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Knut A. Helskog, Bryan C. Hood
& Vladimir Ya. Shumkin

Dwelling Forms and Settlement Patterns on Russia's Kola Peninsula Northern Coast, 2300–1500 cal. BC

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Chapter 1
Introduction

Prehistoric semisubterranean house structures began to be identified along the coast of northern Norway during the 1930s, and by the 1960s hundreds of them had been registered. Today we know that most of these date to the Late Stone Age (5000–1800 BC[1]) and the Early Metal Age (1800 BC to AD 1), although some are also known from the Mesolithic (Early Stone Age; 9000–5000 BC). During the inter-war years, when Finland had sovereignty over the Petsamo/Petchenga region at the western end of the Kola Peninsula, Finnish archaeologists identified similar houses in that region. After World War II, Russian archaeologists working on the Kola Peninsula coast did not register pit-houses; the various depressions noted at coastal localities were either regarded as natural or the result of military activities during the war. After the opening-up of Russia to foreign researchers in the early 1990s, and the participation of Russian researchers in Norwegian excavations, collaborative work with Norwegian archaeologists on the Kola Peninsula (Figure 1.1) led to the registration of many house structures, some very similar in form to those known in northern Norway. Since then, the inventory of semisubterranean houses on Kola has greatly expanded, as Russian archaeologists have surveyed new areas and have excavated dwelling features as part of heritage management projects related to oil and gas development.

The first modern excavation of a semisubterranean house on the Kola Peninsula, however, was undertaken by a Norwegian-Russian team at Drozdovka Bay, in 1994, 1998 and 2000. The project was an exercise in cross-cultural collaboration, and it attempted to align the archaeology of the Kola coast with the better-known archaeology of the north Norwegian coast, as it was obvious from the houses and their material culture that the Kola-Norwegian coast constituted a culturally related interaction area. This book presents the results of this first house-site investigation and attempts to place it in a broader context, relative to other investigations on the Kola Peninsula and those in northern Norway.

In this introduction we provide some basic background information for contextualizing what follows. We begin with a short sketch of the standard cultural history framework and then go on to describe the biogeography of the Kola Peninsula and neighbouring areas of Norway. In Chapter 2 we provide an historical overview of archaeological research on Kola. In Chapter 3 we introduce the Drozdovka Bay region and outline the archaeological investigations undertaken there prior to the work described here, as well as provide a summary of paleoenvironmental data. In Chapter 4 we present an overview of the three field seasons at Ust-Drozdovka III, House 5, and recount how our perceptions of the site changed over time, with the eventual recognition of two superimposed houses. In Chapter 5 we describe the site features and stratigraphy, then assess the occupation sequence of the two houses through statistical analyses of the radiocarbon dates. The artefact assemblage is presented in Chapter 6, and the faunal remains in Chapter 7. In Chapter 8 we revisit the Mayak II site, in outer Drozdovka Bay, excavated by Nina Gurina in 1978–1982. The huge faunal assemblage from this locality, along with its artifact material, are used to consider the place of this important locality in the Drozdovka Bay settlement system during the period 2200–1500 BC. Finally, in Chapter 9 we conclude with a general consideration of coastal settlement patterns on the Kola Peninsula in relation to the neighbouring regions of northern Norway, as well as the cultural linkages between Kola, northern Norway, Karelia, and further east.

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[1] All calendar dates are calibrated ages. Radiocarbon dates have been calibrated using OxCal 4.4 and IntCal20.

Figure 1.1. Map of northern Fennoscandia and northwest Russia.

Cultural history Framework

A few words on cultural history terminology are necessary right at the start. In north Norway and northwestern Russia, the "Stone Age" is customarily divided into three macro-units: Mesolithic/Early Stone Age, Neolithic/Late Stone Age, and the Early Metal Age. The basic characteristics of each unit are sketched out below. The Mesolithic, often termed the Early Stone Age in Norway, dates from 9500 to 5000 BC. In both Norway and on the Kola Peninsula it has been subdivided into three phases (Olsen 1994; Shumkin 1984; 1986; 1990: 5). Painted with a broad brush, the early phase is marked by blade technology and the use of a variety of lithic raw materials (cherts, quartzites, quartz), while microblade technology appears in the middle phase. In Norway, only surface dwellings are known from the earliest phase, while both semisubterranean and surface dwellings are known from the two later phases. The late Mesolithic is marked by changes in point forms and greater use of quartz as a raw material; fewer dwelling structures are known from this period. Hundreds of Mesolithic localities are known from the Norwegian coast. Relatively few sites have been identified in the Norwegian inland – probably due to lack of research – although the interior was occupied by at least 7600 BC (Hood 2012; Skandfer et al., *forthcoming*), and adjacent areas of northern Finland by 8200 BC (Kankaanpää & Rankama 2005; 2014; Rankama & Kankaanpää 2008; 2011; 2018). The earliest Mesolithic sites on Kola are located on the coast; during the middle and late periods they became more frequent in the inland (Shumkin 1986, 1990). The recent large-scale excavations at Teriberka on the north coast also revealed traces of Mesolithic dwellings (Kolpakov et al. 2016: 171).

The succeeding time frame is called the Neolithic in Russia and the Late Stone Age (sometimes called the Younger Stone Age) in Norway (5000–1800 BC). In both areas the defining elements for the beginning of the period are the presence of comb-ceramics, ground slate tools and bifacial point technology. Small semisubterranean dwelling structures become common in Norway. In north

Norway the Late Stone Age is subdivided into three Montelian "Periods," distinguished by differences in artifact types and, to some extent, house forms (K. Helskog 1980; Olsen 1994) (Figure 1.2).

The Early Metal Age is dated to 1800 BC to AD 1. The term was originally coined by Russian archaeologists to denote a period in which northern hunter-gatherers were in contact with metal-producing Bronze and Iron Age societies to the south, which resulted in the import of metal wares as well as some local metalworking. The designation was later appropriated for use in north Norway (R. Jørgensen 1986; Olsen 1984). Metal finds (bronze and copper implements) during the first part of the period are relatively few, especially in Norway, but the defining typological elements for the beginning of the period were the appearance of asbestos-tempered pottery, and in Norway the return of bifacial point technology after an absence of 1000 years. Iron tools made their appearance in Norway by at least 300/200 BC, and there are indications of local smithing of iron in a hunter-gatherer context (Hood & Olsen 1988; Sundquist 1999). In Norway the Early Metal Age has been divided into two "phases" (Olsen 1994: 104–108), which have been distinguished by a contrast between textile-impressed asbestos ceramics (2000/1800–1200 BC) versus Kjelmøy asbestos ceramics (800 BC–AD 1).

Recent analysis of the large corpus of radiocarbon dates produced from Stone Age and Early Metal Age sites in north Norway has suggested that marked demographic fluctuations occurred during this time. Erlend Jørgensen (2020: 43) graphed the summed probabilities of the radiocarbon dates, identifying three periods of heightened activity and possible population peaks, each followed by a distinct crash: 4500–3500 BC,

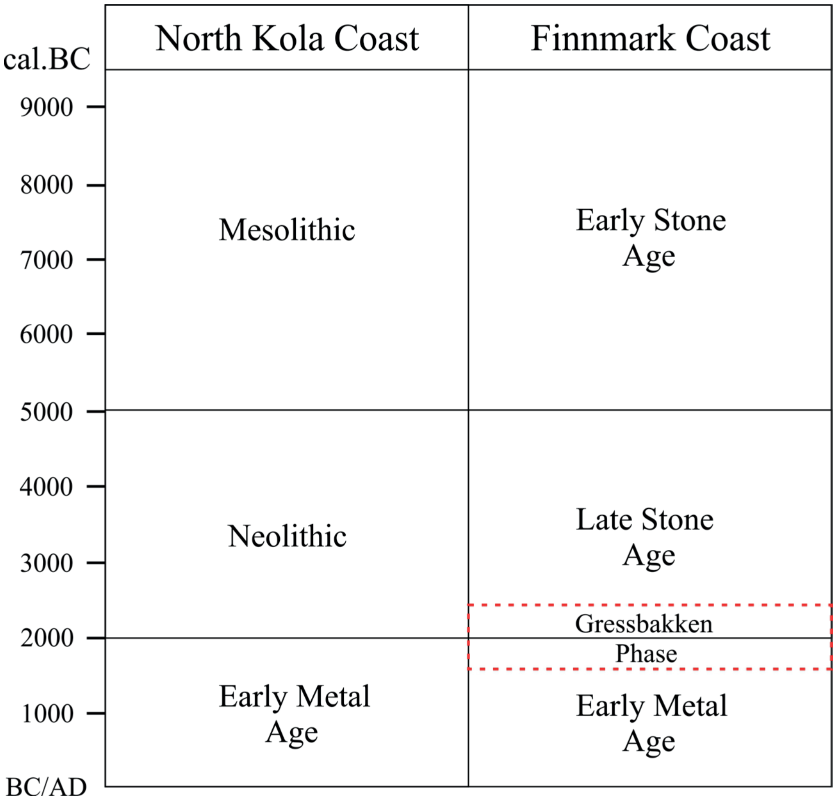

Figure 1.2. Generalized culture-history chronologies for the Kola Peninsula and Finnmark.

2200–1500 BC and 400 BC– AD 1. The peaks are somewhat correlated with increases in marine bioproductivity inferred from paleoclimate proxy data. It is the middle peak that is of interest to us here, as it corresponds to what in Norway has been called the "Gressbakken Phase".

The "Gressbakken Phase" refers to the time span of 2300 to 1500 BC, when large semisubterranean houses with particular structural characteristics were in use. These houses often exhibit multiple entrance passages, generally in the middle of the front wall and at each end of the dwellings, double hearths on the house floors, and sometimes thick midden deposits in front of the dwellings. However, there is considerable variation in construction details. Many archaeologists have interpreted these dwellings and their middens as representing semi-sedentary residence. Gressbakken settlements usually consist of multiple houses, but there has been disagreement over how many of the dwellings at each site were in use contemporaneously; some archaeologists believe relatively few were coeval (6 houses or less), while others assert most of them were (perhaps up to 30 houses) (K. Helskog 1984: 51–57; Olsen 1994: 85–86; Renouf 1989: 229; Schanche 1994: 100, 175; Simonsen 1965: 404–405). Similar houses with comparable dating are now known from many localities along the north coast of the Kola Peninsula.

This "phase" identifies a relatively coherent cultural phenomenon of short duration that can be linked to one of the demographic peaks inferred from the radiocarbon data. The phase transgresses the somewhat arbitrary temporal boundary of the Late Stone Age and Early Metal Age, and it does not fit well with the ceramics-based phase division suggested for the Early Metal Age in Olsen (1994: 104–108). As such, it seems appropriate to treat the "phase" as a meaningful analytical unit and ignore the macro-units. However, the Gressbakken phenomenon is not simply a regional chronological entity; the dwelling forms and other cultural elements have a very broad geographical distribution along the north Norwegian and Kola coasts, and even further afield. As such, the phase exhibits "horizon"-like properties, in the sense of Willey & Phillips (1958: 22): a cultural unit of limited duration, but considerable geographical extent. We will return to this point in the concluding chapter.

Kola Peninsula: Biogeographical Attributes

The Kola Peninsula constitutes the extreme northwestern border of Russia along the Barents Sea (Figures 1.1 and 1.3). Geologically, Kola is part of the Baltic Shield, as are adjacent areas in Norway. Simplifying greatly, most of the peninsula consists of Archaean gneissic crustal rocks dated from 2.9–2.5 Ga, although a series of Late Archaean and Early Proterozoic volcanic, sedimentary, and metasedimentary (greenstone) rocks extend in an east-west trending belt through the central portion of the peninsula. Thick layers of Upper Proterozoic sedimentary rocks are present on the outer coast on the Rybachiy (Fisher) and Sredniy Peninsulas and Kildin Island; these are related to formations on the Varanger Peninsula in Norway (Daly et al. 2006: 580–581; Dobrzhinetskaya et al. 1995: 8; Gorbatschev & Bogdanova 1993: 8; Siedlecka et al. 1995).

Topographically, most of the peninsula is an eroded peneplain of low relief, ranging between 200–350 m above sea level, although the Khibiny Mountains near the center of the peninsula range from 500–1000 m, with peaks of 1200 m. The peneplain extends west of the Norwegian/Russian border into Finnmark County, Norway, where the low relief plateau of the interior regions ranges from 300–500 m, while the coastal areas range up to 150 m. The northern Barents Sea coast – the main focus here – begins at the Norwegian border with a series of small, short fjords and the protruding Rybachiy (Fisher) Peninsula, moves eastward past the deep fjord of Kola Bay (in which the port city of Murmansk is situated), continues 130 km eastwards with very few sheltered inlets until the Drozdovka Bay area (Figure 1.3), then another 180 km towards the entrance to the White Sea. A few large inland lakes are found in the central part of the peninsula, but a series of smaller lakes occur in a belt within 75 km of the north coast. Several rivers connect the interior and its lakes with the north coast: the largest are the Tuloma, emptying into Kola Bay, and the Ponoy, which flows roughly west to east through the center of the peninsula, debouching at the entrance to the White Sea. Along the north coast, east of Kola Bay, are the Teriberka, Voronya, Kharlovka, East Litsa, Sidorovka, Varzina, Drozdovka and Jokanga Rivers. Many of these rivers have been important for fishing salmon (*Salmo salar*) and Arctic char (*Salvelinus alpinus*) (Zubchenko & Sharov 1993).

The north coast of the peninsula borders on the Barents Sea. Due to the ingress of warm Atlantic waters carried by the Norwegian Coastal Current and the Murmansk Current, the northern Kola coast is generally free of winter sea-ice up to a point 100–150 km northwest of the opening of the White Sea. However, the westward extent of sea-ice varies from year to year. Figure 1.4 compares two satellite images – both taken in March, but in different years – that depict the extent of pack and landfast ice at northeastern Kola and the mouth of the White Sea, relative to Drozdovka Bay. The 2005 image shows what may be close to the maximum extent of the sea-ice, with a westerly spread to within ca. 50–60 km of Drozdovka Bay, while the 2001 image shows a more limited distribution near the mouth of the White Sea, ca. 150 km east of Drozdovka Bay. As along the neighboring coast of northern Norway, the lack of winter sea-ice has had important consequences for economic activities. A year-round marine fishery (particularly for cod) has been conducted for thousands of years, and open water sea mammal hunting was possible. On the other hand, in years with a pronounced westward expansion of sea-ice, certain Arctic species would be brought in closer proximity to the Drozdovka area.

Although rare today, harbour seals (*Phoca vitulina*) occur along the Murman coast as far east as Ivanovskaya Bay (immediately east of Drozdovka Bay), which today hosts the largest breeding colony of such seals. During the fall and winter, many harbor seals seem to move west to the Norwegian coast, but some may winter in Drozdovka Bay. In summer, they haul out on small islands and feed near river mouths (Zyryanov & Egorov 2010). Ringed seals (*Phoca hispida*) are also found along the Murman coast, but primarily in sheltered ar-

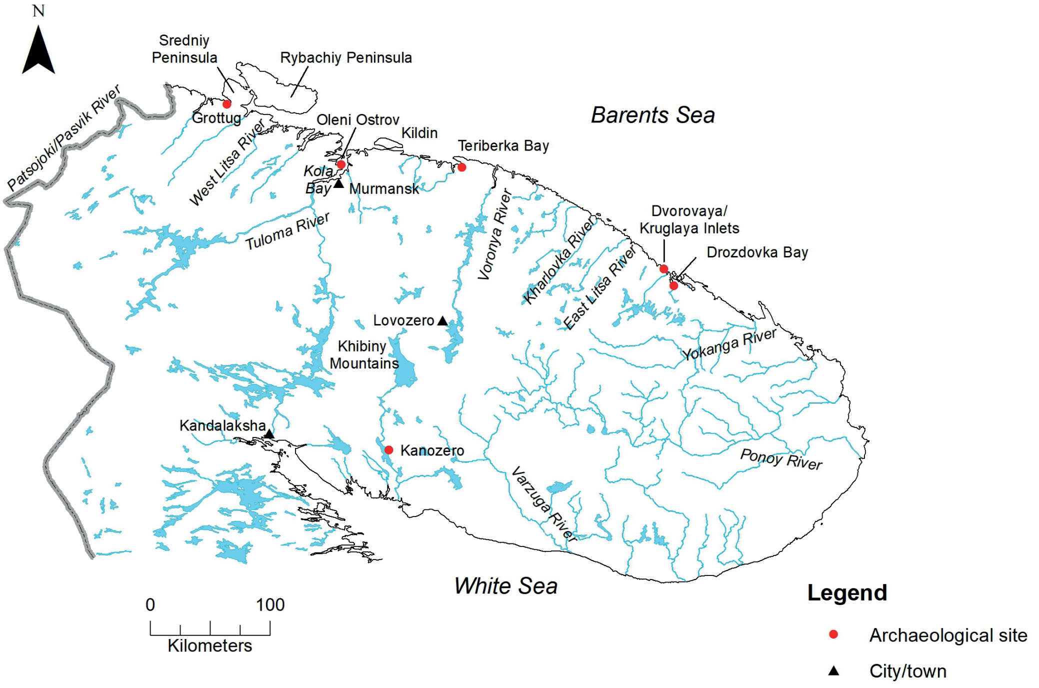

Figure 1.3. Locational map of the Kola Peninsula.

eas rather than on exposed coastlines (Belikov & Boltunov 1998: 68). Because they require stable landfast ice to whelp, breeding populations are likely to have been few along the ice-free stretch of the coast. Grey seals (*Halichoerus grypus*) occur along the entire north coast up to the entrance to the White Sea. Their primary November pupping areas on the coast east of Kola Bay are the islands between the Kharlovka and East Litsa Rivers, and these same islands are used for spring moulting. Grey seals do not exhibit distinct migratory patterns, but some may move westwards in the spring and summer (Ziryanov & Mishin 2007: 14–16). Charnoluskiy's (1930) map indicates grey seal hunting areas along the entire northeastern Kola coast from Drozdovka Bay to the mouth of the White Sea. Migratory harp seals (*Phoca groenlandica*) move along the Kola coast between March and May on their way to their summer feeding grounds to the north near the Arctic ice-edge (see below); large herds may enter the Kola coast bays.

The distributions of other sea mammal species such as bearded seals (*Erignathus barbatus*) and walrus (*Odobenus rosmarus*) are more closely related to the distribution of sea ice, so they are rare west of the entrance to the White Sea. Walrus wintering areas lie northeast of the White Sea between Cape Kanin and Kolguyev Island, and into the Pechora Sea. Some walrus move into the entrance to the White Sea in March-April, and occasionally single animals are observed along the northern Kola coast (Bel'kovich & Khuzin 1961: 1; Haug & Nilssen 1995a: 85; Lydersen et al. 2012). Edward Rae's account of his 1873–74 journey to the White Sea and Kanin Peninsula notes that walrus were absent or rare, even on Morjovets (Morzhovets) Island (Walrus Island) (Rae 1881: 121), located at the entrance to the White Sea. Beluga whales (*Delphinapterus leucas*) occur along the north Kola coast from January to May, and they migrate eastwards along the coast in the spring, moving towards their summering areas (Boltunov & Belikov 2002: 152).

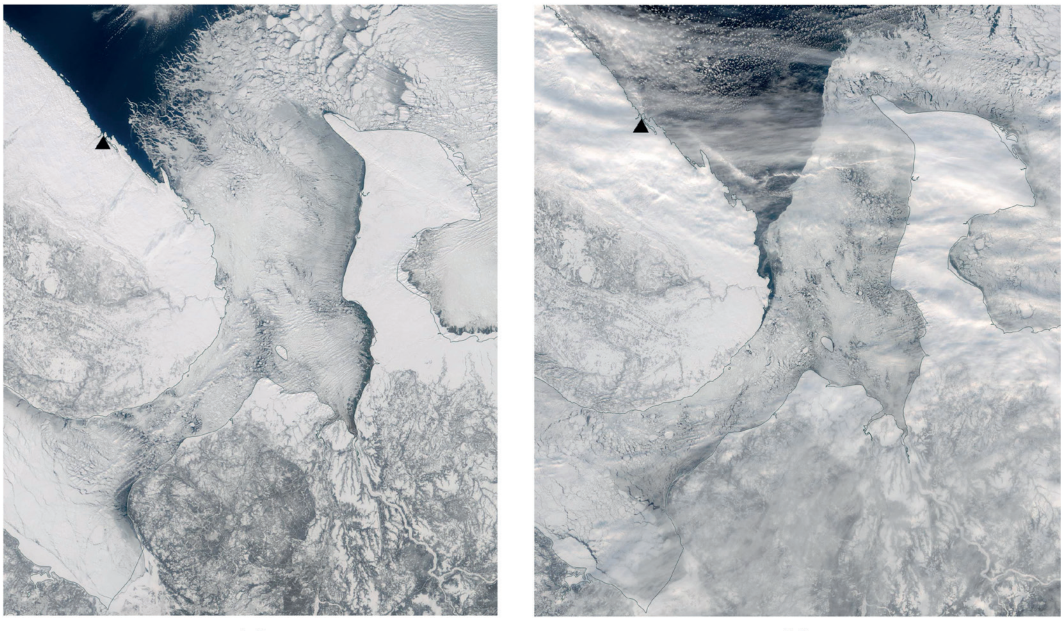
(a) (b)

Figure 1.4. Satellite images showing variation in the extent of pack ice near the mouth of the White Sea, Drozdovka Bay indicated by the black triangle. Image a: extensive western distribution of ice, March 17, 2005, Image b: more limited easterly distribution of ice, March 28, 2001. Open-source imagery from the NASA Worldview application (https://worldview.earthdata.nasa.gov), part of the NASA Earth Observing System Data and Information System (EOSDIS).

Polar bears (*Ursus maritimus*) are rare in the area. Today, the nearest polar bear population is in the Pechora Sea, east of the Kanin Peninsula, although this population has been little researched (Belikov & Boltunov 1995: 120). Polar bear populations were probably more abundant in the past, but it is unknown whether there was ever a local population near the mouth of the White Sea.

The southern and eastern coasts of the Kola Peninsula border on the White Sea, which is icebound during the winter, with a narrow fringe of coastal landfast ice and larger areas of drift ice. With these winter ice conditions, ringed seals are common throughout the White Sea (Belikov & Boltunov 1998: 63–64, 68). The sea-ice also provides a platform for large whelping and moulting aggregations of harp seals in February and March. The harps then migrate in herds along the northern Kola coast from March to May on their way to their northern summering areas near the polar ice-edge, then return to the White Sea in December, this time by way of Novaya Zemlya (Haug et al. 1995: 168–171; Haug & Nilssen 1995b; Makarevich & Krasnov 2005: 174–175; Nilssen 1995: 242). Early twentieth century hunting areas for harp seals are indicated in Figure 1.5, based on a map in Charnoluskiy (1930); they are concentrated near the entrance to the White Sea. Some beluga whales may winter in the White Sea. Their current summering areas are mostly towards the eastern side of the entrance to the White Sea (Boltunov & Belikov 2002: 152–153). Stone Age rock art at Vyg, near the southern shore of the White Sea, provides explicit depictions of beluga hunting from boats (Gjerde 2010:286–321; Savvateev 1968; 1970; 1977).

The climate of the peninsula exhibits contrasts between the maritime-influenced coastal region and the more continental interior. Average July temperatures vary from 10–14°C in the interior, versus 9–11°C on the coast, while February temperatures average -12.3°C in the interior and -11°C on the (White Sea) coast. Rainfall is 600–700 mm in the Khibiny Mountains, 300–400 mm elsewhere in the interior and on the coast. Snow cover extends from mid-October to late May (Koroleva 1994: 804; Kremenetski et al. 1997: 92). These coast-interior climatic differences are reflected in the vegetation zonation of the peninsula (Atlas Murmanskoy oblasti 1971). Gervais & MacDonald (2001: 225) identify four zones along a coast-interior transect (see also Koroleva 1994) (Figure 1.5). Along the Barents Sea coast and stretching 20–100 km into the interior is the tundra zone, consisting of lichen, hearth, birch bushes and other shrubs. Next is a forest-tundra zone with birch trees, followed by a forest-tundra zone with pine trees. The forest zone, which begins near the middle of the peninsula, is marked by the presence of spruce, as well as larger pine trees. The current northern limit of pine ranges from 30–50 km from the coast on western Kola, to ca. 100 km on eastern Kola inland from Drozdovka Bay.

This vegetation zonation has ecological consequences for the distribution of terrestrial mammals. Wild reindeer were virtually extinct by the late nineteenth century, so little is known concerning their migration patterns. By the 1920s only two populations were identified, a western population in a state sanctuary in the mountainous area near Monchegorsk in west-central Kola, and an eastern population in the forest-tundra south of the Ponoy River (Semenov-Tyan-Shanskii 1984: 163). In the early 1970s the western population engaged in short, irregular, vertical migrations, mostly driven by attempts to find accessible winter forage (Zakharov 1984: 168). Little was known concerning the movements of the eastern population.

