines were thin sectioned and their dentine (and also occasionally cementum) bands evaluated and counted, following the methods outlined in Weber et al. (1993, 1998) and Nomokonova (2011). Siberian roe deer and red deer were aged through epiphysis fusion patterns. For roe deer, we utilized the sequence established for *Capreolus capreolus* (Tomé and Vigne 2003), as we are unaware of any such data for Siberian roe deer. Knight (1966) was utilized for the red deer post-cranial remains. Tooth eruption patterns of both red deer and roe deer also were examined for ageing following Brown and Chapman (1991) and Tomé and Vigne (2003). All radiocarbon dates presented in the volume were calibrated using Oxcal 4.2 (Bronk Ramsey, 2009) using the IntCal13 calibration dataset (Reimer et al., 2013), and all calibrated age ranges are shown in years before present (BP; Table 1.1).

## Questions Posed

This edited volume summarizes the currently available Holocene zooarchaeological data for the Cis-Baikal region. Each chapter describes and analyzes such data from a specific site or micro-region, but there are groups of overarching questions that this material is used to address, particularly in the final chapter. These groups of questions are:

1. What are the general characteristics of Holocene subsistence patterns in the region, and how do these differ among the three micro-regions? What factors might account for these differences?

2. How do subsistence practices vary through time in Cis-Baikal? Do changes in subsistence and diet correlate with major changes in the region's culture history and climate? Particularly important are the early periods of formal cemetery use in the region in the Late Mesolithic, the Middle Holocene mortuary hiatus, and the arrival of pastoralism in the Late Holocene, particularly the Late Bronze and Early Iron ages.

3. What major gaps remain in our understanding of Holocene subsistence practices and diets in Cis-Baikal?