Currently, Sámi reindeer herders of the Lovozero region of central Kola have their winter pastures in the interior forest-tundra and forest fringe area and their summer pastures on the coastal tundra (Beach 1992: 128–130; Konstantinov 2000: 51). Charnoluskiy's (1930) map of early twentieth century land-use in eastern Kola documents winter settlements of Sámi and Komi reindeer herders near the interior forest-fringe and migration routes to summer coastal pastures. It seems likely, therefore, that prehistoric wild reindeer seasonal migrations in central-eastern Kola would have exhibited a similar interior-coast pattern. Interior-coast migration patterns are also known for moose/elk. In the forest zone of central and southern Kola, moose seasonal migrations are relatively localized, but moose populations living along the northern forest-tundra border exhibit longer distance movements. There, sev-

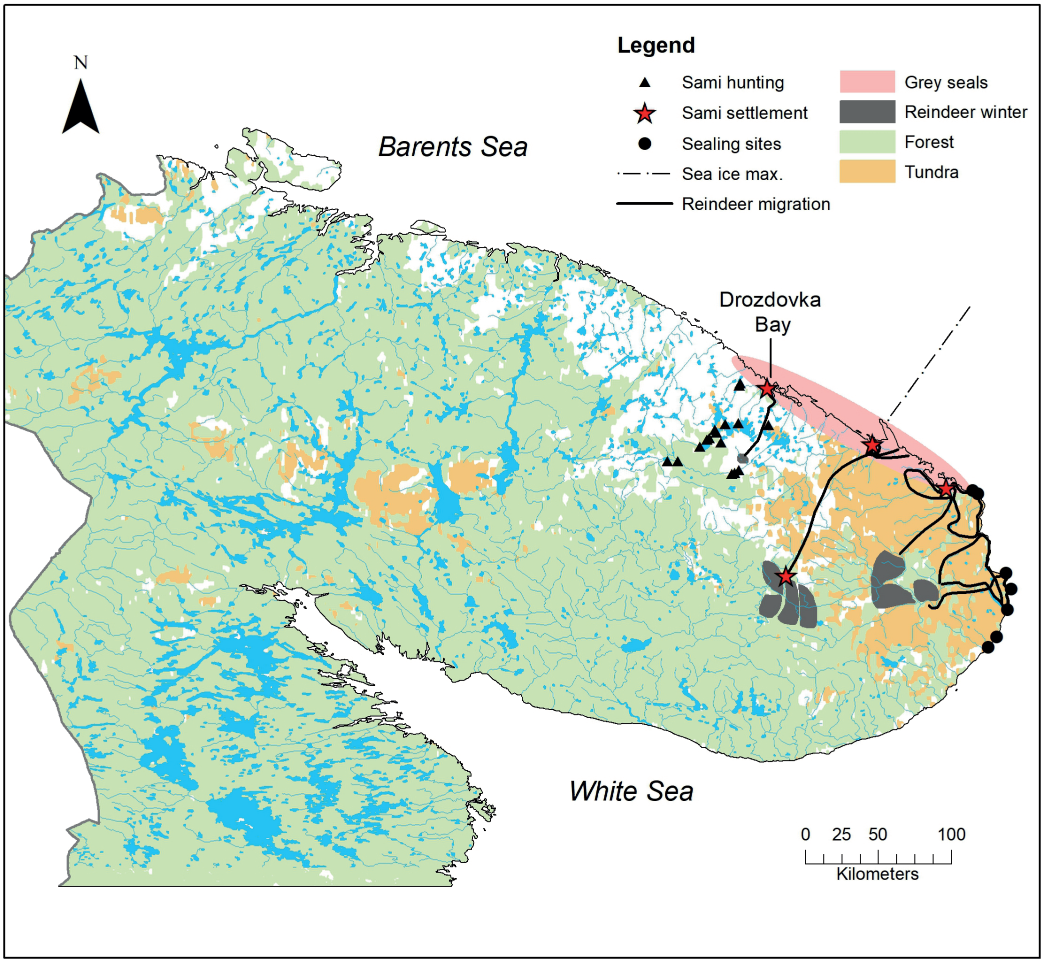

Figure 1.5. Vegetation zones, animal resource distributions, and Sámi settlements. Grey seal concentrations, sites for hunting harp seals, reindeer winter pastures and coastal movements, and Sámi interior hunting sites. Vegetation based on open-source data (http://gis-lab.info/qa/vmap0-eng.html), animal resources and Sámi settlements mapped from Charnoluskiy (1930).

eral densely populated moose wintering areas are found strung out west-east within the northern forest edge. These moose migrate to the coastal tundra areas during the summer and begin their return migration in October; this involves distances of up to 150 km (Makarova 1996).

The ecological contrasts between coast and interior outlined above are fundamental to human settlement in the region. In the early twentieth century, Sámi summer and winter settlements were located in the Varzina-Drozdovka area, close to the important fishing and seal hunting grounds. However, winter settlements ["hunting camps"] were also located in the interior lake district, ca. 35–80 km from the coast (Figure 1.5), based on Charnoluskiy (1930).

The vegetation zones outlined above have not remained static over time, however. In the next section we provide a brief outline of post-glacial environmental change, with emphasis on the Kola north coast.

Paleoenvironmental Development

The deglaciation process of the Kola Peninsula has been the subject of considerable debate, based on varying interpretations of end moraine features (e.g. Hättestrand et al. 2007; Rainio et al. 1995: 186; Yevzerov 2000). One interpretation held that by the Younger Dryas the continental ice had split into two units – the main Fennoscandian ice sheet over western Kola and a separate Ponoy Ice cap over eastern Kola – with a narrow deglaciated area in between. The most recent interpretation suggests the Fennoscandian ice sheet extended over all of Kola and receded progressively from the east (entrance to the White Sea) to the west (Stroeven et al. 2016: 105). In any event, studies of coastal geomorphology and pollen analyses indicate the north coast was deglaciated during the Allerød and the early Younger Dryas (Corner et al. 2001). Postglacial isostatic uplift then resulted in sea-level changes over time. A marine maximum of 80 m has been documented at Polyarny in outer Kola Bay (Corner et al. 2001: 173), 65 m at Dalnie Zelentsy on the central Murman coast and progressively lower towards the east, reaching only 45 m at the East Litsa River (Snyder et al. 1996: 54). Shorelines related to the Tapes Trangression (maximum 7800–6800 cal. BP/5800–4800 BC; Corner et al. 2001: 175) also drop towards the east, from 27 m to well under 10 m towards the mouth of the White Sea (Snyder et al. 1996: 54; see also Koshechkin 1975).

The following brief vegetation history is summarized from several sources (Gervais et al. 2002; Kremenetski et al. 2004; MacDonald et al. 2000; Snyder et al. 2000). During the Younger Dryas cold period (12,800–11500 cal. BP/10,800–9500 BC) the coastal environment was marked by a shrub-herb tundra. The onset of the Holocene was characterized by increasing amounts of dwarf birch, then by 11,100 cal. BP (9100 BC) a shrub-birch tundra was established, followed by tree-birch forest tundra. Coastal areas had more tundra than birch, while further inland birch was more abundant. Isolated pine trees were present near the coast by 9000–8400 cal. BP (7000–6400 BC), but there was never any pine forest. At a pollen sampling site 90 km inland, but north of the current pine limit, pine became the dominant vegetation after 8000 cal. BP (6000 BC); radiocarbon dated fossil pine trees indicate they were present north of the modern pine limit by 7500 cal. BP (5500 BC). Pollen accumulation rates for birch and pine were at their peak from 8000 to 5300 cal. BP (6000–3300 BC), which marks the Holocene Thermal Maximum. The pine treeline expansion northwards suggests a temperature 2°C warmer than today's. At 5300 cal. BP (3300 BC) there was a decrease in both pine and birch in the inland areas and after 3800 cal. BP (1800 BC) the pine treeline had retreated to more than 90 km inland, resulting in the establishment of the modern birch forest-tundra. On the coast the modern sparse birch and predominate tundra habitat was established by 3300 cal. BP (1300 BC). Figure 1.6 shows the modern topography and vegetation of inland Kola west of Drozdovka Bay, as seen from a helicopter.

Figure 1.6. Interior of the Kola Peninsula west of Drozdovka Bay, looking south. Photo: Knut Helskog.

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Chapter 2
Archaeological Research on the Kola Peninsula in Historical Perspective

The archaeological exploration of the Kola region and northeastern Norway started in the middle of the nineteenth century, but the first professional investigations occurred during the first decade of the twentieth century in Norwegian Finnmark, when Ole Solberg (1909) excavated several sites in Norway's Varangerfjord. Originally attributed by Solberg to the Viking Period, these key localities – one of which produced well-preserved bone/antler artifacts – are now dated to the first millennium BC and are regarded as precursors of the Sámi culture. During the 1920s, Anders Nummedal's discovery of the Mesolithic "Komsa Culture" in Finnmark (Bøe & Nummedal 1936; Nummedal 1929) suggested that human colonization had occurred in early post-glacial time. Reconstruction of the colonization routes, however, also required study of the adjacent Russian region.

In northwestern Russia, archaeology was mainly conducted by amateurs prior to the 1920s, thus creating a knowledge gap compared with Norway. In 1900, Konstantin Reva excavated three semisubterranean dwellings at the mouth of the Ponoy River, although these were probably features from the eighteenth to nineteenth centuries (Kolpakov et al. 2016: 168). The Finnish ethnographer T. I. Itkonen (1918) reported artificial depressions in the Lake Yokanga region on the eastern Kola coast, one of which he excavated in 1914. Finnish geologist and anthropogeographer Väinö Tanner (1929) investigated eight pit-houses at Grottug on the Sredniy Peninsula adjacent to the Rybachiy (Fisher) Peninsula to the east of Varangerfjord, which he dated to ca. 1700 BC using shoreline emergence. One of these houses was later excavated in 1929 by the Finn Sakari Pälsi (Seitsonen 2006). These investigations went virtually unnoticed in Russia, perhaps because during the inter-war period Finland had sovereignty over the Petsamo region.

In 1928, A. V. Shmidt excavated several graves at the Bol'shoy Oleny Ostrov cemetery site (currently known as the Kola Oleneostrovskiy cemetery; Kolpakov et al. 2019; Murashkin et al. 2016) on Kola Bay, northwest of Murmansk, which produced well preserved human bone and bone/antler artifacts. Schmidt noted similarities between his material and the bone/antler tools that had been recovered by Solberg at the Kjelmøy sites in Varangerfjord. This material has now been dated to the Early Metal Age. B. Zemlyakov, acting on the instructions of the Commission for the Study of the Quaternary Period, conducted additional archaeological explorations on the Rybachiy Peninsula in 1935–1936, finding additional house structures and confirming the conclusions reached previously by the Norwegians (Zemlyakov 1937). At this point, however, the rest of the territory of Murmansk *oblast* still remained almost unexplored. After World War II, in 1947–1948 Nina Gurina explored a considerable part of the Kola coast and continued the excavation of the Bol'shoy Oleny Ostrov cemetery. The subsequent stages of research, however, were characterized by a nearly total absence of any scientific contact between Soviet and Norwegian archaeologists.

In Norway, from 1951–1960 the Norwegian archaeologists Povl Simonsen and Knut Odner (Odner 1964; 1966; Simonsen 1961; 1963) followed up the earlier work of Anders Nummedal and Gutorm Gjessing by undertaking large-scale excavations of Stone Age sites in Varangerfjord and on the Pasvik/Patsojoki River border with Russia. An important result was the documentation of pit-houses of varying forms from different periods. One form in particular stood out: the so-called "Gressbakken" house. These are relatively large (averaging ca. 25 m^2), often display three apparent entrance passages (front and at each end), generally have a pair of rectangular stone-framed hearths in the middle of the floor and are sometimes associated with substantial external middens containing shell, food remains and tools of bone, lithic material and fire-cracked rock (Figure 2.1). Gressbakken houses often occur in groups, such as the 14 structures at the type-site, Gressbakken Nedre Vest (Figure 2.2; Simonsen 1961: 272). Radiocarbon dates accumulated over the years now indicate these houses date 2300–1500 BC (Helskog 1984; Schanche 1994; Skandfer 2012).

It seems probable that the resumption of fieldwork on the Kola Peninsula was prompted by Povl Simonsen's visit to Nina Gurina's excavations on the Volga River during the mid-1960s, when Simonsen told her about his work in Finnmark. In 1965 Gurina conducted surveys on the Rybachiy Peninsula and along the Pasvik/Patsojoki River. In 1969 the Kola expedition of the Leningrad Branch of the Institute of Archaeology (now Institute for the History of Material Culture of St. Petersburg) of the Academy of Sciences of the

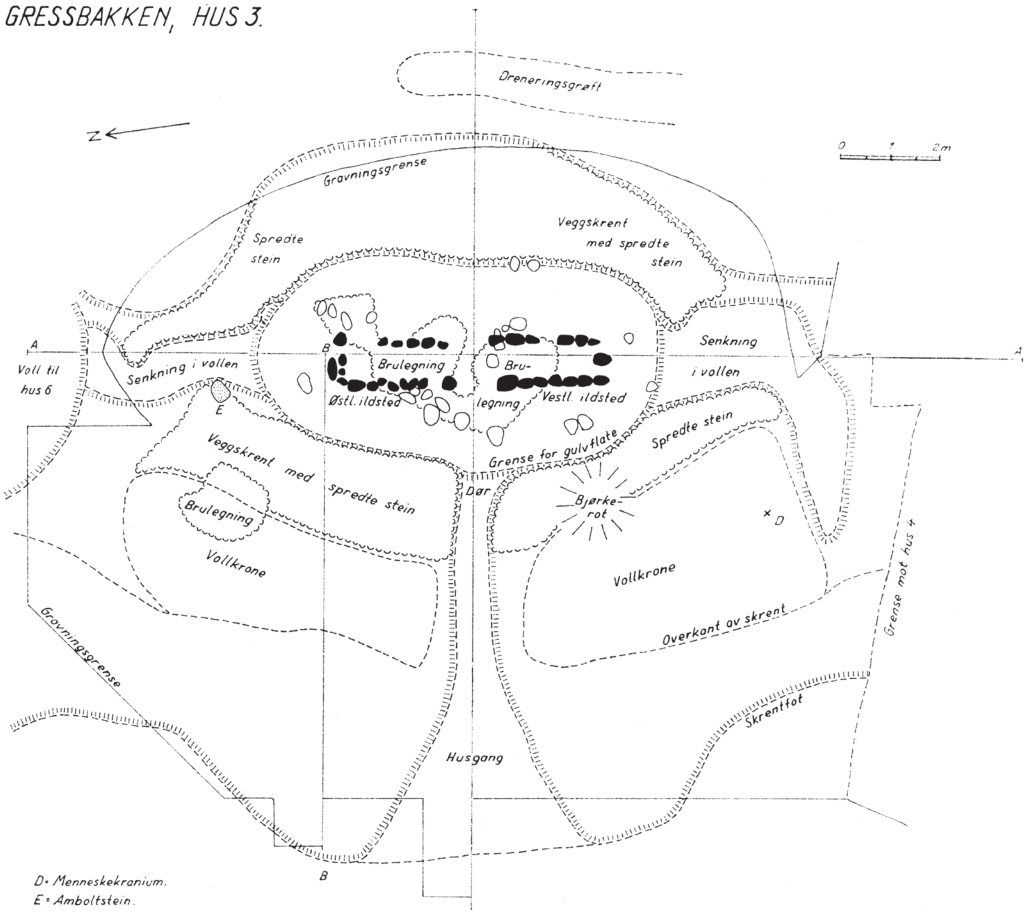

Figure 2.1. Drawing of a "classic" Gressbakken house at Gressbakken Nedre Vest in Varangerfjord; from Simonsen (1961: 290). Note the entrance passage at the front wall, depressions at each end that might be additional entrances or annexes, and the midden mounds on both sides of the front entrance. Reproduced with the permission of The Arctic University Museum of Norway, UiT – Arctic University of Norway, Tromsø.

USSR was organized, headed first by Gurina and now by Vladimir Shumkin. Since then, the expedition has discovered about 500 occupation sites ranging in age from Mesolithic to medieval times, including petroglyphs at Ponoy and Kanozero, rock paintings at Rybachiy, labyrinths and offering sites (Kolpakov et al. 2008; 2016; 2019; Shumkin 2000; 2014).

The end of the 1980s witnessed a rather paradoxical situation. The results of archaeological explorations in Finnmark and Murmansk oblast were quite comparable in terms of artefact assemblages, but while the Norwegian researchers had discovered hundreds of Stone Age and Early Metal Age settlements with numerous pit-houses of different types, their Russian colleagues had studied analogous settlements without semisubterranean dwellings – only the remains of tent-like constructions were found at some of the Kola settlements (Gurina 1987; 1997). As early as 1947, Gurina had excavated a number of possible pit-houses in the southern part of the Kola Peninsula on the Niva River near Kandalaksha, but it was difficult to establish the authenticity of these constructions. She also discouraged the testing of possible houses by others, although the reasons for this remain unclear. Nevertheless, in 1983 Vladimir Shumkin excavated two shallow dwellings in Kruglaya Inlet and in 1985 he excavated another in nearby Dvorovaya Inlet (Kolpakov et al. 2016: 171). In 1991–1992 Oleg Ovsyannikov excavated 13 additional dwellings in Dvorovaya Inlet, one of which resembled a Gressbakken house (Kolpakov et al. 2016: 171; Ovsyannikov 2012: 279).

In 1992, the first joint Norwegian-Russian investigation conducted by Knut Helskog, Ericka Engelstad, Vladimir Shumkin and Abram Stolyar confirmed the existence of pit-houses at Grottug (Volokova Bay) on the Rybachiy Peninsula and discovered settlements with houses resembling the Norwegian "Gressbakken type" in Drozdovka Bay (Figure 2.3) (Shumkin 1993). As a consequence, in 1994 a joint Norwegian-Russian project devoted to the study of Kola pit-houses was started with the goal of comparing them with contemporary settlements in Finnmark with respect to dwelling form, material culture as-

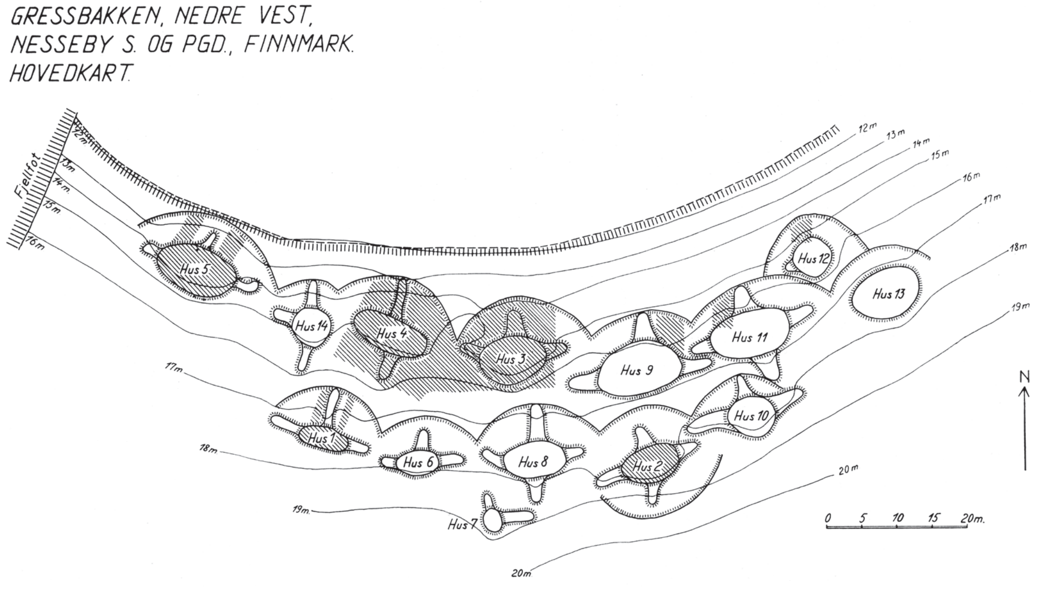

Figure 2.2. Map of the Gressbakken Nedre Vest site in Varangerfjord; from Simonsen (1961: 272). Hatching indicates areas excavated by Simonsen from 1956 to 1958. Reproduced with the permission of The Arctic University Museum of Norway, UiT – Arctic University of Norway, Tromsø.

semblages and subsistence-settlement patterns (cf. Helskog 1984). This work began in Drozdovka Bay, as the region had a number of rich and already well-studied archaeological sites. The excavation of a large pit-house at the Ust-Drozdovka III site was also combined with survey activity in several other parts of Kola, during which numerous new settlements ranging from the Mesolithic to the medieval Sámi occupation were discovered and pit-houses of different types were identified. Over the past 15 years, more than 400 pit-houses from the Stone Age and Early Metal Age have been registered (Kolpakov et al. 2016: 175; Shumkin 2014).

The Bol'shoy Oleny Ostrov (Kola Oleneostrovskiy) cemetery was re-investigated in 2000–2005 by The Kola Archaeological Expedition/Institute for the History of Material Culture, Russian Academy of Sciences led by Vladimir Shumkin, revealing seventeen well-preserved interments dating to the Early Metal Age, with radiocarbon dates mostly ranging between 2500 to 800 BC (Kolpakov et al. 2019; Murashkin et al. 2016; Shumkin 2014; Shumkin et al. 2006). Several individuals were clearly buried in small wooden coffins, similar to the contemporary Sámi sled (*gieres*), and grave goods included harpoons, fishhooks, elk/moose-head decorative objects and many other items. Analyses of the human skeletal morphology and aDNA samples indicate biological affinities with western Siberia (Der Sarkissian et al. 2013; Khartanovich et al. 2019).

In 2010, large scale archaeological research was undertaken at Teriberka, on the Kola coast 65 km east of Kola Bay (Murmansk), connected with the development of land terminals for servicing the large gas fields in the Barents Sea. Semisubterranean house structures (some clearly resembling the Norwegian Gressbakken forms) and hearths have been dated between 3500 BC and AD 500 (Kolpakov et al. 2016; Shumkin et al. 2012). The Kola Archaeological Expedition has also conducted excavations on the Rybachiy/Fisher and Sredniy Peninsulas, Kildin Strait (Kolpakov et al. 2016), as well as Kharlovka River (Kolpakov et al. 2021).

Altogether, more than 1000 sites from the Mesolithic to the nineteenth century AD have been discovered in the 300 km long coastal area from the Rybachiy/Fisher Peninsula in the west

Figure 2.3. A large semisubterranean house at Kumzha, Drozdovka Bay, 1992. Professor Abram Davidovich Stolyar as scale. Photo: Knut Helskog.

to the Nokuyev Bay area in the east (Kolpakov et al. 2016: 175). In essence, the north coast of the Kola Peninsula appears to have been continuously inhabited from the early part of the Mesolithic to the present, and ongoing research will undoubtedly reveal numerous new sites from all periods.

To conclude, in recent years the archaeology of Kola has begun to converge more with that of Norwegian Finnmark as fieldwork in both countries has facilitated exchanges of personnel, knowledge and experience. This has particularly been the case with respect to the documentation of semisubterranean house structures. But there is still far to go with respect to documenting the range of variation in the Kola dwellings and controlling their dating. This volume attempts to contribute substantively to that goal.

Chapter 3

Drozdovka Bay: An Environmental and Archaeological Overview

Drozdovka Bay is located ca. 250 km east of Murmansk and 180 km northwest of the opening of the White Sea. Much of the Kola coast east of Murmansk is lacking in sheltered bays, so the four inlets that make up the Drozdovka region (Figure 3.1) constitute an important resource for humans and other life forms. Drozdovka Bay is a small fjord, only 2 km wide and 6 km long, bordered by hills of Precambrian gneiss that do not exceed 180 m in height, but which increase to 300 m further inland. At the head of the fjord an important salmon stream, the Drozdovka River, extends inland ca. 15 km, ending at a watershed just north of a major inland lake system. The Kumzha River empties into the west side of Drozdovka Bay but extends only 4 km inland. Immediately west of Drozdovka Bay is Varzina Bay, which contained a substantial historic Sámi village. East of Drozdovka Bay are Nokuyev Bay and Ivanovskaya Bay, the latter a long, narrow inlet that runs parallel to the Barents Sea coast.

Figure 3.1. The Drozdovka Bay area with the main archaeological localities discussed in the text. Modified from an original map by E. Kolpakov.

From the 1550s–60s, Dutch and English traders visited the Russian settlement at Kola Bay (Murmansk area) and many plied the Kola coastal route to the trading center at Archangelsk (Veluwenkamp 1995). Map references indicate that the Varzina-Drozdovka area was known to these travelers (Derzhavin 1997: 39; 2006).

Today Drozdovka Bay lies in the coastal tundra vegetation zone. The outer part of the bay has heath vegetation, but as one moves into the bay there is also birch scrub. In the mid-inner bay zone, there are discontinuous stands of small birch trees, which can form thicker stands in sheltered areas. The birch forest limit lies ca. 80 km inland from the head of the bay.

Sources of gray shale and black silicified shale/chert may be present near the Chernaya River in Ivanovskaya Bay, ca. 12 km northeast of the archaeologically investigated area at Ust-Drozdovka (Figure 3.1) A site here with surface finds of considerable quantities of debitage and fragments of tool preforms gives the impression of a "workshop" for materials derived from bedrock sources rather than moraine cobbles (Figure 3.2; Shumkin 2001: 84–85, 170 endnote 119). It is not clear if this is the origin of the slate/shale found in House 5 at Ust-Drozdovka III. Judging from the high frequency of raw soapstone clumps in the House 5 excavations, there are probably local geological deposits of the material in the Drozdovka area, although these have not yet been identified.

Paleoenvironmental History

The primary concerns for local paleoenvironmental history are changes in postglacial shorelines and vegetation patterns. The main points of each will be summarized in turn.

Figure 3.2. Possible workshop locality for shale/slate tools, Chernaya River. A preform is visible in front, near center. Photo: Knut Helskog.

Post-glacial Shoreline Change

According to the generalized regional isobase map for northern Fennoscandia (Møller & Holmeslet 2012) and the uplift data from Snyder et al. (1996; 1997) that covers the area from 40–140 km west of Drozdovka Bay, the Drozdovka area lies on isobase 9 or 10. The early post-glacial marine maximum was 22 m above modern sea level (see Appendix 1), and the Tapes transgression maximum was at 9 or 10 m. The shoreline displacement curve shows sea level regression down to 4–5 m at 9500 cal. BP (7500 BC), then transgression after 8500 cal. BP (6500 BC), reaching 10 m by 6300 cal. BP (4300 BC), after which sea level became regressive until present. The most important implication of the displacement data is that virtually all shoreline-located Mesolithic sites in the Drozdovka Bay area would have been transgressed and either washed away or covered over by marine sediment. Only sites located above their contemporary shorelines and at over 10 m above modern sea-level would have survived. The archaeological record is consistent with these data, as it appears that only Late Mesolithic localities are present, such as on a prominent 20 m terrace at Ust-Drozdovka.

Vegetation Change

In 1994, Matti Saarnisto and Jussi-Pekka Taavitsainen took a pollen core from Lake Soldatskoye, located only 200 m west of the mouth of the Drozdovka River, which debouches into the head of Drozdovka Bay (Figure 3.3). The core was analyzed by Irmeli Vuorela; a detailed report can be found in Appendix 1. The core covers almost the entire Holocene, extending back to 11,000 cal. BP (9000 BC). The basal level contains pollen of taxa indicative of tundra vegetation, such as Cyperaceae, Lamiaceae, *Artemisia*, Chenopodiaceae, Rosaceae, Ericaceae and *Salix*. Birch (*Betula*) pollen increases prior to 10,700 cal. BP (8700 BC)

Figure 3.3. Photo looking westward over the Ust-Drozdovka site (House 5 area marked with white arrow), the Drozdovka River, and Soldiers Lake (Soldatskoye) in the background. Photo: Knut Helskog.

and influx values indicate its greatest abundance between 8800–6800 cal. BP (6800–4800 BC), at which time there was probably a continuous open birch woodland in the area. Birch influx declined sharply after 7800 cal. BP (5800 BC) and continued to decline until 1400 cal. BP (AD 500), when a slight increase occurred, after which it declines towards the modern levels of a sparse birch woodland. Alder was present by 9500 cal. BP (7500 BC) and reached a peak prior to 8800 cal. BP (6800 BC), declining after 4500 cal. BP (2500 BC). Pine pollen reaches a maximum between 6800 and 1400 cal. BP (4800 BC–AD 500), but influx values are consistently low enough to suggest there were no trees in the area, although a pine needle found in a pollen core unit dated between 3800 and 1600 cal. BP (1800 BC and 300 AD) indicates some trees may have been present. Fluctuations in pine influx values indicate shifts in the pine limit, which is currently about 80 km south of the sampling site. A continuous spruce pollen curve begins from 7800 cal. BP (5800 BC), but the influx values are low, indicating long-distance transport.

Using the herb pollen and spore data, along with charcoal particles, three periods of anthropogenic influence are suggested: 6800–4500 cal. BP (4900–2500 BC), 3800–1600 cal. BP (1800 BC–AD 300), and 1400 cal. BP (AD 500) to the present day.

In addition to the pollen analysis, diatoms from the core were analyzed by Grönlund & Kauppila (2002). A deviation in the diatom stratigraphy towards nutrient-rich conditions between 5800 and 4500 cal. BP (3800–2500 BC) might have some linkage to human activity in the area, but this cannot be inferred directly from the diatom data. Increased acidification after 4500 cal. BP (2500 BC) may signal the development of peatlands.

The Archaeological Sites

Surveys in the Nokuyev Bay region (which includes the Drozdovka, Varzina and Ivanovskaya Bays) have identified 127 archaeological sites, including 161 prehistoric houses (Figure 3.1). Of these, 53 houses are found in the inner part of Drozdovka Bay, and four semisubterranean houses were registered along the lower reaches of the Drozdovka River.

The sites date from the late Mesolithic to recent times, although most of them appear to date to the third and second millennia BC, that is, the Neolithic (Late Stone Age) and Early Metal Age. Settlements from these periods are concentrated in four areas: the inner bay and upper Drozdovka River, the mid-bay area from Kumzha to Mayak, and on Nokuyev Island at the mouth of Drozdovka and Ivanovskaya Bays. The main locality described here – Ust-Drozdovka III – lies in the innermost Drozdovka Bay area near the mouth of the Drozdovka River. The previously best-known site in the region, Mayak, is located on the western side of Drozdovka Bay, about halfway up the bay.

Ust-Drozdovka

Ust-Drozdovka (Figures 3.4 and 3.5) consists of four sites located on the western edge of an extensive flat terrace north of the mouth of the Drozdovka River. The terrace edge falls steeply to the present river estuary on the west side and to a small bay on the northeast. All four sites are located at 20 m above present sea-level. As discussed previously, the post-glacial shoreline displacement regime in the area (Koshechkin 1975; Snyder et al. 1996; 1997) was marked by relatively little isostatic rebound and a marine transgression that erased or covered all but the latest Mesolithic sites. Given the limited uplift and the prominence of the 20 m terrace as a natural settlement attractor, sites dating from 5000 BC to the present are all found on the same terrace level (Figure 3.6).

Ust-Drozdovka I is a large open-air locality with traces of Neolithic occupation, of which 756 m^2 was excavated from 1975 to 1978 (Gurina 1997: 46; Shumkin 1984; 2001). Only one radiocarbon date is available from this site: 5510±100 BP (4456–4249 BC, 68.3% prob; LE-1332; Gurina 1997: 49, 138), which is believed to date the Early Neolithic component. About

Figure 3.4. Ust-Drozdovka site viewed towards the east (from west of Lake Soldatskoye). House 5 area marked with a white arrow. Photo: Knut Helskog.

Figure 3.5. Helicopter overview of Ust-Drozdovka I – IV, with the house cluster including House 5 marked with a white circle. Looking north towards the outlet of Drozdovka Bay. Photo: Knut Helskog.

Figure 3.6. Ust-Drozdovka site map, with the House 5 excavation and test-pits marked in red. Modified from the original field map by E. Kolpakov.

60 m to the north are Ust-Drozdovka IУ, II, and III, which are located on a narrow point at the extreme northwest corner of the extensive terrace. Ust-Drozdovka IУ includes three dwelling structures. House 1 is an extremely large rectangular pit-house with inner dimensions of 20 by 7 m. The centre of the house had been disturbed by later human activity and/or fox dens. In 1994 two test pits were excavated outside the house on its northeast side. The unit just outside the house wall revealed traces of a midden deposit, charcoal from which was radiocarbon dated to 3730±40 BP (2200–2040 BC, 68.3% prob; TUa-4403; see Table 5.1 for all the dates from Ust-Drozdovka IУ and III). House 2, lying 15 m east of House 1, is a rectangular depression measuring 10 by 5 m in size, while 50 m to the southeast lies House 3, a 6 by 4 m rectangular depression.

Ust-Drozdovka II consists of a large rectangular boulder cairn, 5.5 by 2.5 m in outer dimensions, possibly dating to the Bronze Age (Figure 3.7). Ust-Drozdovka III lies immediately to the north of the boulder cairn and consists of eight probable house depressions. Five of these (Houses 1, 2, 4, 5, 7) were oval to sub-rectangular (10–15 m long by 5–10 m wide), one (House 3) was round (5–7 m diameter), while two (Houses 6 and 8) were square/rectangular, 6 by 4 and 6 by 7 m respectively. House 5 was chosen for excavation, which occurred during the 1994, 1998 and 2000 field seasons, while five of the other depressions were tested. A charcoal sample from a test pit into the hearth of House 7 was radiocarbon dated to 3515±45 BP (1899–1751 BC, 68.3% prob; TUa-4402).

Terraces further to the east and northeast of Ust-Drozdovka III contained a considerable number of house structures, mostly shallow and more difficult to discern on the surface. Figure 3.8 illustrates one of these, which will not be discussed further here.

In addition to the houses at Ust-Drozdovka III, a radiocarbon date was obtained from Kumzha, a small inlet on the west side of Drozdovka Bay into which the Kumzha River drains. Four large semisubterranean houses along with four smaller square houses were noted here (Figure 2.3). A test pit in one of the large houses revealed a thick deposit of fat-rich sediment. The charcoal from the test-pit was insufficient for radiocarbon dating while a radiocarbon date of 2470±180 BP (1010–111 BC, 68.3% prob; LE-4768) was obtained on fats that saturated the soil sample. This date, however, is problematic with respect to the chronological expectations for the dwelling.

Another set of radiocarbon dates was acquired from the Mayak site, which lies adjacent to a small inlet on the northwest side of Drozdovka Bay. Excavated by Nina Gurina from 1978 to 1982, the site consisted of deep midden deposits containing a huge quantity of faunal remains and preserved bone artifacts (Gurina 1987; 1997). The lower level of the midden contained Neolithic material dated 4600–2500 BC, while the upper levels of the site – which constituted the majority of the archaeological materials – dated to the Early Metal Age. This locality will be discussed in depth in Chapter 8.

The house sites on Nokuyev Island, along Ivanovskaya Bay, and the coast to the north, are similar to those observed in the inner part of Drozdovka Bay. None of these outer sites have

Figure 3.7. The possible Bronze Age cairn, registered as Ust-Drozdovka II. View towards the south. Photo: Knut Helskog.

Figure 3.8. A shallow house-floor on a terrace east of the Ust-Drozdovka site. This is one of several such features on the terrace, none of which have been dated. Looking towards the northwest. Photo: Knut Helskog.

Figure 3.9. Large Gressbakken-like house at Small Sharitskaya Bay, in Ivanovskaya Bay; Knut Helskog as scale. Photo: Bryan Hood.

been tested or excavated, but morphologically most of the dwellings appear to date to within the last 4000 years BC (e.g., Figure 3.9). In addition, small circular walls have been identified as the remains of Sámi houses from the Iron Age and Medieval period. In essence, the prehistoric sites in the outer Nokuyev Bay region span the entire prehistory of the area.

Chapter 4

Excavation of Ust-Drozdovka III, House 5: Changing Perspectives Over Three Field Seasons

Ust-Drozdovka III, House 5, was excavated over three discontinuous field seasons, 1994, 1998, and 2000. Delays in returning after the first season were due to an inability to obtain approval from security officials for the participation of the non-Russian project members. Over this time span, our understandings of the nature of the site changed, as did the crew personnel. Because these circumstances are relevant for evaluating the data presentation that follows, we first sketch out a general expedition narrative, followed by an overview of how the excavation progressed from year to year.

Expedition Narrative

1994 Season

The excavation of House 5 at Ust-Drozdovka was a joint project between Dr. Vladimir Shumkin of The Kola Archaeological Expedition at the Russian Academy of the Sciences in St.Petersburg, Professor Knut Helskog at the University of Tromsø (UiT), The Arctic University of Norway, and Professor Bryan Hood, initially at the Memorial University of Newfoundland, Canada, later at the University of Tromsø. The first field season planned for the summer of 1993 was cancelled because the foreign members of the project were not granted permission to enter the northern border zone on the Kola Peninsula. Permission was granted for the summer of 1994, however, and the crew from UiT and the Kola Archaeological Expedition met July 31 at the Norwegian/Russian border at Storskog, east of Kirkenes, and drove to Murmansk. On the way we stopped at Pechenga to collect a large double-walled house tent with windows and a stove, before spending a couple of nights in a communal lodging house in Murmansk. The members of the crew were Vladimir Yakovlovich Shumkin, Evgeniy Kolpakov, Vladimir Nazarenko, and Svetlana Ilina from Russia, Bryan Hood from Canada, and Åse Sørgård and Knut Helskog from Norway. In Murmansk we bought provisions and then headed for the *Maria Ermolova*, a passenger ship that linked with the coastal communities on the north coast of the Kola Peninsula and Archangelsk. We left at 18:00 and were put ashore at 6.00 in the morning at the Drozdovka settlement (a military outpost), from where Anatoli Gavrilov, the lighthouse keeper, provided transport to the innermost part of Drozdovka Bay. Setting up camp took the remainder of the day. In the following days we explored the house depressions and decided to excavate House 5 at the site Ust-Drozdovka III. After a few days, Professor Matti Saarnisto from the Geological Survey of Finland arrived by helicopter together with the archaeologists Jussi-Pekka Taavitsainen and Aleksander Saksa to conduct paleo-ecological (botanical) research in the region. They camped with us for a week and also participated in our excavation. Saarnisto also received two radiocarbon samples from the archaeological site to date in Helsinki and thereby permit comparison of the cultural materials with the vegetation sequence from his own research, which is included as an Appendix in this volume. Figure 4.1 provides a group portrait of the 1994 crew.

The excavation began with exposure of part of the house floor, as well as two trenches running up the house walls from the floor area. It became evident that it would not be possible to finish the excavation of House 5 in the time at our

Figure 4.1. Crew 1994. From left: Knut Helskog, Bryan Hood, Evgeniy Kolpakov, Jussi-Pekka Taavitsainen, Aleksander Saksa, Åse Sørgård, Matti Saarnisto, Vladimir Nazerenko, Vladimir Shumkin, Svetlana Ilina. Photo: Knut Helskog.

disposal because the stratigraphy soon proved to be extremely complicated. Therefore, we covered the trenches with a polystyrene tarpaulin and soil, which could easily be removed upon returning to continue the research. We left the site on August 17 with the intent to continue the excavation in 1995.

1998 Season

Unfortunately, it was not before 1998 that the authorities gave the non-Russian members of the project permission to return to Drozdovka. This time the crew members were Vladimir Shumkin, Anton Murashkin, Lila Shayachmetova, Nikolai Uraltsev, Vyacheslav Frolov, Mihail Kazakov and Yuri Ivanov from Russia, and Elisabeth Eriksen, Bryan Hood and Knut Helskog from Norway (Figure 4.2). The fieldwork in 1998 lasted from July 16 to August 10. We left Murmansk on the ship *Klaudia Elenskaya* at 21:00 in the evening and arrived ashore in Drozdovka at 8:00 in the morning the following day. Due to low tide we had to wait five hours before we could move to the site and set up camp. The next day we removed the backfill and the tarp, cleaned the old excavation area and started deturfing the new area we aimed to excavate. The good weather that day was one of only three days for a 26-day excavation plagued with low temperatures and rain and fog from the Barents Sea. We stretched a tarp over the whole excavation unit as protection against the elements and stayed low. The large double-walled house tent proved to be a highly valuable investment against the elements.

The small 1994 excavation was expanded over the entire house floor and parts of the walls. We worked hard, but the increasing complexity of the site was such that we did not manage to finish the excavation. Again, we had to cover the excavated area with the tarp and backfill, with the goal of finishing the fieldwork the following year.

Figure 4.2. Crew 1998. From left: Vladimir Shumkin, Lilia Shayachmetova, Vyacheslav Frolov, Nikolai Uraltsev, Bryan Hood, Mihail Kazakov, Knut Helskog, Yuri Ivanov, Elisabeth Eriksen, Anton Murashkin. Photo: Knut Helskog.

Figure 4.3. Crew 2000. From left: Zhenya Kolpakov, Frank Røberg, Aile Aikio, Oula Seitsonen, Bryan Hood, Sanna Puttonen, Knut Helskog, Gennady Uraltsev, Eugeniy Kolpakov, Elena Ryabtseva, Lilia Shayachmetova, Nikolai Uraltsev, Anton Murashkin, Vladimir Shumkin. Photo: Knut Helskog.

2000 Season

Unfortunately, the non-Russian members of the project were not allowed to enter the Drozdovka area again before the summer of 2000. This time we accessed and left the site by helicopter (MI-8), which was a pleasure labor- and time-wise compared with the time-consuming boat trip and the repeated transfers of equipment and provisions.

The members of the crew were as follows (Figure 4.3): Vladimir Shumkin, Evgeniy Kolpakov and Elena Ryabtseva with their son Evgeniy Kolpakov, Anton Murashkin, Lila Shayachmetova and Nikolai Uraltsev with their son Gennadiy from Russia, and Aile Aikio, Sanna Puttonen and Oula Seitsonen from Finland, and Bryan Hood, Frank Røberg and Knut Helskog from Norway.

The fieldwork lasted from July 25 until August 21. All of July 26 we labored to remove the backfill and tarp that covered House 5, controlled the grid system and decided in which areas we needed to extend the excavation. The first ten days were blessed with much good weather and relatively few mosquitos and gnats, but later rain and cold fog from the Barents Sea drifted into the area and made life miserable. On August 12 there was considerable helicopter activity in the area and sounds from explosions associated with naval exercises in the Barents Sea. During the night of August 15, we heard on the BBC World Service that in the morning of August 12 the Russian nuclear submarine Kursk had sunk along the coast not far from where we were. It was a terrible tragedy in which the 118 people on board all died, mostly young men. August 15, Russian Archaeology Day, we spent inside the tents because the weather was so stormy and rainy that it was impossible to work.

The last five days in the field were hectic, as we needed to finish the excavation. Rain and fog hampered the process, but fortunately, on the last day we were "blessed" with clouds and calm weather with neither rain nor fog. The last day was a long one; backfilling on the tarp over the remnants of the excavation finished in the dark around 22:00 at night. We judged that we had retrieved sufficient information to make a plausible analysis of what we now realized were two superimposed houses from approximately 2200–1500 BC. Thus, we preserved the remains of the houses and the structural relationships to the adjacent houses and midden deposits for future research.

Excavation Progress: Changing Perceptions of the Site

Initially, House 5 seemed to resemble the "Gressbakken" houses known from the Norwegian coast. During the first field season in 1994, part of the floor area was opened up and an east-west test trench was extended from the floor area up the sides of the house to the top of the walls to acquire a profile (Figure 4.4). Two large rectangular hearths of typical Gressbakken form were uncovered in the floor area and possible postholes were noted in the floor. Overlying the hearth and floor deposits was a sandy podzol A-horizon that contained a considerable quantity of quartz debitage and tools. This layer had to represent either deposits resulting from roof collapse after the house was abandoned or the results of activities undertaken in the house depression sometime after the dwelling was abandoned (or perhaps a combination of these). In the profile area on the west wall of the house depression a small area with a finely laminated series of ash and sand layers was found, the significance of which was unknown. A test-pit in the northeast wall area indicated a midden with mussel shell and preserved bone. Radiocarbon dates from the western part of the house floor (3560±60 BP; 2016–1776 BC, 68.3% prob.; Su-2839) and two from the non-shell northwest midden outside the house (3520±80 BP; 1951–1701 BC, 3680±70 BP; 2193–1960 BC; both 68.3% prob.; Su-2840, Su-2841) confirmed that the house dated to what would be termed the Gressbakken Phase in Norway.

The 1998 field season greatly expanded the excavation area to encompass the entire house floor as well as most of the walls (Figure 4.5). It was realized that the house was more stratigraphically complex than expected, and that its configuration did not seem to conform to expectations derived from Norwegian Gressbakken dwellings. Large rocks in the middle of the north and south walls

Figure 4.4. House 5 excavation area in 1994, view towards the north. Exposure of the floor area and profile trenches running up the walls. Photo: Knut Helskog.

Figure 4.5. House 5 excavation at the end of the 1998 field season, view towards the south. Large hearths under the central profile, “annexes” to the left and right. Darker areas on the excavation margins are wall middens and midden deposits slumping onto the house floor. Photo: Knut Helskog.

were suggestive of entrances. Continued excavation of the floor area indicated marked color and texture differences between the area west of the central fireplace (reddish, sandy) and that to the east (darker, mottled, clayey). Removal of thick midden deposits from the eastern and western walls indicated that the underlying house walls cut further than expected into the yellow sand subsurface, giving the impression of annexes on each long side of the house. Thus, the floor area seemed to take on a cruciform shape, something never seen previously in the region. The floor of the eastern annex contained a black, clayey, midden deposit containing much bone (mostly seal).

During the final 2000 field season, further excavation changed our perception of the deposits by exposing even more complexity. Removal of the midden material from the eastern "annex" revealed an unusually well-preserved hearth oriented at 90° to the two large rectangular hearths that ran north-south in the central floor area (Figure 4.6). Possible remnants of a similar hearth were also identified in the western "annex". Additionally, removal of the overlying midden materials on the wall of the western "annex" revealed an entrance passage that cut very clearly through the yellow sand subsurface as well as through a brown sand deposit outside the house wall. These features made it obvious that the unusual floor shape and spatial differences in soil color and texture did not reflect one large house. Rather, there were two superimposed houses, the earlier one (5A) oriented east-west, and a younger one (5B) oriented north-south that was constructed perfectly perpendicular to the first, cutting through the center of the earlier structure and obliterating its mid-section (Figure 4.7). To further complicate matters, outside the southern end-wall of the later house 5B was what appeared to be a circular antechamber to the younger house (with deposits of fire-cracked rock and charcoal), or perhaps an entrance passage (Figure 4.8). A similar concen-

Figure 4.6 House 5 excavation at the end of the 2000 field season, view towards the south. The later house (5B) with rectangular hearths clearly visible running front-back (north-south) in the photo, the earlier house (5A) running left-right (east-west) through the middle of the photo. The hearth associated with the earlier house (5A) is marked with an arrow. Photo: Knut Helskog.

tration of rocks and charcoal was found just outside the north wall of the same house, although its structural relationship was more uncertain.

The radiocarbon dates received from the various features of the site complicated the picture even further. They suggested that the two recognizable houses are only two components in a multiple occupation sequence and that some of the features first thought to be associated with one or the other of the two dwellings may, in fact, be traces of earlier and intermediate activity phases at the site. In sum, this one area at Ust-Drozdovka III was used repeatedly between 2300–1500 BC, with traces of pre-dwelling structure activity, two recognizable house phases, possible activities occurring between the two house phases, and a post-dwelling depositional phase. The final picture was therefore very different from our initial expectations that we were going to undertake a straight-forward excavation of one large house.

This kind of complex palimpsest deposit is not known from the north Norwegian coast. Although some Gressbakken houses in Varangerfjord

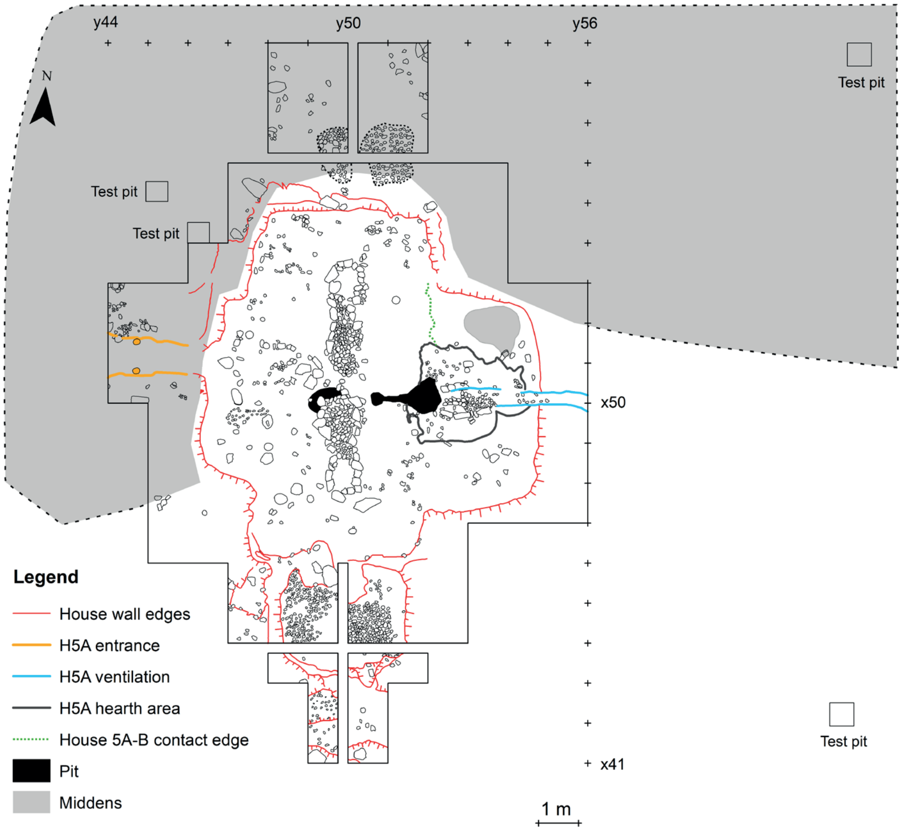

Figure 4.7. Plan drawing of the House 5 excavation at the end of the 2000 season, without house phasing. The later house (5B) runs north-south and includes the large rectangular hearths. The remnants of the earlier house (5A) run east-west and consist of a portion of end-wall and its entrance passage on the left, and part of the eastern house-end with a hearth-pit construction on the right.

Figure 4.8. Circular chamber on the southern end-wall of House 5B; view towards the east. House 5B is partly visible on the extreme left of photo. Photo: Knut Helskog.

were partly rebuilt or reoccupied (e.g. Simonsen 1961: 276–280, 346–353), the usual practice was to disperse dwellings along raised shorelines. Despite the availability of habitable shorelines at Ust-Drozdovka, the dwellings were packed into a small area on a point and an even smaller area at House 5 was used intensively and repeatedly. This pattern indicates deliberate choice, and it implies that actions undertaken at any given time after the first establishment of the settlement were always played out in relation to the existing built environment or remnant traces thereof. Consequently, the interpretation of the House 5 palimpsest is not simply a question of understanding site formation and abandonment processes, but is also a question of interpreting a sequence of human actions in terms of how people incorporated or reacted to the material remains resulting from previous actions.

Chapter 5
Features and Occupation Sequence at Ust-Drozdovka III, House 5

This chapter provides an overview of the House 5 excavation area. We first describe the primary archaeological features and depositional units. Then we consider how these units should be understood as an occupational sequence, based on an in-depth analysis of the radiocarbon dates.

Features and Main Depositional Units

Given the complexity of the House 5 area, a description of the occupation components must be based upon what we can be sure of: that stratigraphically we have two definite house phases. The primary reference points for this occupation sequence are the two recognizable houses, which are defined primarily by their hearth configurations. These houses are designated 5A (oldest, oriented east-west) and 5B (youngest, oriented north-south). The later House 5B can be clearly distinguished as a unity based on its end-walls, its long-walls clearly cutting through the House 5A floor, and its two large hearths. The earlier House 5A has been cross-cut by House 5B, so we must assume that the two truncates – the eastern and western end-portions – belong to the same house. Given that some of the western end-portion of House 5A has been disturbed by the construction of House 5B, clear evidence for symmetry in construction, such as similar hearth types at each end, is somewhat obscured. Nonetheless, we argue that the western and eastern areas are part of the same dwelling. Thus, our description begins with the earliest house, 5A, followed by the complex stratigraphic sequence associated with the entrance to the house. We then discuss the later house, 5B. Finally, because the relationship of some of the other archaeological features to these two houses is difficult to determine they are presented last, as features of uncertain temporal phasing.

House 5A

We believe that House 5A (Figure 5.1) was a rectangular dwelling with a 9 m long, 4.5–5.5 m wide floor area (ca. 45 m^2) and two hearths, one in each end-portion. There were also ventilation channels running from each hearth through their respective end-wall to the exterior. Unfortunately, the western hearth and channel were mostly destroyed by the construction of House 5B. House 5A was accessed through a short entrance passage extending from its western end-wall.

The best-preserved portion of House 5A was the hearth at the eastern end of the dwelling (Figure 5.2), which was associated with a clear perimeter wall excavated (50 cm) into the sterile subsoil. The hearth was unusually well-preserved, 170 cm long and up to 100 cm wide, with large border stones along the south side (those on the north side had been removed) and an inner deposit of smaller fire-cracked rocks, all of which were blackened, probably by the burning of animal fat. Excavation within the hearth indicated there was a layer of charcoal and burned fat or fat-consolidated sand between upper and lower tiers of fire-cracked rocks, which implies two firing episodes. The base of the feature contained a 1 cm thick compact layer of burned fat. A distinct dark layer extended 50–100 cm outwards all around the feature. Overlying the hearth prior to its exposure was a whitish-grey deposit with roughly the same horizontal extent as the dark basal layer.

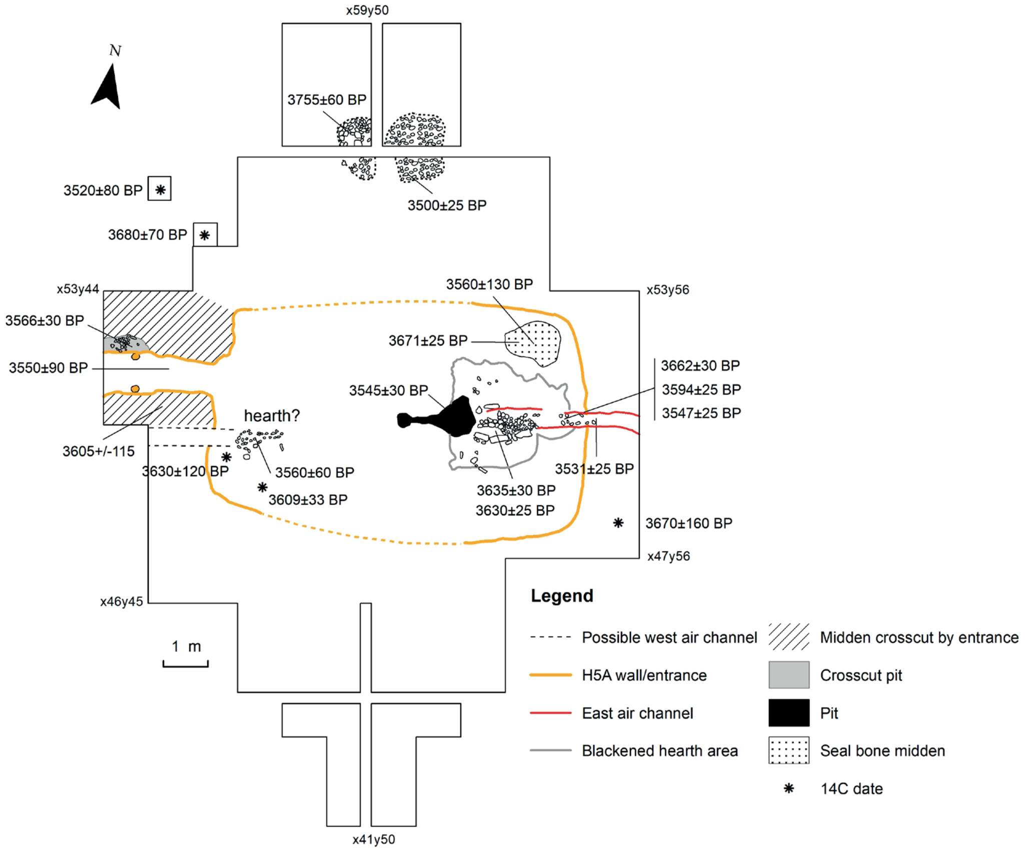

Figure 5.1. House 5A schematic diagram and relevant radiocarbon dates.

The most remarkable aspect of the feature was the remains of a channel that extended eastwards from the hearth and through the base of the eastern end-wall of the house (Figure 5.3). The channel was 50 cm wide at the hearth-end, excavated 10 cm into the yellow sub-surface, narrowing gradually to 40 cm wide where it entered the house wall. The deposits on the bottom of the channel inside the house were gravelly black sand mixed with charcoal, and they appeared to be saturated with a fatty substance. The channel entrance to the wall was marked by a cluster of 10 rocks, and from the top of the wall mound the channel extended another 40 cm before narrowing to 20 cm between four large boulders located approximately one meter from the inside floor area. The channel continued into the unexcavated area to the east, but judging from the rocks and the narrow opening this was close to the terminus of the channel. Considering the length of the channel and its relationship to the top of the remaining wall mound, the base of the house wall had a thickness of 50–60 cm, depending on how far outside the wall the channel ended. In sum, the channel was slightly funnel-shaped, more than 2.5 m long, 50 cm wide and approximately 20-30 cm high at the fireplace, then tapered off to a height of 10–40 cm and a 20 cm wide opening outside the wall. We interpret this feature as an air intake for the hearth.

A longitudinal cross-section profile of the channel was clearly visible in the baulk that ran through the middle of the hearth. As shown in Figure 5.4 (also Profile 2A in Figure 5.20), the channel deposits – which consisted of brown-black sand, slightly blacker than the overlying

Figure 5.2. House 5A eastern hearth. The border rocks on the lower side were removed prehistorically. Note the black staining from burned sea mammal fat, the air channel on the left, and the associated circular pit on the right. View southwest. Photo: Knut Helskog.

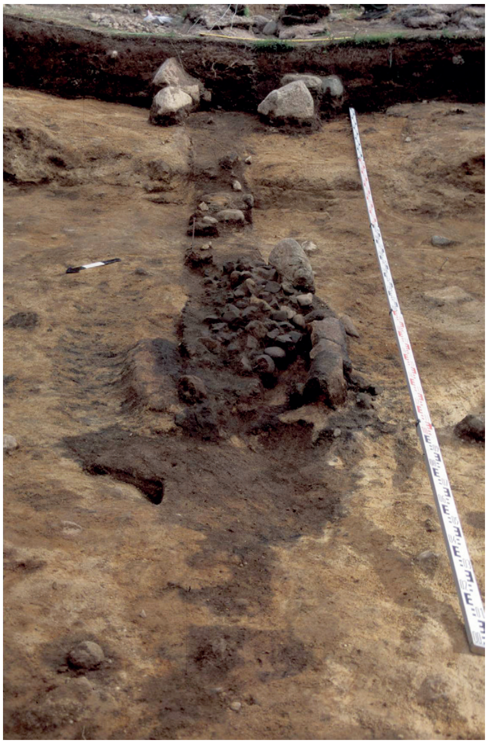

Figure 5.3. House 5A eastern hearth and ventilation channel. View east. Note the extension of the channel over the house wall and between two rock features, and the circular pit (unexcavated) at the other end of the hearth. Photo: Knut Helskog.

midden deposits – extended ca. 1.4 m out from the hearth and were slightly excavated into the top of the basal yellow sand. Adjacent to the hearth, and superimposed on the channel deposits, was a wedge of light brown sand that contained a fleck of red ochre. These two units – which together were up to 20 cm thick – were clearly separated from the overlying midden deposit by a thin dark band (containing charcoal flecks) that began near the hearth and continued eastwards until it arched sharply upwards over the house wall-edge. Thereafter, the channel extended eastwards along the wall-top until the excavation limit as a thin 2-3 cm band of light sand running between the basal yellow sand and the midden deposits. The channel was also visible on the opposite side of the baulk (Profile 2A in Figure 5.20), although here it was a 10 cm thick deposit of slightly banded brown, red-brown and yellow sands.

It should be noted that this hearth/ventilation channel construction is unlike anything previously recorded in north Norway or on Kola, and it appears to be functionally different from the large double hearth associated with later House 5B.

Another feature that seems to have been associated with the eastern end of House 5A was a large pit located immediately west of the hearth (Figures 5.2 and 5.3). This pit was excavated into the yellow basal sand and was covered with deposits associated with House 5B. The pit was oval in plan, funnel-shaped vertically, 90 cm in diameter at the top and 6 cm at the bottom, and 62 cm deep; it was filled with black soil and small charcoal fragments.

Also related to the eastern portion of House 5A was an oval midden deposit, ca. 1.3 by 1.0 m in size, 30 cm thick, which was positioned in the northeastern corner of the floor, about 1.0 m distant from the hearth (Figure 5.5). The lower portion of the midden intruded slightly into the underlying sterile yellow sand. The midden contained the remains of most of the body elements of a harp seal (*Phoca groenlandica*), along with a considerable number of indeterminate seal and

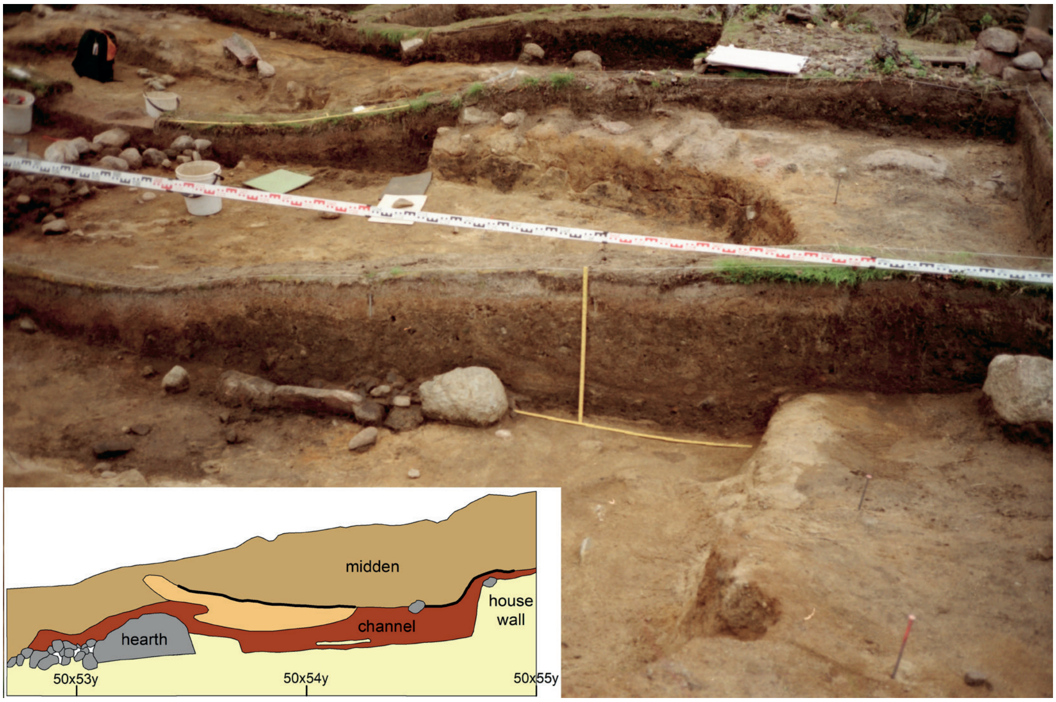

Figure 5.4. House 5A eastern hearth and air channel profile prior to removal of the baulk. View towards the north. The inset diagram provides a simplified profile of the channel between the hearth and the house end-wall. Photo: Knut Helskog.

Figure 5.5. House 5A eastern end; deposit of seal bones on house floor. View north. Photo: Knut Helskog.

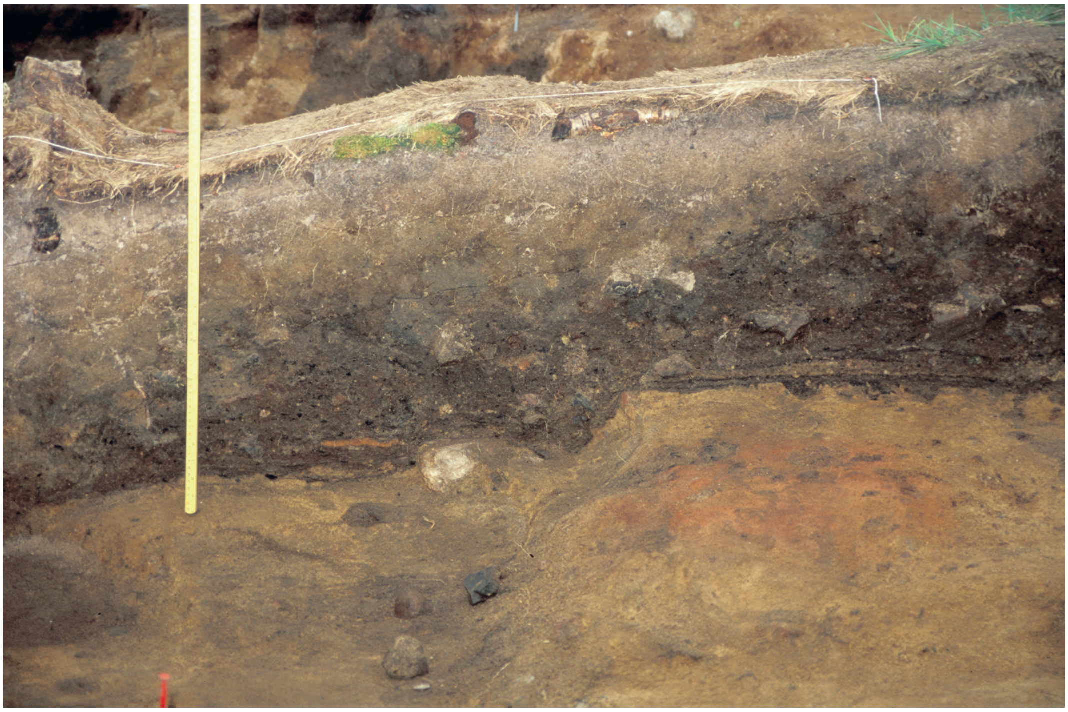

Figure 5.6. House 5A, western end; traces of probable ventilation channel in the profile, on the opposite (northern) side of what is drawn in Profile 2A. Note the horizontal laminations above the house floor to the right of the measuring stick and up to the edge of the house wall, where they continue as a thin band up the wall slope and then further west as a broader laminated band on top of the house wall. Also note the red ochre patch on the wall, adjacent to the House 5A entrance passage (right foreground). Photo: Knut Helskog.

mammal bones, a few bones from reindeer and birds, and single bones of brown bear and fish (see Chapter 7 for details).

Turning to the western end of House 5A, which was badly disturbed by the construction of House 5B, we can identify three features as likely to be associated with the earlier dwelling. At the western edge of the House 5B floor there was a patch of black-stained sand associated with a concentration of small rocks (Figure 5.1), which we interpret as a disturbed hearth. This feature remnant can be seen in relation to a laminated deposit that was visible in the adjacent east-west profile (Profile 2A, Figure 5.20, also Figure 5.6). This deposit was located on top of the west house wall and ran for about 1 m along the top of the basal yellow sand, with a thickness of little more than 6 cm. It consisted of bands of yellow-brown sand and ash separated by thin black bands. About 30 cm downslope towards the house floor, and also on top of the basal yellow sand, was a similar laminated deposit, but this was only 20 cm long. Together, these two features are suggestive of a ventilation channel running east-west from the possible hearth, through the western end-wall and parallel to the south side of the entrance corridor.

As noted at the outset, we believe that the entrance to House 5A was through a short entrance passage extending out from the western end-wall of the dwelling (Figure 5.1). Given the stratigraphic complexity of this area, however, it is treated separately in the following section. The radiocarbon dating of House 5A is discussed later; all the dates for Ust-Drozdovka IУ and III are presented in Table 5.1. Individual dates were calibrated with OxCal 4.4 and the IntCal20 curve (Bronk Ramsay 2021; Reimer et al. 2020) and the summed probabilities were calculated with the same program.

The Entrance Passage: A Complex Sequence

The western side of the site contained a complex and imperfectly understood series of stratigraphic events, the primary feature of interest being the entrance passage to House 5A, which lay underneath a thick layer of midden material that was in turn topped by wind-blown sand. The entrance passage was at least 2.5 m long, 80–90 cm wide, and was excavated ca. 10–15 cm below the surface of the basal yellow sand (Figures 5.7 and 5.8). The passage was filled with light brown sand that clearly cut through adjacent darker brown midden deposits that lay on top of the basal yellow sand that constituted the house wall, and the passage also cut through a small pit containing fire-cracked rock and charcoal, presumably a cooking feature. At the southern junction of the entrance passage and the House 5A wall there was a 30 by 40 cm, 3 cm thick deposit of red ochre, which lay directly on top of the basal yellow sand and beneath the thin brown layer that was cross-cut by the entrance fill.

On the inner edge of the entrance passage, 2.0 m out from the house wall, there were small post-holes on each side of the passage, suggesting a support framework for entrance walls and/or a roof. Given the sharp thin line separating the entrance corridor from the adjacent deposits, and the lack of identifiable house wall deposits proximate to the entrance, it appears that the passage wall was fairly thin, as if made of hides.

The relationship of the entrance passage to its adjacent and overlying deposits is complicated and not fully understood. Using the horizontal relations depicted in Figures 5.7 and 5.8, as well as the stratigraphic profile at the western end of the entrance (Figure 5.9), the event sequence in this area seems to have been roughly as follows. 1) A small cooking pit was excavated into the basal yellow sand. 2) A red ochre patch was deposited on the yellow sand. 3) A thin brown midden layer was deposited over the ochre and on top of the basal sand in adjacent areas. 4) The shallow entrance passage was excavated, cutting through the edge of the cooking pit and the thin midden layer, then slightly into the basal sand. 5) After the entrance came into use the brown midden continued to accumulate (up to a depth of 15–25 cm) on both sides of the passage, covering the cooking pit and slumping down towards the passage. 6) During the use-period of the entrance a thin deposit of fill accumulated in the entrance passage; this was probably supplemented by slump-

Figure 5.7. House 5A entrance passage, view west with the house floor in the foreground. The stippled area marks the boundary between the entrance passage and adjacent midden deposits. Note the red ochre on top of basal yellow sand near the junction of the entrance and the house floor. The cross-cut weathered soil horizon in the profile is marked with thin white lines. Photo: Knut Helskog.

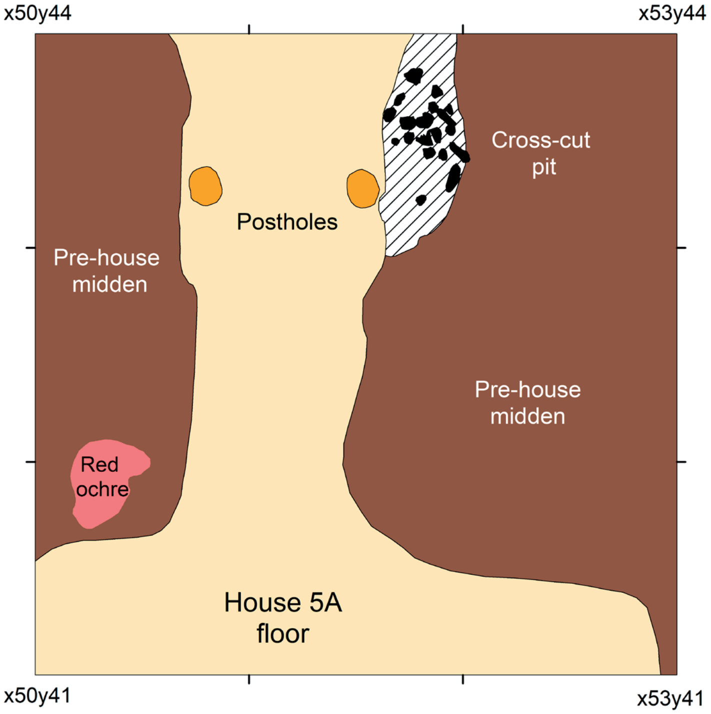

Figure 5.8. House 5A, entrance passage, schematic drawing.

ing from the midden when the entrance went out of use. 7) The midden surface stabilized long enough to permit the development of a distinct rusty soil weathering horizon. 8) The soil weathering horizon was cut through, almost directly over the original entrance passage, although it is unclear whether the entire entrance passage was re-excavated. This event might have been associated with the establishment of House 5B and the re-use of the entrance passage depression as an entrance for House 5B (see below). 9) The weathered horizon and the disturbed area with cutting into the original entrance passage were covered by a 15–30 cm thick midden deposit consisting of brown sand, fire-cracked rock fragments and lithic materials. This was probably related to the on-going activities at House 5B, but contributions from adjacent Houses 3 and 4 are also possible. 10) An 8–10 cm thick layer of podzolized sand mixed with quartz debitage and tools was deposited during the last phase of site use, after the abandonment of House 5B.

Radiocarbon dates suggest that events 1–4, the initial activities in this area, occurred within a relatively short period of time, although two of the three dates are conventional, with large standard deviations. Event 1, the cross-cut pit, was AMS dated to 3566±30 BP. Event 3, the deposition of the midden on the basal sand surface, was dated to 3605±115 BP. Event 4, the entrance passage infilling, was dated to 3550±90 BP. The "R-Combine" function in OxCal 4.4 uses the chi-square test to determine if there is a statistically significant difference between pairs of *uncalibrated* dates, while the "Combine" function tests for differences between pairs of *modelled calibrated* dates and provides an index of agreement between the dates (Bronk Ramsay 2021). Both tests indicate there are no significant differences between the dates, although the large standard deviations for two of them reduce the usefulness of the tests. The sum of probabilities for these dates provides a calibrated range of **2025–1773 BC** (68.3% prob.) or **2200–1640 BC** (95.4% prob.) for the entrance passage events.

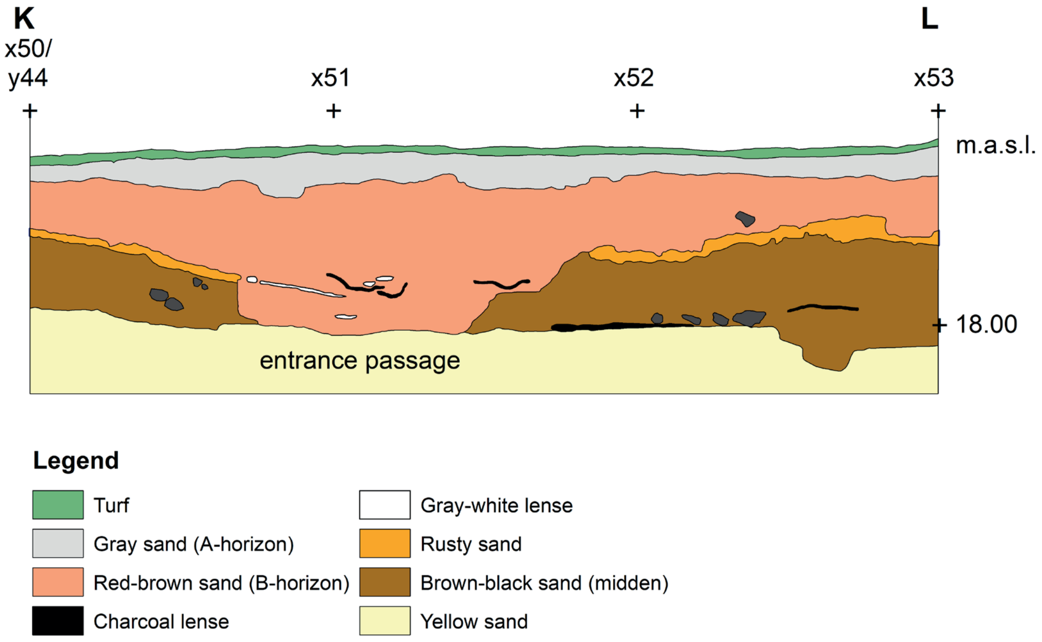

Figure 5.9. House 5A, wall profile at the western end of the entrance passage. For the location see Figure 5.18, Profile 5 (K-L).

House 5B

The younger dwelling, House 5B, was oriented north-south and was 9 m long and 4.5 m wide, with a floor area of ca. 38 m^2 (Figures 5.10 and 5.11). The house was dug into the yellow basal sand, but in this case only at the ends that extended outside the area of the older house. That is, the traces of the east and west long-walls crosscut the floor of House 5A such that House 5B used part of the existing House 5A depression. The main floor areas of the two houses appear to have been dug equally deep, such that they shared the same floor level. The long-side edges of the house floor eventually became apparent when the overlying slumped-in midden deposits were removed, thus revealing where the House 5B floor cut through the earlier deposits (Figure 5.12). The demarcation between the floor and the wall was seen as a distinct low ridge in the west, while on the east side a black 4–5 cm wide linear deposit was present on half of the north side and there was a clear soil color and texture difference between the House 5B floor and the black midden deposit on the floor of House 5A. In the area of cross-cutting there was little evidence that the walls of House 5B were very wide because there was a fairly sharp delineation without possible indications of a wall mound such as layered peat or built-up sand. Instead, the wall may have been rather thin, made of

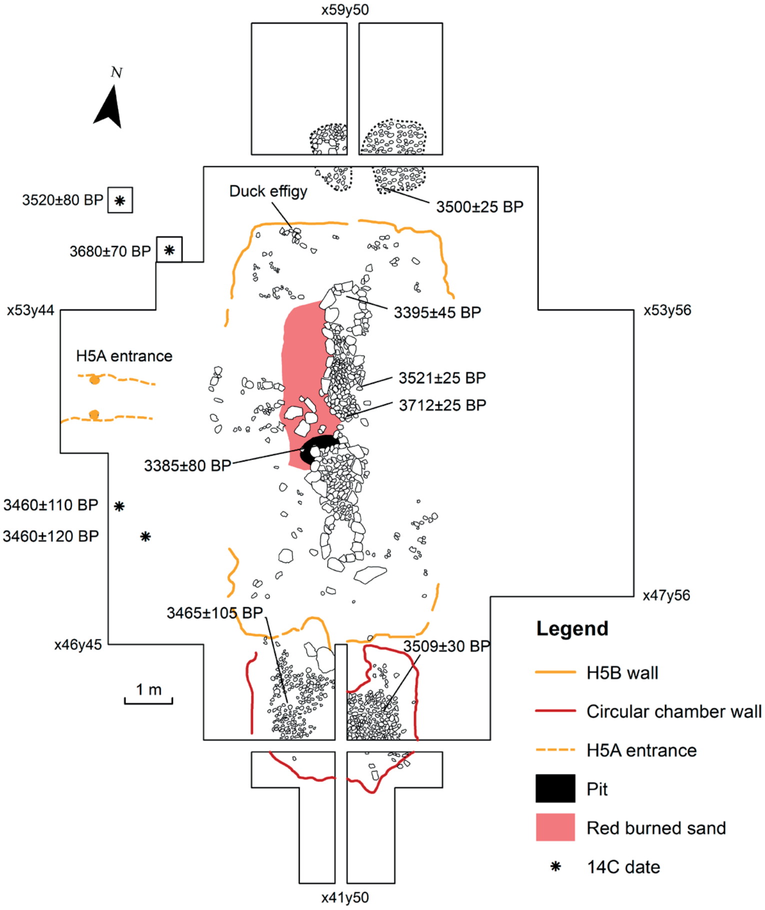

Figure 5.10. House 5B and the circular chamber, with relevant radiocarbon dates.

Figure 5.11. House 5B at the end of excavation. View towards the south. Photo: Knut Helskog.

Figure 5.12. House 5A/5B boundaries. The upper arrow points to a fairly sharp difference between the House 5B floor (yellow-brown) and the midden (dark brown) covering the House 5A floor, indicating where House 5B cut through the earlier deposit. The lower arrow indicates the junction between the House 5B floor and the midden slumping in on top of it from the western wall-top. View east. Photo: Knut Helskog.

hides on a frame of wooden posts and branches, or alternatively, composed of wooden beams laid horizontally, which left no discernible traces.

Along the central axis of House 5B there were two 2.5 by 0.90 m large rectangular stone-bordered hearths (Figure 5.13); in each case their inner two-thirds towards the center of the room were filled with fire-cracked rocks. The floor adjacent to the northwest side of the hearths consisted mostly of a distinctive red-brown sand, possibly indicative of burning oxidation, while the floor on the east side of the hearths appeared darker and more mottled. These soil variations indicate some functional differences, although it was not possible to recognize which. Partly beneath the border rocks at the northwest end of the southern hearth alignment was an oval pit, 70 cm wide and 44 cm deep, which contained a small amount of charcoal and many fist-sized rocks in its lower portion, of similar size to those filling the hearths.

In the floor area towards the northern end-wall of House 5B there was a series of regularly placed, ca. 5 cm wide, grey round marks that could represent traces of vertically placed posts (Figure 5.14). Such circles were often seen in the floor area and it was unclear what they actually might represent. Rodent and root activity may account for not recognizing post holes, as well as the fact that the posts could have been placed on the sandy surface rather than being dug into the sub-surface. However, combined with the lack of indication for thick walls, the absence of post-holes might indicate that this house was not the substantial construction that such dwellings have often been supposed to be.

On the floor towards the north end of the house was what we believe to be a 40 cm effigy of a waterfowl (duck?), outlined with eight to nine different colored stones (Figures 5.10 and 5.15). This may have been one of the last features constructed in the house before it was abandoned, as it would be unlikely to have survived an extended period of daily activities. Waterfowl representations are known from several different media

Figure 5.13. House 5B hearths, showing concentrations of heating/cooking rocks and the rock-filled pit partly beneath the edge of the southern hearth (under the stadia rod). View southeast. Photo: Knut Helskog.

Figure 5.14. House 5B, possible markings from vertically placed posts at the north end-wall. Photo: Knut Helskog.

Figure 5.15. House 5B, waterfowl effigy (duck?) in the floor at the north end of the house. Photo: Knut Helskog.

in northwestern Russia and adjacent regions. Images of swans are frequent in the Lake Onega rock carvings in Karelia (e.g., Lahelma 2012; Lobanova 2019; Savvateev 2007: 119–194; cf. Helskog 2019). Ducks occur as impressed figures on Karelian ceramics (Gurina 1961: 144–151). Swimming loons are depicted on a bone comb from Ust-Drozdovka, House 5 (see Chapter 6, Figure 6.20). Bird effigies made of bone are present in the contemporary Gressbakken Nedre Vest site and the slightly earlier Nyelv House 1 in Varangerfjord, Norway (Simonsen 1961: 301, 325, 337, 403). Waterfowl figures knapped in flint are known from sites in European Russia (Zamyatnin 1948: 108). Refuse fauna from the Finnish Neolithic suggests that birds, especially ducks, may have played a larger socioeconomic role than hitherto imagined (Mannermaa 2003), and bird remains in mortuary contexts in Mesolithic and Neolithic Sweden and Latvia have been interpreted as symbolizing the role of waterfowl as messengers or spirit guides when traversing the realms of the living and the dead (Mannermaa 2008: 216–217, 220). A similar theme is found in Sámi ontology (Rydving 1987).

We have been unable to identify an entrance to House 5B. A possible entrance was suggested at the north end of the house in the form of a large oblong stone located on top of the wall mound, but excavation revealed no evidence for a constructed entrance corridor, a trampled path, or disturbance of the earlier-dated cooking pit located only 1.0 m outside the entrance. Another possible entrance was through the circular chamber near the south end of the house (see below), but there was no convincing physical evidence for an entrance aperture. The remaining entrance possibility is that it was in the same position as the entrance passage to House 5A, which would mean that it was located mid-way along the western long-wall of House 5B. This positioning would be consistent with that of the entrance passages to many Gressbakken houses in northern Norway. The possible evidence for this interpretation is the stratigraphic context, which was marked by down-cutting through an incipient weathering horizon directly above the original House 5A entrance passage, with subsequent infilling by brown midden deposits, presumably related to House 5B. But there is no direct physical connection between this stratigraphic sequence at the entrance passage and the House 5B wall area.

The radiocarbon dating of House 5B is discussed below. The dates are listed in Table 5.1.

Other Features

The small area at the extreme north of the excavation (Figures 5.1 and 5.16) contained two shallow, flat-bottomed, circular pits filled with fire-cracked rock and charcoal. Their bottoms were slightly excavated into the basal yellow sand, and they were superimposed by 5–10 cm of light brown and gray-brown sand. Extending northwards from these features to the boundary of the excavation was a deposit of black-brown mottled sand that increased in thickness from 10 cm beside the pits to 30–40 cm near the excavation edge (see Profile 1, Figure 5.19). This layer was a midden containing a considerable quantity of bone in varying degrees of preservation. The western pit cut into the midden, indicating the pit is younger. The midden was in turn covered with a 5–10 cm thick sequence consisting of a thin yellow-brown sand layer (possibly a weathering zone) followed by light brown-gray sand. The origin of the deposits overlying the pits is uncertain, but it is possible that some of them were the product of activities related to House 3, situated a few meters to the north (see Figure 3.3). Charcoal from the western pit was dated 3755±60 BP (2283–2041 BC, 68.3% prob.), suggesting an occupation slightly earlier than House 5A, and contemporary with the date from the midden outside Ust-Drozdovka IУ House 1. Charcoal from the eastern pit was dated 3500±25 BP (1882–1771 BC, 68.3% prob.), which overlaps with the younger date range of House 5A and the older date range of House 5B. A date of 3970±320 BP (LE-5966) was also received from this pit, but it is ignored due to an unacceptably high standard deviation.

An important feature that is difficult to phase into the activity sequence is the circular chamber-like construction at the southern end of House 5B (Figures 5.11 and 5.17). This feature was ca. 3.5 m wide, 2.5 m long, and 9 m^2 in area. It was

Figure 5.16. Flat-bottomed circular pits with fire-cracked rock and charcoal in the northern excavation area, looking south, adjacent to the northern end-wall of House 5B. The pit on the left is half-excavated, the one on the right is still intact. The surrounding deposits in the foreground – excavated further on the left side – contained bone remains of varying degrees of preservation. Photo: Knut Helskog.

Figure 5.17. The circular chamber on the south wall of House 5B, visible as a slight depression with a floor deposit of fire-cracked rock and charcoal. The deeper depression on the right is the southern end-wall of House 5B. View west. Photo: Knut Helskog.

positioned 30 cm higher than the 5B floor, on top of the south wall, and it was slightly inclined with a 25 cm difference between the lower and upper ends. On the southern end of the house, a slightly downward sloping depression runs through a small opening in the wall and into the chamber; the ground was compact as if trampled. The floor of the chamber feature was covered with fire-cracked rock, ashes and charcoal, which appear to have been dumped onto the floor. The wall mound into House 5B was cut by a compact circular deposit of gray sand and a large stone, as if marking an entrance. The southern end of the House 5B floor was quite distinct, but unfortunately, fox burrowing in the wall between the chamber and House 5B had disturbed the deposits, so it was difficult to ascertain their stratigraphic relationships.

Several interpretations of this feature have been considered. The initial assessment was that it served as an antechamber to House 5B, based on analogies with features associated with the end-walls of some Gressbakken houses in east Finnmark, northern Norway (Andreassen 1988: 14; Schanche 1994: 25, 35, 253–270; Simonsen 1961: 275). The fire-cracked rock deposits imply heating activities, which could include, for example, sauna practices. Alternatively, the chamber might have served as an entrance to House 5B, although this seemed unlikely as an entry threshold or aperture was lacking and the heating activities would have constituted an obstruction to movement. Or, the chamber may have been related to air intake to the house, but there was no obvious air channel connecting the chamber and the house. As we shall see below, however, the radiocarbon dates from the chamber overlap with those from an apparent later phase of House 5A, which would imply that the chamber was a construction partly contemporary with, but physically separate from, House 5A, and that it was older than House 5B.

Stratigraphic Profiles

The vertical stratigraphy at the site was recorded in four major profiles: one running north-south through the long axis of House 5B, and three running east-west, cutting across the width of House 5B and what would have been the long axis of House 5A (Figure 5.18). They will be briefly described in turn. A short fifth profile at the western end of the entrance to House 5A was described previously. The original drawings have been simplified slightly because the strong but locally variable podzolization processes produced coloration features that were sketched in the field but were later judged not to be depositionally relevant. This is particularly the case for what is presented here as the "B-horizon", in which iron and humic acids translocated from the leaching zone precipitated to varying degrees, often merging with the upper portion of the midden and house floor deposits in a "brown sand" of variable color. These precipitates often made it difficult to determine layer boundaries.

Profile 1 (Figure 5.19) began at the southern edge of the excavation, extended through the center of the circular chamber at the southern end of House 5B, ran down the central long axis of House 5B on top of its hearth, then into the midden-like area north of House 5B. The circular chamber is visible at the southern end as a very slight depression in the basal yellow sand that was superimposed by a deposit of dark brown sand containing a distinct charcoal lens and fire-cracked rock fragments. This feature was superimposed by a B-horizon of light brown sand containing very sparse lithic materials. Although the dark brown sand encompassing the circular chamber resembled a midden deposit, it was actually a slightly iron-consolidated sand formed at the base of the podzol profile.

The relationship between the chamber and the southern end of House 5B was difficult to determine because of fox-denning activity in the wall area. Nonetheless, a 10–20 cm thick layer of dark brown sand characterized as a midden deposit extended from the top edge of the house wall downwards over the southern end of House 5B's floor. Some of this unit might have consisted of material from the top of the wall that collapsed inwards over the floor after the house was abandoned. The remainder of the floor northwards towards the central hearth consisted of 5–10 cm of brown sand. These wall and floor deposits were

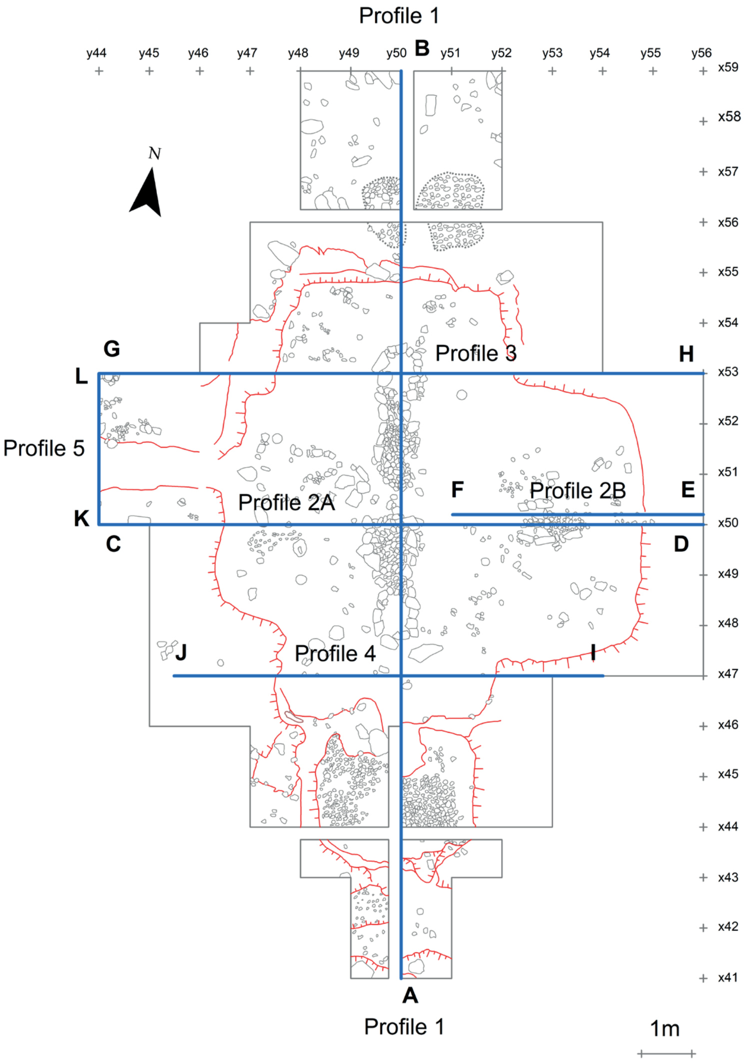

Figure 5.18. Locations of the House 5 profiles.

superimposed by a B-horizon of brown or red-brown sand. The sand directly associated with the northwest side of the hearth was distinctly reddish-brown, possibly heat oxidized (see Figure 5.10).

The floor at the northern end of House 5B also contained a dark brown sand midden deposit that tapered off towards the top of the house wall, similar to the floor/wall deposit at the southern end of the house. About 0.5 m beyond the northern end of the house, the profile ran through a shallow flat-bottomed pit dug into the top of the basal yellow sand. The pit was filled with fire-cracked rock and charcoal, and it intruded into the edge of a thick layer of mottled dark brown sand that extended further to the north. The latter contained scattered faunal remains and the mottling is probably decayed bone. Given the cross-cutting context, the pit is stratigraphically younger than at least part of the bone-bearing layer. The bone-bearing layer and the northern end of the pit were both superimposed by a thin layer of yellowish-

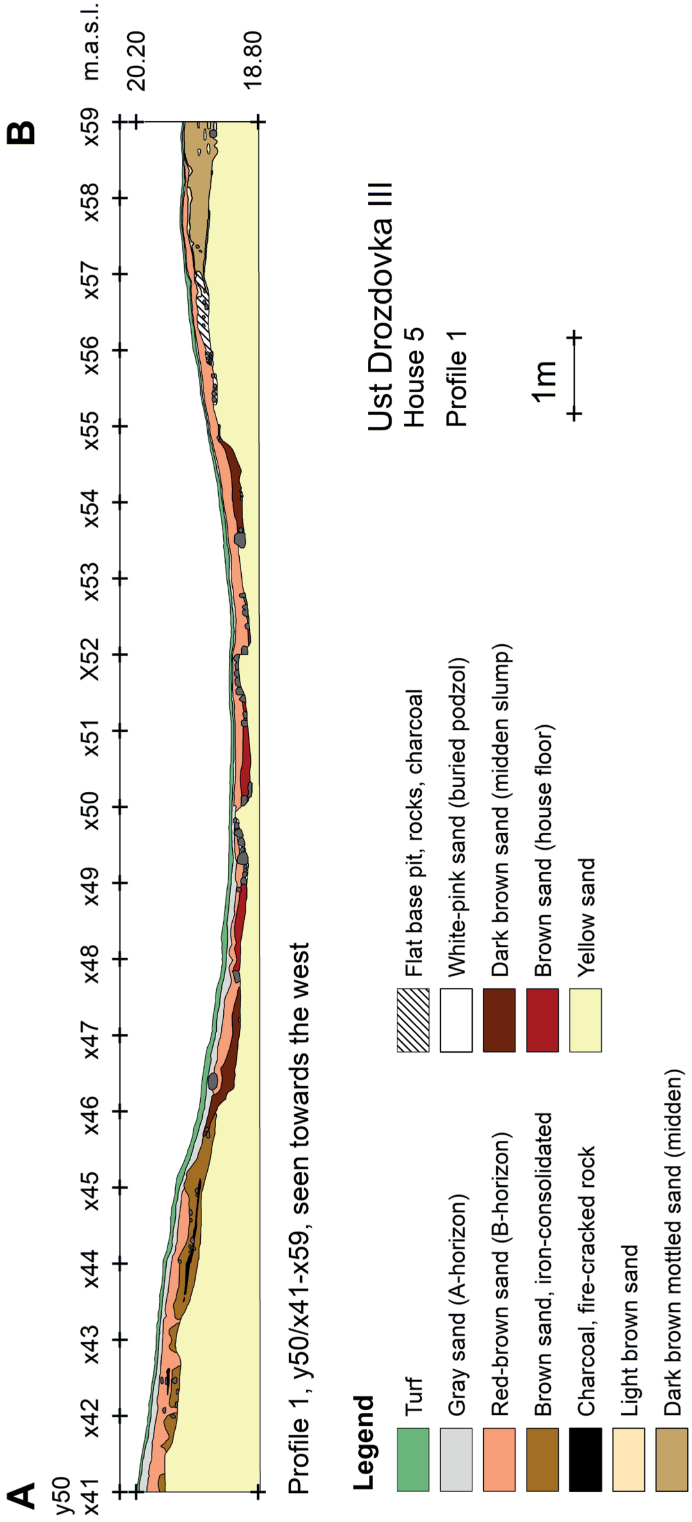

Figure 5.19. House 5, Profile 1.

brown sand, possibly a weathering zone or podzolization product. This layer, and the rest of the pit, were in turn covered by a B-horizon of light brown-gray sand. The remaining non-turf layer drawn in the profile is the gray-leached sand of the upper portion of the podzol profile; the layer overlay all of the previously described units and constituted the weathering horizon of the post-house sand-fill. It should be noted that some of the material deposited in this northern end of the excavation could have originated from the adjacent House 3 (see Figure 3.3).

Profile 2A (Figure 5.20) ran west-east, cutting across the width of House 5B at the midpoint of the dwelling, then running along the long axis of the eastern remnant of House 5A, right through its hearth. On the western side of the profile a midden layer up to 35–40 cm thick and consisting of brown-black sand, fire-cracked rock fragments, charcoal, and artifacts, lay on top of the basal yellow sand that constituted the long-wall of House 5B. No bone was found in this midden other than small burned fragments. The deposit continued over the wall-edge and thinned-out above the House 5B floor, having slumped into the house from the wall area. On top of the house wall, right at the bottom of the midden and extending ca. 1 m out from the wall-edge, was a 6 cm thick unit of laminated yellow-brown sand, ash and thin black bands. A similar but smaller laminated area was found on the house floor, close to the wall-edge. These features are probably the remnants of an air channel associated with the destroyed hearth at the western end of House 5A (see also Figure 5.6). The upper portion of the midden, near the western limit of excavation, contained a series of yellow/rust-colored sand lenses that seemed to mark a discontinuous layer. These lenses were the edge of the weathered soil horizon that was more clearly visible on the opposite side of the profile above the entrance to House 5A, where the horizon was clearly cross-cut by prehistoric excavation activity in the entrance area (see Figures 5.7 and 5.9).

The houseward (eastward) portion of this midden unit was superimposed by another, thinner, midden layer of slightly lighter brown-black sand that extended downslope and onto the floor of House 5B, almost to the edge of the

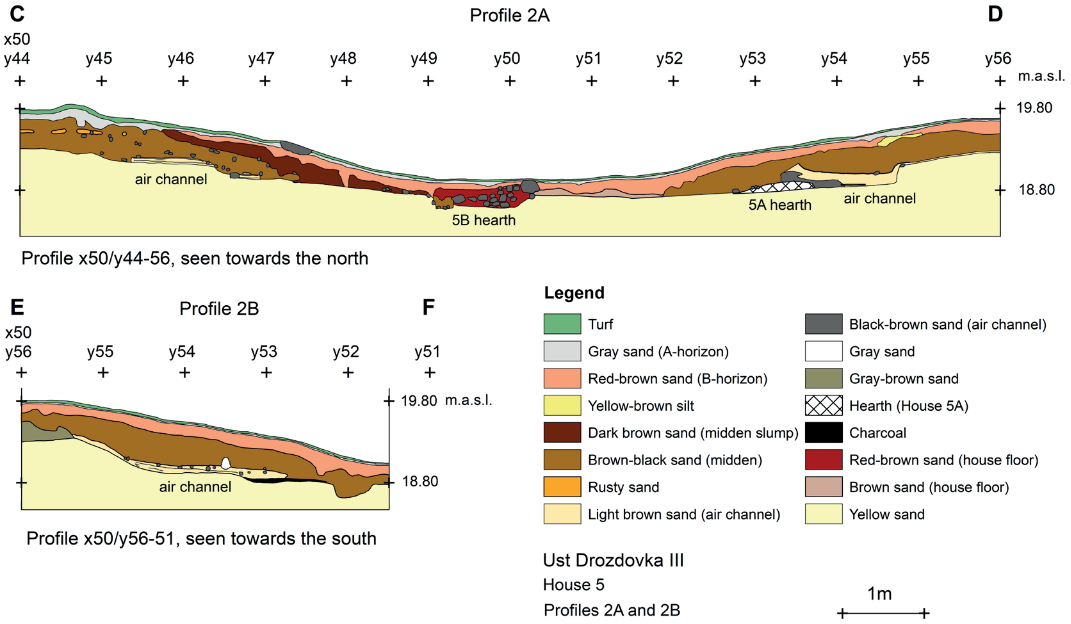

Figure 5.20. House 5, Profiles 2A and 2B.

hearth. These supra-floor deposits likely collapsed onto or slid over the floor from the wall area after the house was abandoned. The house floor deposits were difficult to distinguish from the slumping midden. The house floor west of the 5B hearth was distinguished by reddish-brown sand, possibly heat-oxidized (Figure 5.10). The house floor to the east of the hearth was marked by a thin layer of brown sand that extended ca. 1.5 m from the hearth, the basal portion of which terminated abruptly where House 5B cut through the floor of House 5A. The upper portion of the floor layer was diffuse, being obscured by podzolization from the overlying B-horizon as well as by a small amount of brown-black midden slumping in from the east.

On the eastern side of the profile, a 30–40 cm thick midden of brown-black sand with fire-cracked rock and charcoal sat on top of the basal yellow sand that constituted the eastern end-wall of House 5A. This midden extended westward, filling the floor of House 5A with 30–40 cm deposits that tapered out rapidly near the edge of House 5B. The upper portion of the midden was probably deposited during the course of the House 5B occupation when the previous House 5A floor was used as a disposal area. However, it was impossible to discern a boundary between these midden deposits and the floor of House 5A. Beneath the midden layer were the House 5A hearth ventilation channel deposits. These consisted of brown-black sand, slightly blacker than the overlying midden deposits, that extended ca. 1.4 m out from the hearth and were slightly excavated into the top of the basal yellow sand. At the hearth end, superimposed on the channel deposits was a wedge of light brown sand containing a fleck of red ochre. These two units together were up to 20 cm thick and were clearly separated from the overlying midden deposits by a thin dark band containing charcoal flecks that ran mostly horizontally eastwards from the hearth until it arched sharply upwards over the house wall edge. At that point the channel continued over the wall top and eastwards towards the excavation limit as a thin 2–3 cm band of light sand that ran between the basal yellow sand and the overlying midden (see also Figure 5.4).

The thick midden layer was superimposed by a much thinner layer of B-horizon red-brown sand that extended downslope from the top of the wall midden to the floor of House 5B. Above the B-horizon along the entire length of the profile was gray leached sand at the top of the podzol profile. Together, these constitute the post-house sand fill.

Profile 2B (Figure 5.20) is a short section from the opposite (north) side of Profile 2A at the eastern end of House 5A. The overall stratigraphic sequence was the same, and the air channel at the base of the midden was also very distinct. The channel consisted of a well-defined ca. 1.4 m long and 10 cm thick unit of brown and yellow sand with thin charcoal bands, running along the floor of House 5A from the vicinity of its hearth (the edge of which was marked by a dense charcoal layer) and probably up the wall slope. The end of the channel nearest the hearth as well as the wall slope portion were difficult to distinguish from the midden deposits.

Profile 3 (Figure 5.21) also cut across the width of House 5B, but this time on a baulk 3 meters north of its mid-section. The baulk lay just outside the northern long-wall of House 5A. This profile shows House 5B very clearly, with its longitudinal walls cut 40–50 cm deep into the basal yellow sand. On top of the western wall was a midden deposit of black-brown mottled sand with fire-cracked rock, charcoal, artifacts, and some preserved bone near the northwest wall-corner of House 5B. The midden was quite thin at the house edge but increased to 35 cm thick at the border of the excavation, 2 meters north of the house wall. This was the midden deposit that constituted the fill above the entrance passage to House 5A. Along the lower slope of the house wall, and extending onto the floor of the dwelling, was a layer of dark brown sand containing cultural material; some of this was probably fill that slid in from the wall top, but its lower portion merged imperceptibly into the house floor deposits. In this area it was uncertain whether the floor deposits were related to House 5B or the northern remnant of House 5A.

On top of the thick midden deposit on the northern house wall was a thin rust-coloured layer that extended eastward for about 1.2 m. This was the same feature that was described previously as a cross-cut weathered surface situated directly above the House 5A entrance passage (Figures 5.7 and 5.9). This layer, as well as the midden deposits and the house floor near the central hearth, was covered by a B-horizon of brown-gray sand. At the opposite (eastern) end of the profile, the wall-top exhibited a broadly similar profile. In this case, however, there was an undulating, gray-leached sand fossil podzol horizon under the midden deposit, and on top of the basal yellow sand. The midden unit of black-brown sand, fire-cracked rock and charcoal, and artifacts, was up to 25 cm thick, but thinned-out near the edge of the House 5B wall. The unit continued over the wall-edge as a thin ca. 5 cm layer superimposed on a thick deposit (up to 30 cm) of brown sand that likely represents midden and wall material that collapsed and slid over the House 5B floor along its eastern long-wall after the house was abandoned. The wall midden was topped by a thin B-horizon of brown sand that pinched out near the house wall-edge but was present again above the House 5B hearth and part of the midden/wall deposits that slumped over the house floor. A gray leached sand podzolization horizon topped the entire sequence, having developed in the uppermost layer of the post-occupation sand filling the houses.

Profile 4 (Figure 5.21) cut across the width of House 5B, this time at its southern end. This profile nicely depicts the maximum depth of House 5B, here excavated about 60 cm into the basal yellow sand, slightly deeper than at the north end of the house. On the northern wall-top of the house, a thin gray leached sand fossil podzol layer separated the basal yellow sand from a thin (10–15 cm) midden layer of black-brown sand containing fire-cracked rock, charcoal and artifacts. The house floor was filled with brown-black sand, interpreted as wall collapse material that slumped over the floor after the house was

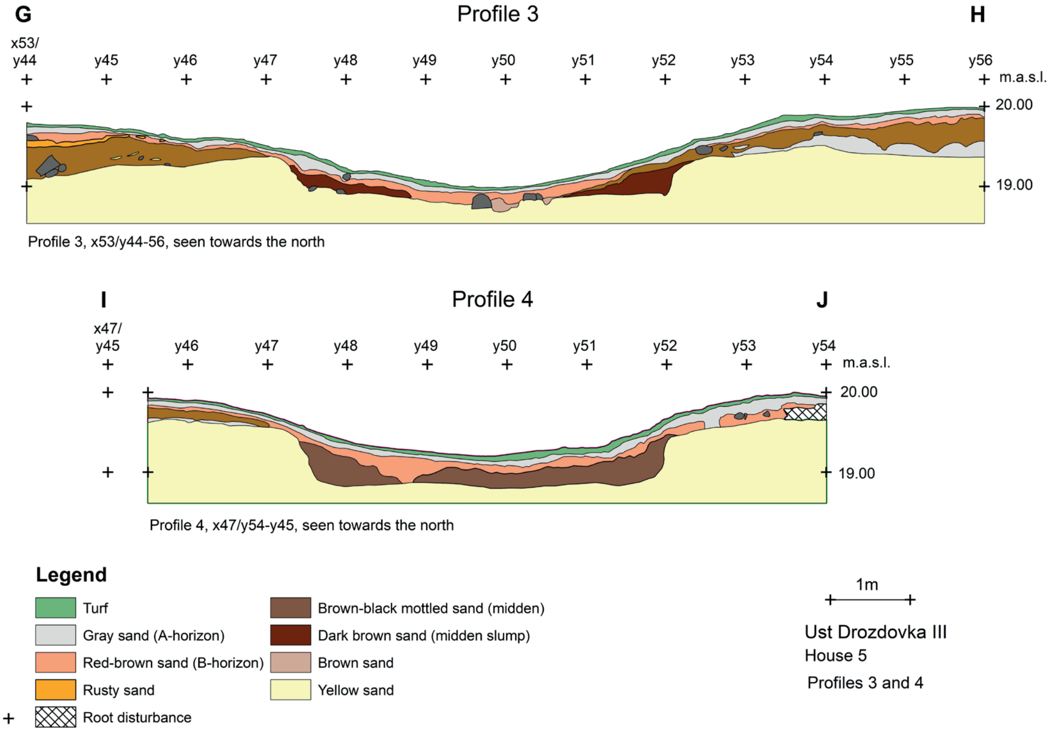

Figure 5.21. House 5, Profiles 3 and 4.

abandoned. This unit was superimposed by a B-horizon of brown sand, which was also present as a thin layer on top of the midden deposits on the northern wall. The southern wall-top lacked a distinct midden layer; there was only a simple podzol A-B horizon profile.

Dating the Occupation Sequence

Table 5.1 presents all the radiocarbon dates from Ust-Drozdovka IУ and III. Dating of some of the smaller features has already been discussed; here we will concentrate on assessing the chronology for Houses 5A, 5B and the circular chamber, after which we consider the overall sequence of events at the site.

House 5A

The dating of House 5A was established with 11 radiocarbon dates: eight AMS and three conventional (Table 5.1 Figure 5.1). These dates are from charcoal samples directly associated with the hearth and other features believed to be connected with the dwelling. There are several additional radiocarbon dates from the floor area but they are disregarded given their extremely large standard deviations (conventional dates run on small samples). Two dates were on charcoal from within the eastern hearth: 3635±30 BP and 3630±25 BP. Four dates on charcoal were derived from the eastern ventilation channel: 3662±30 BP from the basal portion of the channel, 3531±25 BP, 3547±25 BP, and 3594±25 BP from the upper portion. Charcoal from the deep pit adjacent to the eastern hearth was dated 3545±30 BP. A charcoal sample from the base of the bone midden deposit in the northeastern corner of the house provided an AMS date of 3671±25 BP. A conventional date on charcoal also from the midden base assayed at 3560±130 BP. Near the western end-wall of the dwelling, charcoal from the vicinity of the disturbed hearth was dated 3560±60 BP. Slightly west of this hearth, charcoal from near the edge of the house floor and adjacent to the possible ventilation channel (this context was not recognized when the sample was collected in 1994) was dated 3630±120 BP.

The interpretation of these dates is not straightforward. At first glance, the samples from the eastern hearth, basal portion of the ventilation channel, and the base of the midden appear to be slightly earlier than those from the upper portion of the ventilation channel and the deep pit. It should also be pointed out that the basal dates from the midden may pre-date the deposition of that feature; one possibility is that the midden was deposited on the abandoned floor of House 5A during the House 5B occupation. The probability sum of the 11 dates provides a calibrated range of 2110–1780 BC (68.3% prob.) or 2136–1745 BC (95.4% prob.). This does not change much if only the eight AMS dates are used: 2109–1826 BC (68.3% prob.) or 2133–1772 BC (95.4% prob.). If all 11 calibrated dates were displayed in a multiplot (not shown here), they would seem to overlap. However, the visual impression of date overlap may be misleading, particularly given the large standard deviations of the conventional dates. Did the dwelling have a long use-period, or might there have been different occupation events that are hidden in a visual plot? If we consider only the eight AMS dates, an intuitive visual inspection of the calibrated multiplot (Figure 5.22) suggests there could have been two activity episodes, but the multiple outlier peaks on the distributions complicate interpretation. These peaks are caused by significant wiggles in the calibration curve (Figure 5.23), which make it difficult to constrain the dates. Consequently, further statistical treatment of the AMS dates is needed to shed light on the matter.

The eight AMS dates associated with House 5A were analyzed using the “R-Combine” and “Combine” functions in OxCal 4.4 (Bronk Ramsay 2021), which as mentioned previously use the chi-square test to determine if there is a statistically significant difference between uncalibrated and modelled calibrated dates, respectively. All pairings of the dates were tested. The result was that seven of the eight dates fall into two groups displaying statistically significant differences or poor agreement, while one date overlaps with both groups. The earlier group consists of the dates 3630±25 BP, 3635±30 BP, 3662±30 BP, and

Table 5.1. Radiocarbon dates from Ust-Drozdovka IУ, II and III. All but one date calibrated with OxCal 4.4, using the IntCal20 curve (Bronk Ramsay 2021; Reimer et al. 2020).

Date BP	**Lab No.**	**Provenience**	**Calibrated BC 68.3% prob.**	**Material**
3500±25	Wk-35067	H5, north area, eastern cooking pit	1882–1771	Birch charcoal
3970±320	LE-5966	H5, north area, eastern cooking pit		Charcoal
3755±60	TUa-3536	H5, north area, western cooking pit	2283–2041	Birch charcoal
3566±30	Wk-25739	H5, pit cross-cut by H5A entrance	1955–1830	Birch charcoal
3605±115	T-15743	H5 Layer predates H5A	2137–1775	Birch charcoal
4130±330	LE-5979	H5A, eastern hearth		Charcoal
3600±360	LE-5972	H5A, eastern hearth		Charcoal
3600±260	LE-5977	H5A, eastern hearth		Charcoal
3630±25	Wk-35062	H5A eastern hearth	2028–1953	Deciduous charcoal
3635±30	Wk-25738	H5A, eastern hearth	2035–1946	Birch charcoal
3545±30	Wk-25737	H5A, pit adjacent eastern hearth	1936–1781	Birch charcoal
3560±60	Su-2839	H5A disturbed western hearth	2016–1776	Charcoal
3550±90	T-15742	H5A entrance fill	2021–1751	Birch charcoal
3690±200	LE-5971	H5A, edge of eastern hearth		Charcoal
3662±30	Wk-25736	H5A, ventilation channel	2132–1976	Birch charcoal
3531±25	Wk-35063	H5A ventilation channel, wall top	1921–1776	Birch charcoal
3594±25	Wk-35064	H5A ventilation channel	2012–1901	Birch charcoal
3547±25	Wk-35065	H5A ventilation channel	1936–1783	Birch charcoal
3560±130	LE-5973	H5A base of floor midden	2128–1698	Charcoal
3671±25	Wk-35066	H5A base of floor midden	2132–1981	Birch charcoal
3670±160	LE-5968	H5, wall east of H5A	2291–1779	Charcoal
3385±80	T-15741	H5B, pit under south hearth	1862–1542	Birch, aspen, willow
3395±45	TUa-3537	H5B, north hearth	1743–1622	Birch charcoal
3712±25	Wk-35069	H5B, north hearth	1734–1563[2]	Ceramic residue
3521±25	Wk-35068	H5B edge of northern hearth	1892–1775	Birch charcoal
3460±120	LE-5969	H5, wall top under western midden	1927–1620	Charcoal
3460±110	T-11918	H5, wall top under western midden	1920–1622	Birch charcoal
3630±120	T-11917	H5, wall top under western midden	2197–1780	Birch charcoal
3680±70	Su-2841	H5 test pit NW midden, x56y47	2193–1960	Charcoal
3520±80	Su-2840	H5 test pit NW midden, x57y46	1951–1701	Charcoal
3509±30	Wk-25735	H5, circular chamber	1887–1772	Birch charcoal
3465±105	T-15744	H5, circular chamber	1899–1626	Birch charcoal
3609±33	Wk-35070	H5A/5B; x48.78, y47.81, L-5D	2026–1922	Slate point, resin
3730±40	TUa-4403	IУ H1, cultural layer outside house	2200–2040	Birch charcoal
3515±45	TUa-4402	III H7, hearth on House 7 floor	1899–1751	Birch charcoal

[2] Calibrated with IntCal marine20, 50% marine, δR -238 σ55, based on a sample from Bolshye Chevry Bay, Kola coast (see text for more details).

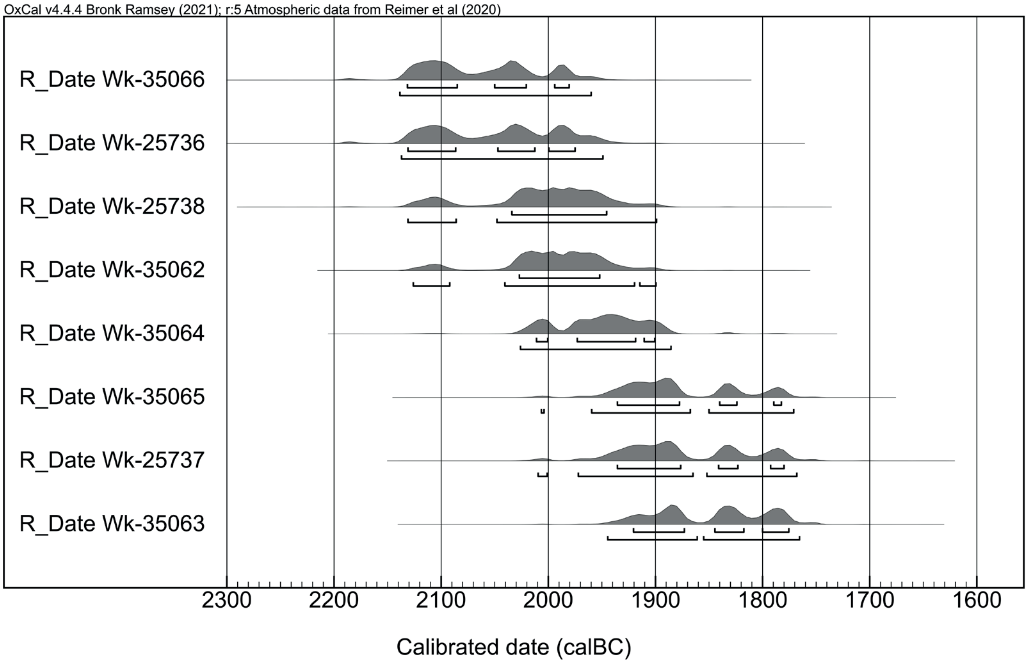

Figure 5.22. Multiplot of calibrated House 5A AMS dates. From OxCal 4.4 (Bronk Ramsay 2021), using IntCal20 (Reimer et al. 2020).

3671±25 BP. Two of these dates are from the hearth, one from the ventilation channel, the other from the base of the bone midden. The later group consists of the dates 3531±25 BP, 3545±30 BP, and 3547±25 BP. Two of these are from the ventilation channel (in the profile) and one from the pit adjacent to the hearth. The date of 3594±25 BP overlaps with both of these groups; it is from the ventilation channel (collected from the profile). Although the date sample is small, the implication is that there could be two occupation events represented here: an earlier occupation dated by its sum of calibrated probabilities to 2109–1826 BC (68.3% prob.) or 2133–1772 BC (95.4% prob.), and a slightly later occupation dated by its summed probabilities to 1929–1778 BC (68.3% prob.) or 2006–1751 BC (95.4% prob.).

House 5B

There are only four radiocarbon dates for House 5B: three AMS and one conventional. A charcoal sample from the northern hearth was AMS dated 3395±45 BP (1743–1622 BC; 68.3% prob.) (Table 5.1, Figure 5.10). A charcoal sample from the deep pit partly underneath the northwest end of the southern hearth was conventionally dated to 3385±80 BP (1862–1542 BC; 68.3% prob.). Stratigraphically, the pit must represent an activity at least slightly preceding construction of the southern hearth. These two dates are statistically indistinguishable.

An almost complete asbestos-tempered ceramic vessel (undecorated, but similar to Lovozero Ware) was found on top of the northern hearth (Figure 5.24). Residue scraped from a sherd was AMS dated to 3712±25 BP. This result is problematic because the vessel stratigraphically post-dates the other two samples, so it should be either similar in age or younger, unless the vessel was recycled intact from an earlier deposit, which seems unlikely. A marine reservoir effect is likely. The δ^{13}C value for this sample (-22.6) is under the range expected for terrestrial plant and animal protein samples (e.g., Hedges 2004:

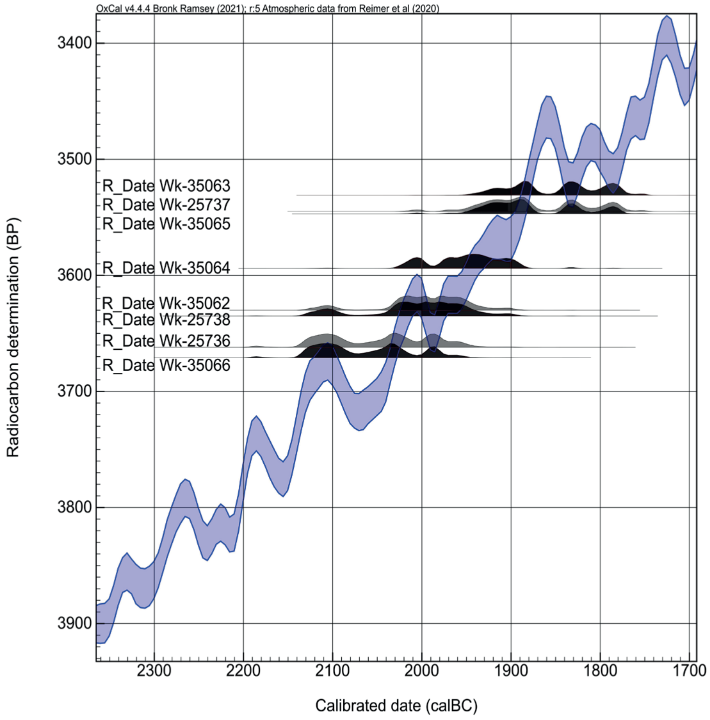

Figure 5.23. OxCal 4.4 (Bronk Ramsay 2021) multiplot of the calibrated AMS dates from House 5A in relation to the IntCal20 calibration curve (Reimer et al. 2020). Note how the curve wiggles produce multiple calibration probability peaks.

Figure 5.24. The near-complete ceramic vessel found on top of the northern hearth of House 5B. Residue from the vessel was radiocarbon dated to 3712±25 BP (1734-1563 BC with 50% marine reservoir correction; Wk-35069). Photo: Knut Helskog.

36) and under the values derived from modern sea mammal fat: -24.7 to -27.0 (Heron et al. 2010: 2191). However, these bulk isotope measurements are difficult to interpret; instead, molecular analysis of the specific compounds making up the residue is required to identify and sample the marine component (Heron & Craig 2015: 713–715; Casanova et al. 2020). Based on evaluations by Fischer & Heinemeier (2003: 460) and Finnish samples discussed by Pesonen et al. (2012: 665), a δ^{13}C value of -26.0 could be seen as an upper limit for a terrestrial signal, with less negative values implying a marine effect. In any event, the use of standard procedures to correct for the reservoir effect in this ceramic residue sample produced the following results. Using the IntCal marine20 curve, an assumption of a 100% marine sample, and a δR value of -238 σ55 from a Russian sample on the Kola coast (Bolshye Chevry Bay; Forman & Polyak 1997), results in a calibration range of 1345–1130 BC (68.3% prob.). Using a δR of -151 σ46 based on an average of nine samples from the Norwegian coast (Mangerud & Gulliksen 1975; Mangerud et al. 2006) produces a range of 1428–1249 BC (68.3% prob.).[3] This would place the ceramic vessel at least 100–200 years later than the other hearth samples. A correction based on a 50% marine composition of the residue sample and the same δR values results in a range of 1734–1563 BC (68.3% prob.) for the Kola adjustment and 1764–1623 (68.3% prob.) for the Norwegian average. Such a correction suggests the ceramic vessel may have been deposited at the same time as, or soon after, the other dated hearth samples. This alternative seems more plausible given the depositional context.

Finally, there is also a sample of charcoal from the eastern edge of the northern hearth that assayed at 3521±25 BP (1892–1775 BC; 68.3% prob.), slightly older than the other charcoal samples and closer to some of the dates associated with House 5A. It is possible this sample includes material from the remnants of the House 5A floor, so it may not provide a satisfactory date for House 5B. Application of “R-Combine” and “Combine” in OxCal 4.4 indicates that this hearth-edge date is significantly different from the 3395±45 BP date from the northern hearth of House 5B, so they may indicate different occupation phases. The 3385±80 BP date from the pit partly beneath the southern hearth is not significantly different from the hearth-edge date, although they show weak agreement, but it is a conventional assay with a larger standard deviation. When the hearth-edge 3521±25 BP date is tested against the younger group of dates associated with House 5A there is no statistically significant difference. Consequently, it seems that the hearth-edge sample could be related to the earlier House 5A, which was cut through by the construction of House 5B.

In sum, only three radiocarbon dates likely pertain to House 5B, of which the one derived from ceramic residue has an uncertain marine reservoir correction. If we consider only the two dates most reliably associated with House 5B (3385±80 BP, 3395±45 BP), then the sum of their calibrated probabilities indicates an occupation span of 1861–1547 BC (68.3% prob.) or 1877–1515 BC (95.4% prob.).

Circular Chamber

During and after the excavation it seemed reasonable to assume that the chamber was an annex associated with House 5B, by analogy with some of the Norwegian Gressbakken houses that have circular annexes attached to their end-walls. Charcoal samples procured from the chamber floor were radiocarbon dated to 3509±30 BP and 3465±105 BP, which are not significantly different statistically speaking. The sum of probabilities for these two dates gives a calibrated range of 1919–1702 BC (68.3% prob.) or 2017–1538 BC (95.4% prob.). Taken at face value, these ranges overlap with both the later date group for House 5A and the dates associated with House 5B.

However, we can use the “R-Combine” and “Combine” functions in OxCal 4.4 to explore the possible overlaps more closely. In this case we used only the single AMS date from the cham-

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[3] The δR values were derived from the marine20 database at http://calib.org/marine/

ber to compare against the four AMS dates from the later phase of House 5A, the one AMS date from the hearth-edge at House 5B (possibly related to the late phase at House 5A), and the one AMS date and one conventional date associated, respectively, with the hearth and pit at House 5B. Of these pairwise comparisons, only two were significantly different. The oldest date from the late phase at House 5A (3594±25 BP; which also overlaps with the 5A early phase) was significantly different from the chamber date when using "R-Combine" and not significantly different but with poor agreement using "Combine". The AMS date from the hearth at House 5B (3395±45 BP) was significantly different from the chamber date using "R-Combine" and not significantly different but with poor agreement using "Combine". This could suggest that the chamber overlaps with the late phase at House 5A – in which case it must have been a small building spatially independent of House 5A – and that it is not contemporary with House 5B. However, the use of only one date from the chamber and only two from the House 5B hearth area constitutes weak grounds for comparison.

Bayesian Modelling of House 5A and 5B Occupation Phases

The straight-forward analysis of the radiocarbon dates presented above suggests there were at least three and possibly four occupation phases related to houses 5A and 5B and the circular chamber. To test this further we used OxCal 4.4 (Bronk Ramsay 2021) to conduct Bayesian analyses of the AMS dates and the conventional dates with smaller standard deviations. This is presented more fully in Appendix 2. Here we merely summarize the procedure and findings.

Bayesian modelling uses prior knowledge of archaeological contexts to create constraints for modelling the relationships between radiocarbon dates. In this case, the fundamental stratigraphic superpositioning of House 5B over House 5A constitutes prior knowledge that the dates associated with House 5B should be younger than those from House 5A. This stratigraphic before-after relationship affects how the date probabilities are modelled. The other element of prior knowledge incorporated into the modelling of the house activity sequence was the suggestion from the pairwise significance test comparisons of the AMS dates that two sequential activity phases are represented at House 5A.

The first Bayesian model (Appendix 2: Table A2.2) was structured with the three phases established through the pairwise statistical testing: 1) House 5A earlier episode (five dates), 2) House 5A later episode (three dates), and 3) House 5B (two dates). The sample consisted of nine AMS dates and one conventional date. The OxCal results for the three-phase model provided a quite acceptable level of agreement between the modelled and unmodelled data, although the oldest and youngest dates from the early phase of House 5A did not fit the model as well as the other dates. Consequently, a second model consisting of four phases was constructed (Appendix 2: Table A2.3), in which the two oldest House 5A samples were used form a new Phase 1, and House 5A was now modelled in relation to three rather than two occupation episodes. The four-phase model showed a modest improvement in agreement with the unmodelled data, but this cannot be considered a better model, just a different statistical result. At any rate, given the small sample size we should perhaps not read too much into the modelling results, but they provide grounds to suggest that the temporal sequence of activities related to the houses is more complex than what might inferred from intuitive visual inspections of radiocarbon date multiplots.

If we consider the three-phase model to be foundational, the modelled dates for the earliest House 5A phase range from 2091 to 1916 BC (95.4% prob.), while those for the later phase range from 1981 to 1751 BC (95.4% prob.), and for House 5B from 1891–1511 BC (95.4% prob.). We can also use the model to estimate the time spans of each phase and the intervals of time between them. The maximum spans of the two phases related to House 5A were calculated as 94 (phase 1) and 95 (phase 2) years, but in principle each phase could have lasted only one year. The maximum span of the phase associated with House 5B was calculated as 96 years. The interval between phases 1 and 2 at House 5A was calculated as maximum 145 years, although it could have been much shorter. The interval between House 5A (phase 2) and House 5B (phase 3) was calculated as maximum 209 years. The overall time span for the activities associated with houses 5A and 5B was calculated as 103 to 540 years. These numbers should be taken with the proverbial grain of salt, particularly as they are based on relatively few AMS dates, but they provide a rough idea as to the possible temporal scope of the event sequence related to the two houses.

Middens

The two houses are ringed by midden deposits, which occur on the western, northern and eastern sides of the dwellings (Figure 4.7). The western midden extends along most of House 5B's western wall, although it tapers off towards the southern end of the dwelling. On the flat wall-top the midden is 15–35 cm thick, but the deposits have also slumped downwards into the house depression, covering the western edge of House 5B. As noted previously, the stratigraphic sequence in the House 5A entrance area indicates the initial construction of a pit and deposition of red ochre at ca. 3600 BP (2000 BC), after which a 15–25 cm thick midden layer accumulated, containing a considerable quantity of fire-cracked rock but no preserved bone. This midden is probably associated with House 5A. Superimposed on this is a second midden layer, 15–30 cm thick, containing occasional fire-cracked rock but lacking bone preservation, which is probably associated with House 5B. North of the entrance passage and on the northwest wall of House 5B, the midden deposits were up to 40 cm thick and consisted of brown-black sand. Some bone material was preserved on top of the northwest wall. Test pits showed that midden material continued another 5–6 meters to the west and north of the entrance passage.

Two conventional radiocarbon dates were procured from the midden deposits ca. 2–3 m south of the House 5A entrance (see Figure 5.11): 3460±110 BP (1920–1622 BC, 68.3% prob.) and 3460±120 BP (1927–1620 BC, 68.3% prob.), both from the lower midden component. At 68.3% prob. these midden dates overlap best with the dates for House 5B and just slightly with the younger tail for House 5A, but at 95.4% prob. (2132–1500 BC) they overlap with both houses. Two test pits in the northwest midden (see Figure 5.11) provided charcoal samples from their lower portions that produced conventional radiocarbon dates of 3680±70 BP (2193–1960 BC, 68.3% prob.) and 3520±80 BP (1951–1701 BC, 68.3% prob.). At 68.3% prob. the former overlaps best with the older tail of the dates for House 5A, while the latter overlaps with both House 5A and 5B.

The northern end of the House 5 locality featured a 30 cm deep midden layer consisting of dark brown sand adjacent to and superimposed over the two flat-bottomed circular pits containing fire-cracked rocks. Bone in varying degrees of preservation was dispersed adjacent to and north of these pits. The westernmost pit is the earliest dated feature at the House 5 locality (3755±60 BP, 2283–2041 BC, 68.3% prob.), while the easternmost pit suggests later activity (3500±25 BP, 1882–1771 BC, 68.3% prob.). Parts of the northern midden could have been deposited by the inhabitants of both Houses 5A and 5B, but some of it could also represent a tailing-off of midden deposits from House 3, which lies 5 m to the northwest, or activities related to House 1 at Ust-Drozdovka IУ. "R-Combine" and "Combine" in OxCal 4.4 indicate there is no significant difference between the date from the earlier westernmost pit and the dated layer outside House 1 at Ust-Drozdovka IУ, suggesting they were deposited in a similar time horizon. There is also no significant difference between the date from the easternmost pit and three dates from the latest phase of House 5A, although there is a significant difference and poor agreement with the fourth date that also overlaps with the earliest phase of House 5A. Thus, the easternmost pit could be related to the later occupation at House 5A.

The thickest midden deposit covered the house depression wall northeast of the dwellings (53x53y); there, the midden contained a considerable quantity of mussel shell (*Mytilus edulis*) and preserved bone. Only the upper 30 cm of this deposit was excavated and coring indicated that the midden continued downwards for another 50 cm, for a total depth of ca. 80 cm. A test pit revealed that it extended another 8 m towards the northeast. Additional testing between House 5 and Ust-Drozdovka IУ House 1 indicated an area with 20 cm deep, very black and highly organic sand, but no bone preservation. No radiocarbon dates are available from this northeastern midden.

The other bone-bearing midden deposit was a 30 cm thick roughly oval concentration on the floor of the northeastern corner of House 5A (Figures 5.1 and 5.5). The lower portion of the midden intruded as a slight depression into the yellow sand sub-surface of the House 5A floor and contained the fairly complete skeleton of a harp seal (*Phoca groenlandica*). There was no clear stratigraphic distinction between the lower and upper portions of the midden, so the chronology of deposition in relation to the house occupations is uncertain. Since the lower part of the midden intrudes the House 5A floor it might have been deposited during that occupation or at the time of abandonment of the house. On the other hand, the feature could also represent a dump deposited during the House 5B occupation, as one might expect that midden material deposited earlier could have been disturbed by the construction of House 5B. Two charcoal samples from the base of the midden were radiocarbon dated, resulting in an AMS date of 3671±25 BP (2132–1981 BC, 68.3% prob.) and a conventional date of 3560±130 BP (2128–1698 BC, 68.3% prob.). "R-Combine" and "Combine" in OxCal 4.4 indicate the AMS date is not significantly different from the dates for the earliest hearth and ventilation channel events at House 5A, so there are grounds to associate the lower part of the midden with activities occurring during the earliest phase of House 5A. However, the charcoal sample could date the house floor rather than the midden.

This bone midden was in turn superimposed by a non-bone midden deposit consisting of brown sand, fire-cracked rock fragments and lithic debris. The latter filled the eastern end of House 5A and extended as a thin layer onto the top of the eastern house depression wall. Stratigraphically, it post-dates House 5A and may have been deposited during the House 5B occupation.

Conclusion: The Temporal Dynamics of Settlement at Ust-Drozdovka IУ/III

The settlement history revealed by our excavations on the point at Ust-Drozdovka is complex, and it will probably prove to be even more complex if and when investigations are conducted on the other houses in the dwelling cluster. We shall conclude with an overview of the site chronology, followed by an interpretive summary of settlement activities.

Site Chronology Based on Bayesian Analysis

A more comprehensive site-level Bayesian model was constructed by expanding the previously discussed House 5 three phase model to include dates from other sampled features at the House 5 locality as well as dates from two other dwellings: House 7 at Ust-Drozdokva III and House 1 at Ust-Drozdovka IУ (details in Appendix 2: Table A2.5). All the conventional radiocarbon dates with a standard deviation of ±130 or less were included, for a total of 28 dates. This new model had four phases: an early phase, the time spans associated with each of the two phases for House 5A, and the later time span associated with House 5B. Dates from the other contexts and houses were slotted into these phases. The modelling result estimated that all the dates from the sites span a time frame of 192–693 years (95.4% prob.). However, it should be kept in mind that we have not sampled all the houses on the point.

We can summarize activity at the sites in terms of the following chronological phases, which are based on the modelled dates from the four-phase Bayesian analysis rather than the unmodelled calibrated ages.

Phase 1: ***2298–1999 BC*** (95.4% prob.)
Initial activity on the point. Two AMS dates: the western cooking pit at the northern end of the site (TUa-3536) and part of the external midden at Ust-Drozdovka IУ House 1 (TUa-4403).

Phase 2: ***2068–1911 BC*** (95.4% prob.)
House 5A early phase and other features. A total of nine dates. Four AMS dates associated with the House 5A hearth and ventilation channel (Wk-25736, 25738, 35062, 35064), one AMS date from the base of the House 5A floor midden (Wk-35066), one AMS date on resin from a slate point (Wk-35070), three conventional dates from: a layer cross-cut by the House 5A entrance passage (T-15743), the wall top under the west midden (T-11917), and the basal portion of a test pit in the northwest midden (Su-2841).

Phase 3: ***1952–1760 BC*** (95.4% prob.)
House 5A late phase and other features. A total of 15 dates. Three AMS dates are associated with House 5A features: the ventilation channel (Wk-35063, Wk-35065) and the pit adjacent to the eastern hearth (Wk-25737). There are also two conventional dates from the disturbed western hearth (Su-2839) and the entrance passage fill (T-15742). Three dates have a less certain connection with House 5A: an AMS date from the edge of the hearth at House 5B (Wk-35068), an AMS date from the small pit cross-cut by the House 5A entrance passage (Wk-25739), and a conventional date from the base of the House 5A floor midden (LE-5973). Three conventional dates are from midden contexts (LE-5969, T-11918, Su-2840). Two dates are from the circular chamber, one AMS (Wk-25735) and one conventional (T-15744). One AMS date is from the eastern cooking pit north of House 5B, while another is from a test pit in House 7 (Tua-4402).

Phase 4: ***1881–1529 BC*** (95.4% prob.)
House 5B. Two dates: one AMS date from the northern hearth (TUa-3537) and one conventional date from the pit partly under the southern hearth (T-15741).

Phase 5: ***post 1600–1500 BC*** (no radiocarbon dates)
Infilling of the House 5A/B depression. House collapse deposits and aeolian sand, also the deposition of quartz lithics associated with continuing settlement activity at the locality and possibly refuse deposition from other houses.

Interpretive Summary of Site Activities

The inhabitants of Ust-Drozdovka IУ and III and made a deliberate choice to pack their settlement into a small area on a sandy point and they used the House 5 area intensively and repeatedly. According to Bayesian modelling, these habitations spanned a period of 192 to 693 years (95.4% prob.). The point was privileged for several obvious practical reasons: sand deposits facilitating house excavation, a commanding view over Drozdovka Bay, and a strategic position at the river mouth for intercepting salmon runs. However, the choice to tightly pack the settlement rather than spread it out to adjacent areas on the prominent terrace suggests that social considerations related to "place-making" also affected the clustering.

The semisubterranean construction of the houses, as well as their prominent hearth features and associated middens with quantities of fire-cracked rock, all suggest occupation over the winter. However, there is no structural evidence for substantial support posts or turf walls. The midden faunal collection is too small to draw reliable conclusions, but indicators of spring to fall occupation are present (see Chapter 7). The houses might have been occupied year-round, although we cannot rule out the possibility that other seasonal sites were also used, both in the outer bay area or in the inland.

The House 5 locality is positioned near the center of the settlement cluster (Figure 3.6), which might indicate a degree of social centrality as well. However, we do not have sufficient radiocarbon dates from the other houses, nor do we have excavated evidence of house construction, use and longevity, to provide an adequate picture of overall settlement structure and development. Nonetheless, once the settlement was established, subsequent activities were always carried out relative to existing features and infrastructure.

The earliest traces of occupation on the sandy point might be a fragment of comb-stamped ceramic with crushed rock temper (Figure 6.18b) and a narrow ground slate point (Figure 6.7) (see Chapter 6). These could date to the initial portion of the Late Stone Age/Neolithic, i.e., 5000–3500

BC. However, the earliest radiocarbon dated occupation traces are the cooking pit at House 5 dated to 2350–2012 BC (91.5 % prob., or 2434–1975 at 95.4%), and the similarly dated midden deposit outside Ust-Drozdovka IУ House 1. According to the three-phase Bayesian model (Appendix 2: Table A2.2), the east-west oriented House 5A was established 2091–1954 BC (95.4% prob.), and later activity phases continued until 1926–1751 BC (95.4% prob.). The circular chamber is not well dated, but it appears to fit with the same occupation phase as the later activity at House 5A. If so, it was not (originally) an antechamber to House 5B, as was first thought, but a spatially independent feature. The chamber seems to have been used for specialized heating activities, such as a sauna.

After the abandonment of House 5A, its still-visible dwelling remains became a reference point for subsequent developments at the site. The second major construction phase, House 5B, is not well dated, but chronological modelling indicates the dwelling was used 1891–1511 BC (95.4% prob.), less than 209 years after House 5A was terminated. The new construction involved placing the center of House 5B directly on top of the center point of House 5A, but also deliberately rotating 5B's long axis 90° perpendicular to the earlier structure, in a north-south orientation. This must have been done in full awareness of the material traces of the earlier settlement. Components of the previous structure might have been incorporated into the new dwelling: the House 5A entrance passage could have been reactivated for use with House 5B and some of the rocks from the House 5A hearths could have been recycled for use in the large hearths in House 5B. The House 5A to 5B sequence therefore records a series of human actions that sedimented material structures that served as precedents for subsequent actions of incorporation and modification. These actions constituted "place-making" practices that linked personal biographies with the material genealogies of dwellings, which became anchors for creating and sustaining the social memories of local groups and for grounding claims of ancestry and descent (Hood et al. 2022).

When House 5B was abandoned ca. 1600–1500 BC, a waterfowl effigy was placed on the floor, perhaps to mark the termination of the dwelling. After 1600–1500 BC, the large depression created by the House 5A, 5B and circular chamber activities was used for outdoor quartz tool production and perhaps as a disposal area for other houses in the settlement cluster.

The evidence from Houses 5A and 5B suggests there were significant variations in house form within a span of less than 200 years. An important part of this variation involved a change in domestic heating technology. The earlier house had compact box hearths with long ventilation channels running through the end-walls of the house. The entrance was likely a long passage on one end-wall. The later dwelling had larger stone-framed hearths, apparently without ventilation channels. Neither of the dwellings exhibited much evidence for substantial walls or superstructural support. Whether these variations are simply idiosyncratic, seasonal/functional, or reflective of broader patterns of change in house construction and maintenance, is a question for future research. However, in Chapter 9 we take a broader look at variation in dwelling form on the regional and supra-regional levels.

Chapter 6
Ust-Drozdovka III, House 5 Artifact Assemblage

The artifact assemblage from the two houses and the surrounding middens consisted of a large quantity of lithic materials, ceramics, a small number of bone implements and one fragment of ornamented bronze. Most of the material was found within the midden layers or in the fill overlying the house floors; relatively little material was found directly associated with the floor areas, which had obviously been "maintained" during the course of their respective occupations. We proceed by looking at different classes of material culture and how they are distributed between the main depositional units at the site. No attempt is made at an exhaustive study of spatial patterning as the reoccupation sequence and the disturbances deriving therefrom complicate our understanding of specific contexts, and the regular maintenance of the house floors involving cleaning and the dumping of household waste in the surrounding middens renders a study of floor patterning problematic.

The House 5 area was divided into seven analytical units that reflect different depositional contexts as well as a simplified version of the occupational sequence. The floors of Houses 5A and 5B were treated as one unit because they crosscut each other and it must be assumed that there is considerable potential for mixing of material from the two dwellings. The midden on top of the western wall of House 5B is treated as a unit ("western midden"). East of House 5B the midden deposits occur superimposed on the floor of House 5A (a dense cluster of mostly seal bones), on top of the house wall east of the end of House 5A, where they are relatively thin, and as a thick shell-bearing midden on the wall to the northeast of the two houses. These are collectively termed the "east midden". Midden deposits also slumped in over the floors of the houses and the circular chamber and occur in the area north of the houses; these are referred to as "other middens". The floor of the circular chamber is considered as a separate depositional unit ("chamber"), as is the basal layer of the area north of the houses ("North basal"), which may represent a slightly earlier occupation than that of the houses. Finally, the overlying sand deposits that are superimposed over the dwellings, the annex, the middens and the northern area, are termed "post-house fill". These seven depositional units simplify what was a more complex stratigraphic sequence, but they provide a useful starting point to explore possible variation in the artifact assemblage.

When considering the quantified data presented below it should be kept in mind that the volumes of deposit represented by these units are very different. The chamber floor and northern basal deposit represent very small sediment volumes compared with the others, so much lower numbers of artefacts should be expected. Although the house floor area constitutes a greater sediment volume than the latter units, it is still much less than the midden deposits and the post-house fill units.

Lithic Debitage Materials

Hydrothermal vein quartz was locally available in the Precambrian gneiss basement rocks. Gray slate may have been procured somewhat locally in Ivanovskaya Bay, ca. 12 km northeast of the Ust-Drozdovka settlement (Chapter 3, Figure 3.2), along with gray-black cherts. Multi-colored flints probably were imported from the White Sea region where they occur in Carboniferous Period formations in the Arkangelsk area (Kinnunen et al. 1985: 7), but also in secondary contexts as water-rolled nodules on marine beaches. One problem is that the artifact catalogue does not distinguish properly between chert and flint; the presumed local cherts are gray-black, but a significant proportion of what is listed as "chert" consists of multi-colored specimens that must be flint. Consequently, multi-colored "cherts" in the catalogue are regarded here as flints.

Variation in the frequency and proportions of the main lithic debitage raw materials relative to the primary units of site context is shown in Table 6.1. Quartz is the dominant raw material in all contexts, in all but one case over 90% of the material. The exception is the earlier-dated basal component north of the houses, which has the highest proportion of chert and flint found on the site (17.9% and 6.7%, respectively), and a proportion of slate (10.7%) that is roughly twice that found in other contexts.

The prodigious use of quartz is remarkable, totaling over 52,000 flakes as well as about 1300 bipolar and other cores and almost 1500 scrapers (see below). The expedient reduction of quartz, to a significant degree involving bipolar percussion, seems to have been an activity common to all the site contexts. Presumably, the primary goal of quartz reduction was to acquire sharp-edged fragments for cutting functions, or blanks that could be modified into scrapers with a minimum of retouch. Flenniken (1981: 71–78, 84–90) provides an example of how unmodified quartz fragments could have been hafted in wooden handles and then used for processing fish. The faunal remains from House 5 (see below) provide evidence for the exploitation of both cod and salmon at the site, and the site is located adjacent to a modern salmon-fishing river.

The slate debitage, as well as the presence of little-modified slate plates and tool preforms, attests to the on-site production of slate tools, mostly points and knives. The debitage is associated with all the site contexts. Flint flakes occur in all the contexts, although generally in small numbers, with the exception of a slightly higher count in the post-house fill unit. Much of this may represent the retouch of tools produced elsewhere. One small flint nodule was found in the basal northern unit (see below), which may indicate that imported raw material nodules were reduced locally, but flint may also have been

Table 6.1. Lithic debitage raw material frequencies by occupation context. Row percentages indicate the proportion of each raw material within the given depositional unit.

	Material						
Context	**Quartz F (%)**	**Slate F (%)**	**Flint F (%)**	**Chert F (%)**	**Sandstone F (%)**	**Quartzite F (%)**	**Total**
West midden	5949 (93.9)	316 (5.0)	39 (0.6)	20 (0.3)	12 (0.2)	0 (0.0)	6336
East midden	10786 (92.5)	780 (6.7)	23 (0.2)	34 (0.3)	26 (0.2)	6 (0.1)	11655
House floors	7883 (91.7)	627 (7.3)	36 (0.4)	38 (0.4)	13 (0.2)	0 (0.0)	8597
Other midden	11328 (93.1)	767 (6.3)	42 (0.3)	25 (0.2)	8 (0.1)	1 (0.0)	12171
Chamber	1258 (94.2)	61 (4.6)	6 (0.4)	9 (0.7)	1 (0.1)	0 (0.0)	1336
North basal	608 (64.7)	101 (10.7)	63 (6.7)	168 (17.9)	0 (0.0)	0 (0.0)	940
Post-house fill	14884 (94.2)	743 (4.7)	164 (1.0)	109 (0.7)	21 (0.1)	11 (0.1)	15932
Total	52696	3396	373	403	81	18	56967

imported in the form of preforms or finished tools, which were then subjected to secondary or tertiary retouch. Chert is present in modest quantities in all the contexts. In the earlier basal level of the northern area, just outside the houses, there is an anomalously high proportion of chert. However, much of this is clustered in the northwest corner of the subarea, which lies a short distance from adjacent House 3, a possible contributor to the deposition. The modest numbers of chert flakes associated with the house floors and the middens suggest, at minimum, the retouch of blanks procured at nearby sources. The larger quantity of chert flakes in the basal northern subarea might indicate more substantial manufacturing activities; two chert point fragments were found in this area, but no preforms.

Given the huge quantities of quartz flakes in the House 5 area, the debitage distribution can perhaps inform us regarding depositional patterns at the site. Figure 6.1 provides an inverse distance weighted (IDW) interpolation of quartz debitage density patterns in the post-house fill layers at the site. The analysis was based on 50 cm^2

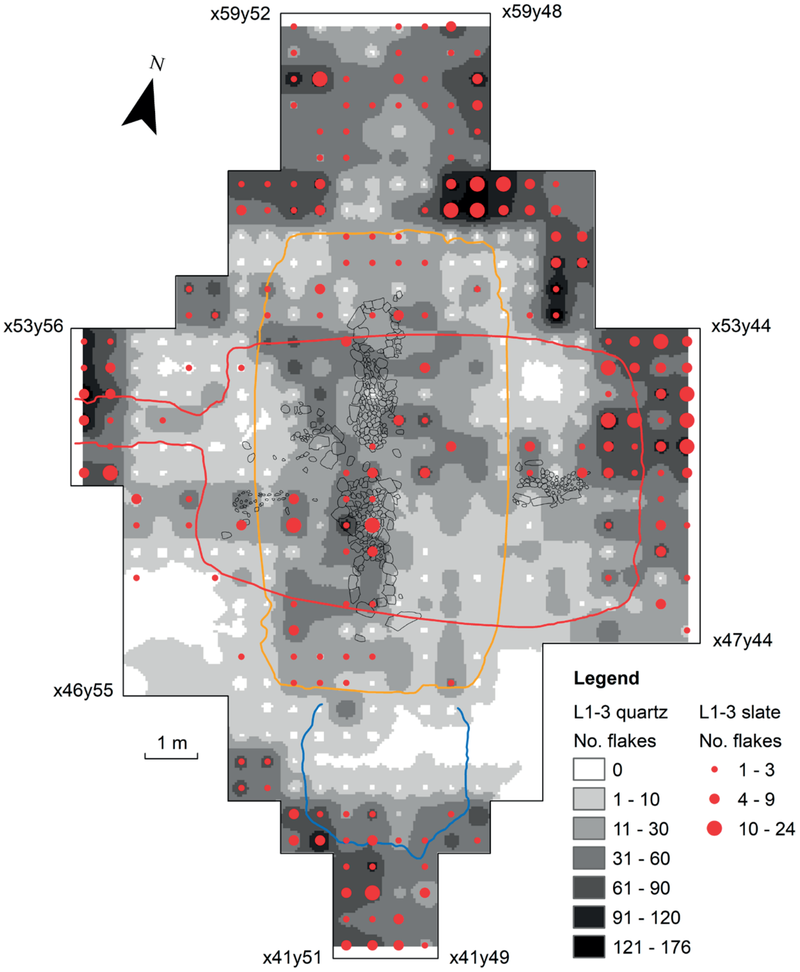


Figure 6.1. Inverse distance weighted interpolation plot of quartz debitage density and graded circle plot of slate frequencies in the post-house fill layers.

collection quadrats and the mapped density categories were derived from adjusted natural breaks in the interpolated results. Quartz frequencies are high outside the House 5 depression, with particularly high frequencies to the west and northeast of the dwelling feature. A moderate density of quartz flakes is visible in the bottom of the house depression, conforming somewhat to the underlying floor of House 5B. Overlain on the quartz density distribution is a graded circle display of slate flake frequencies in the same post-house fill layers. Slate frequencies follow the quartz patterns fairly closely. Thus, the two most frequent lithic raw materials had similar patterns of discard. Both were deposited in the abandoned house depression, either by in situ knapping or by the use of the depression as a disposal area for adjacent houses that were still in use.

The same debitage raw materials were mapped in relation to layers believed to correspond to the floors of Houses 5A and 5B and the circular chamber (Figure 6.2). At least two caveats should be mentioned: 1) the distinction between floor and overlying fill was not always clear, especially in the areas near the house walls, where greater quantities of fill had slumped in over the floor, and 2) because of the stratigraphic overlap between the houses their flake distributions may be mixed. One clear pattern is the dense concentration of quartz flakes adjacent to the eastern hearth of House 5A, which probably pertains to deposition during the House 5A occupation. Another dense cluster of quartz flakes occurs east of the southernmost hearth of House 5B; it is less clear which of the houses this cluster should be attributed to, although House 5B seems most likely. West of the House 5B southern hearth is an apparent low-density passage between two areas of higher quartz density. This could be suggestive of an entrance passage off-center on the western wall of House 5B, but there was no evidence of a depression running through the west wall. There is another quartz concentration on the floor of the circular chamber.

The slate flake distribution mostly follows the density patterns of the quartz, including a low-density area corresponding to the above-mentioned quartz "passage" west of the House 5B hearth. However, the vast majority of slate flakes seem to be associated with House 5B, and to a lesser extent, the circular chamber, with the caveat that some of the flakes in the area of house-floor overlap could have been associated with House 5A.

The quartz debitage can also serve as a rough proxy for mapping variation in midden deposition, as much quartz probably was collected from the house floors and then dumped outside the dwellings in a series of "maintenance" episodes. Given the thickness of the midden deposits – in places up to 40 cm – the arbitrary levels used in its excavation were grouped into two units in order to simplify the presentation: upper and lower levels. An IDW interpolation of quartz flake frequencies was conducted for each level. The lower midden deposits (Figure 6.3) show a very high quartz concentration at the eastern end of House 5A, immediately south of its hearth. Given the difficulties in distinguishing between the house floor and the basal midden deposits, some of these flakes might be associated with the house floor. However, as the debitage concentration continues in the overlying midden deposits it is likely that most of the flakes represent material dumped on the house floor after the dwelling was abandoned. Another debitage concentration occurs in the northeast corner of House 5B; this is probably wall midden material that slumped over the floor. A couple of less dense concentrations are found in the western midden area. The largest lies on top of the entrance to House 5A, representing fill that post-dates the house.

The upper midden deposits (Figure 6.4) are more extensive. Thin midden materials cover much of the house floors, but the major accumulations are shown by the high flake densities in the western midden above the House 5A entrance passage and the area north of House 5B. A less dense accumulation occurs on the eastern wall of House 5A. It is possible that some of the materials in the western and northern midden areas were deposited by the inhabitants of adjacent Houses 3 and 4.

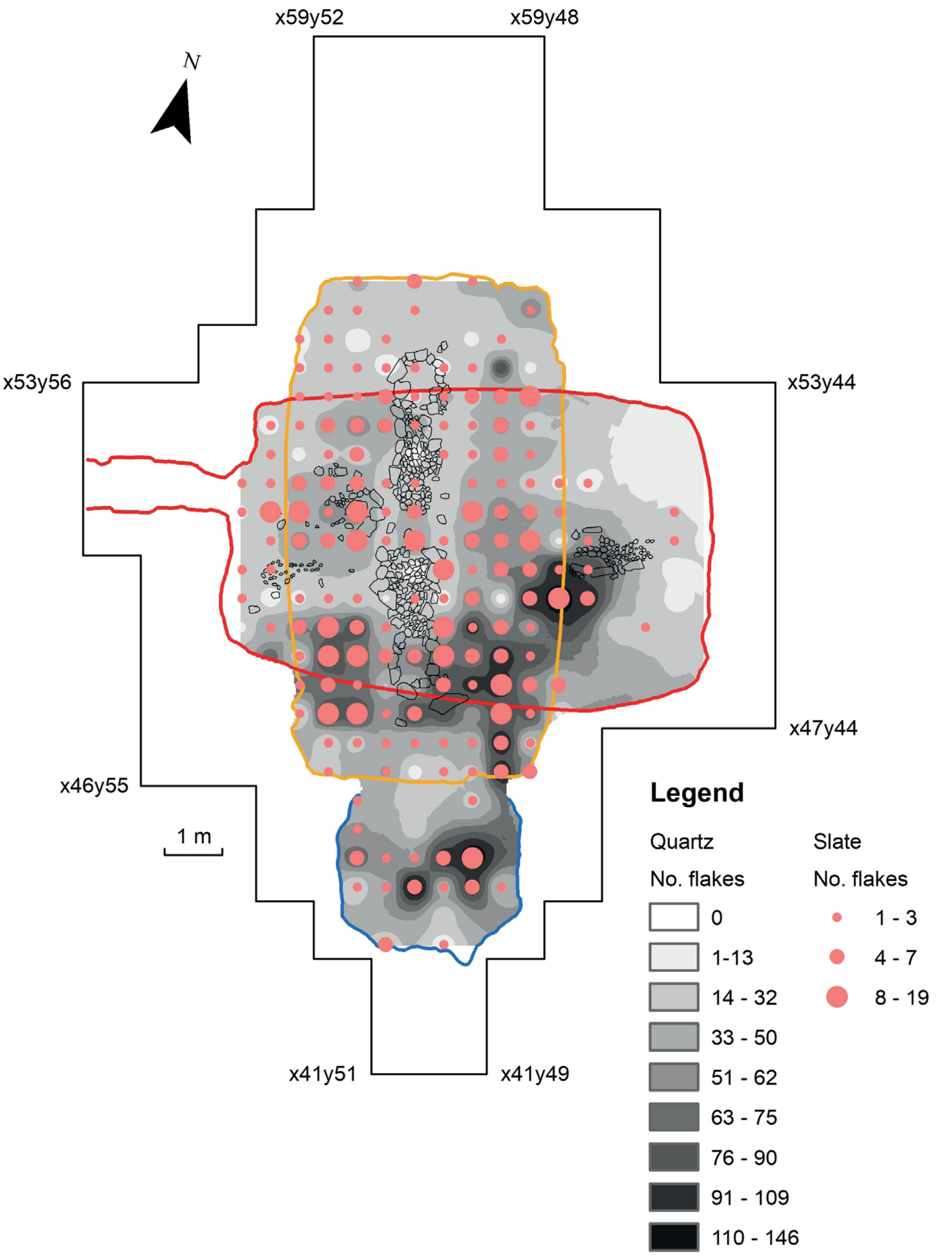


Figure 6.2. Inverse distance weighted interpolation plot of quartz debitage density and graded circle plot of slate frequencies on the house and circular chamber floors.

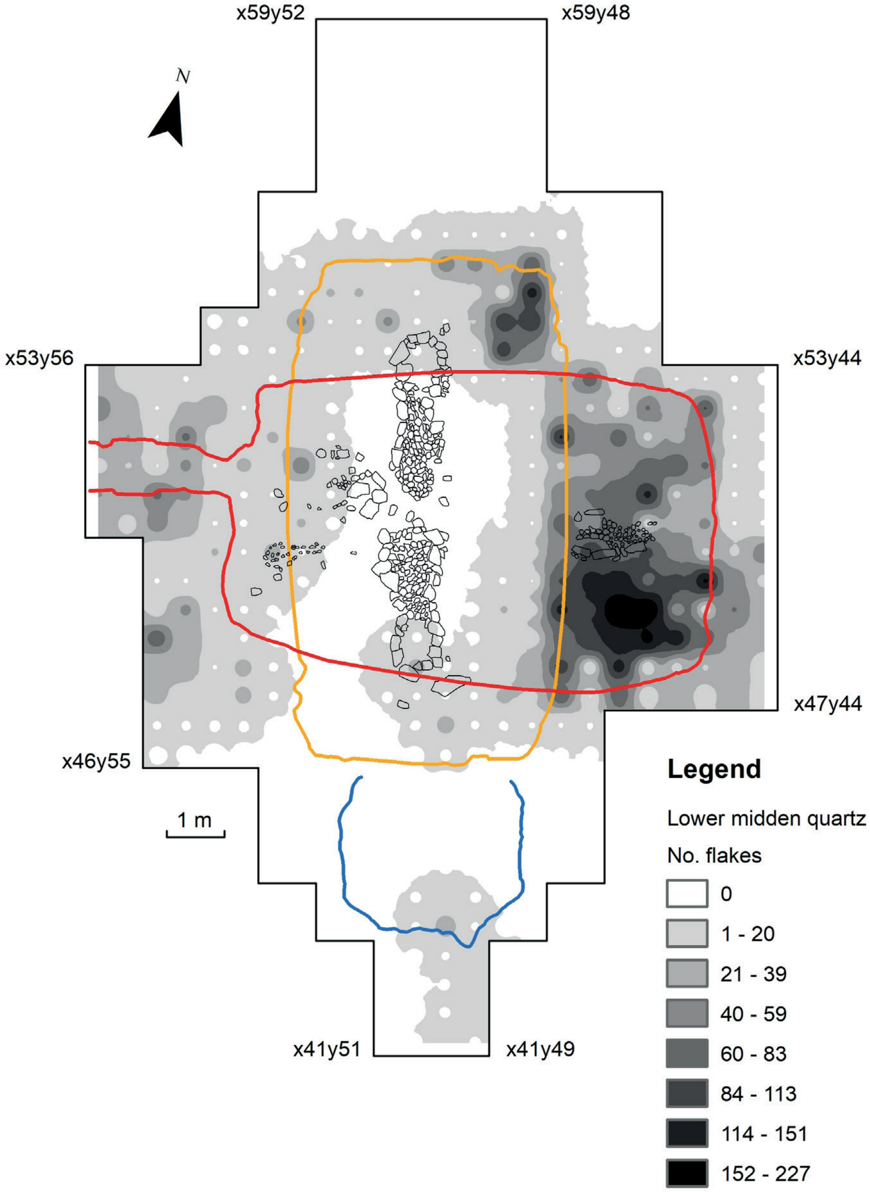


Figure 6.3. Inverse distance weighted interpolation plot of quartz debitage density in the lower midden deposits.

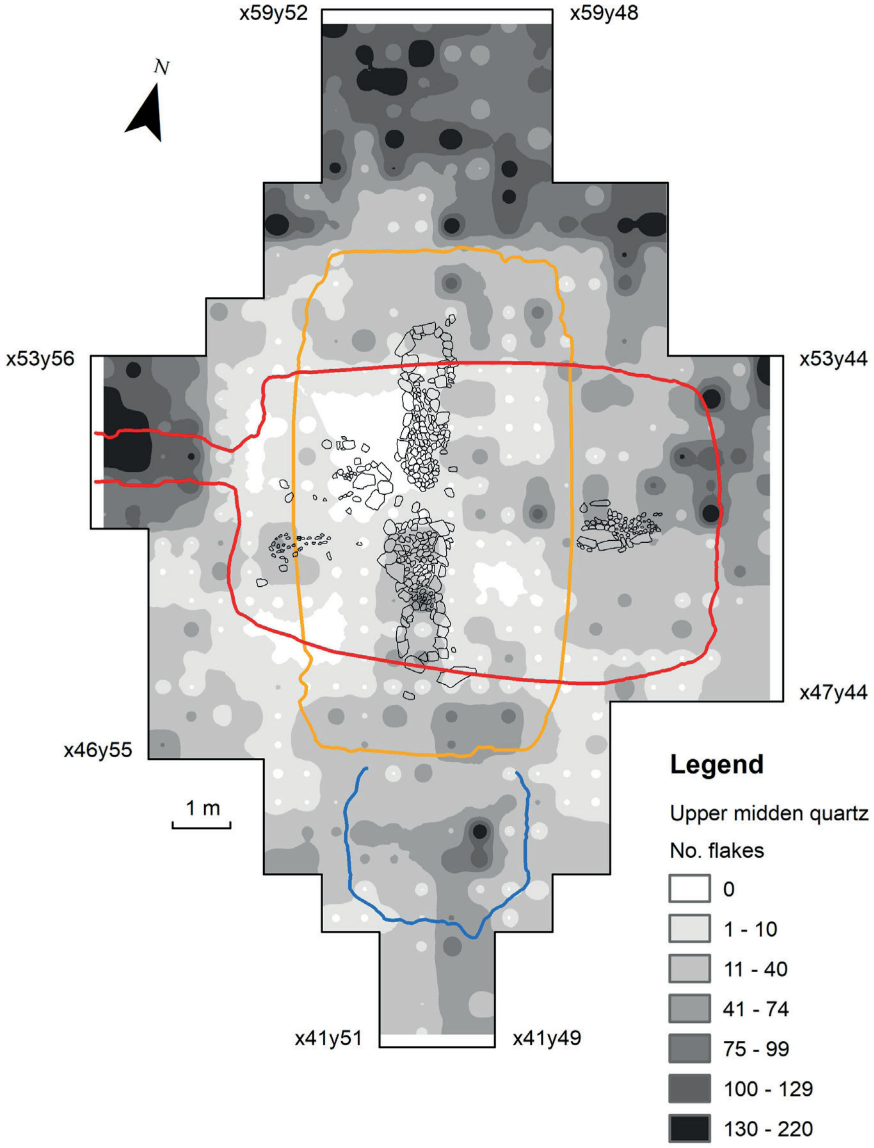


Figure 6.4. Inverse distance weighted interpolation plot of quartz debitage density in the upper midden deposits.

Lithic Tool Assemblage

Variation in the lithic tool assemblage will be explored by dividing the assemblage into its main raw material-based technological components: quartz, slate, chert/flint, and soapstone.

Quartz Tool Assemblage

The prodigious quantities of quartz debitage attest to the importance of quartz in the lithic technology at Ust-Drozdovka III. The tool assemblage is also dominated by quartz implements: large numbers of bipolar cores and scrapers, amorphous cores, and a very few bifacial points. Table 6.2 outlines the distribution of the quartz tool assemblage in relation to the main depositional units at the site. The sample sizes from the chamber floor and the basal northern area are very small (n= 36, 8), partly as a consequence of the small area and volume of deposition in each case, so they make for weak inferences. For the larger sample units, if we consider the column percentages – the proportion of that tool class found in each of the depositional units – we see that the greatest proportion of bipolar cores, other cores and scrapers is found in the post-house fill unit (in all cases just under 40%). There is a slightly higher proportion of bipolar cores in the east midden, but the other cores and scrapers show relatively even proportions between the units, except for the post-house fill deposits. If the row percentages are considered – the proportion of a tool class found in that specific unit – there are only minor differences between the larger sample units with respect to the proportions of the three main tool classes present in each unit; that is, the assemblage characteristics are similar.

Overall, these data support the impression developed during the fieldwork: that the post-house layers seem to have been the focus of either considerable amounts of quartz reduction and scraper-related maintenance activities, or that the abandoned house depression was used as a refuse deposit for lithics produced elsewhere, such as adjacent houses.

Figure 6.5 shows the distribution of quartz technology components in relation to the house floors and the circular chamber. Most of the implements seem associated with House 5B, and particularly its southern end, but some may be

Table 6.2. Quartz tool assemblage in relation to the main depositional units. Parentheses are column percentages, square brackets are row percentages.

Unit	Bipolar cores	Other cores	Scrapers	Bifacial points	Total
West midden	151 (12.6) [42.1]	28 (18.2) [7.8]	180 (12.4) [50.1]	0 (0.0) [0.0]	359
East midden	261 (21.8) [47.5]	21 (13.6) [3.8]	266 (18.4) [48.5]	1 (33.3) [0.2]	549
House floors	122 (10.2) [39.7]	19 (12.3) [6.2]	165 (11.4) [53.7]	1 (33.3) [0.3]	307
Other midden	197 (16.5) [42.8]	23 (14.9) [5.0]	239 (16.5) [52.0]	1 (33.3) [0.2]	460
Chamber	16 (1.3) [44.4]	2 (1.3) [5.6]	18 (1.2) [50.0]	0 (0.0) [0.0]	36
North basal	6 (0.5) [75.0]	0 (0.0) [0.0]	2 (0.1) [25.0]	0 (0.0) [0.0]	8
Post-house fill	444 (37.1) [41.0]	61 (39.6) [5.6]	577 (39.9) [53.3]	0 (0.0) [0.0]	1082
Total	1197	154	1447	3	2801

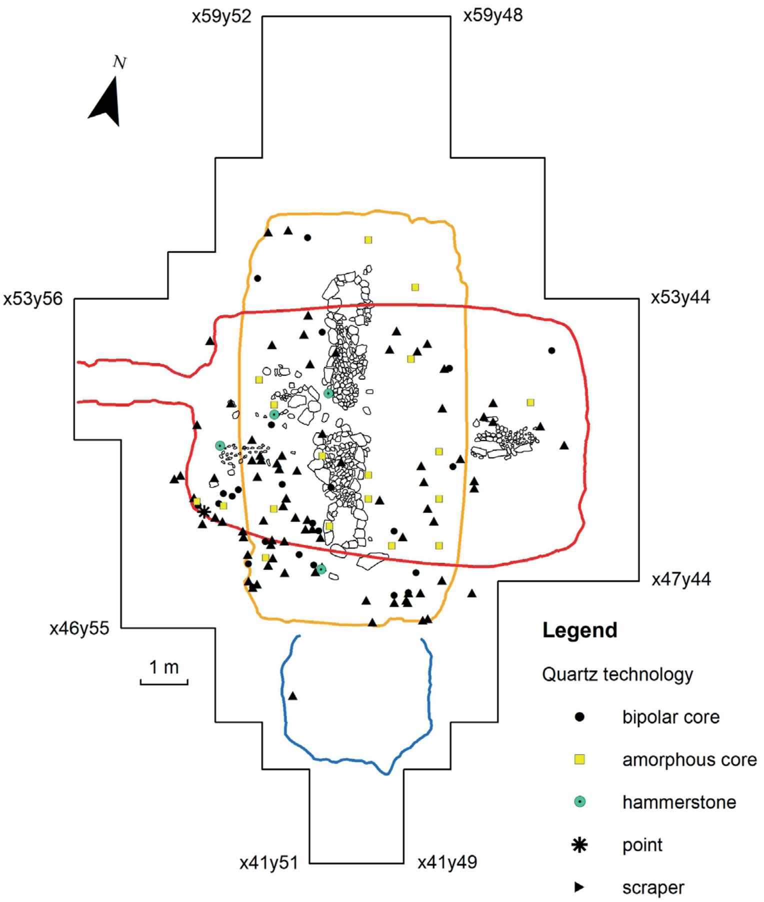


Figure 6.5. Distribution of quartz technology components in relation to the house and circular chamber floors.

related to House 5A, given the dwelling-floor overlap. The cluster of implements west of House 5B's southern hearth corresponds to a cluster of quartz debitage in the same area (Figure 6.2). Most of the bipolar cores occur in the southwestern portion of House 5B, while amorphous cores exhibit a more generalized distribution across the house floor. All the hammerstones occur on the west side of the House 5B hearths. Scrapers are distributed across both house floors, although there is a particular concentration in the implement cluster in the southwestern corner of House 5B. Although the circular chamber contained a concentration of quartz debitage (Figure 6.2), its only retouched implement was a single scraper.

Slate Tool Assemblage

After quartz, slate was the next most prominent component of the lithic technology. Gray slate may have been procured from nearby sources in Ivanovskaya Bay (see Chapter 3). Relatively few plates of raw slate or minimally modified cores were present (n= 11), but on-site tool production is indicated by a large number of preforms as well as grindstone and whetstone fragments (Table 6.3), as well as a considerable quantity of debitage (Table 6.1). This production was oriented mainly towards two tool classes – ground slate knives (Figure 6.6) and points (Figure 6.7) – although axes/adzes and chisels may also have

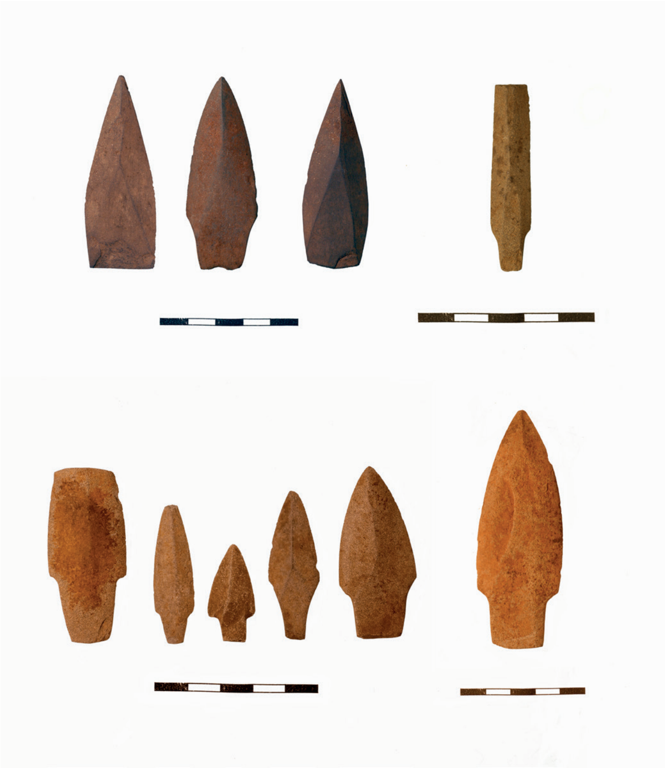
Table 6.3. Slate tool assemblage in relation to the main depositional units. The percentages are row percentages, indicating the proportion of that tool class in each unit.

	Plate-core	Pre-forms	Point pre-forms	Knife pre-forms	Axe-adze pre-forms	Points	Knives	Axe-Adze	Tool frag-ments	Whet-grindstones	Total
West midden	3 (5.9)	9 (17.6)	1 (2.0)	1 (2.0)	1 (2.0)	4 (7.8)	11 (21.6)	1 (2.0)	12 (23.5)	8 (15.7)	51
East midden	2 (3.4)	8 (13.6)	2 (3.4)	2 (3.4)	1 (1.7)	5 (8.5)	7 (11.9)	2 (3.4)	22 (37.3)	8 (13.6)	59
House floors	3 (6.4)	12 (25.0)	0 (0.0)	1 (2.1)	1 (2.1)	2 (4.2)	7 (14.6)	2 (4.2)	15 (31.3)	5 (10.4)	48
Other midden	0 (0.0)	20 (29.0)	1 (1.4)	2 (2.9)	2 (2.9)	0 (0.0)	10 (14.5)	1 (1.4)	22 (31.9)	11 (15.9)	69
Chamber	0 (0.0)	0 (0.0)	1 (33.3)	1 (33.3)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	1 (33.3)	0 (0.0)	3
North basal	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	1 (100.0)	0 (0.0)	1
Post-house fill	3 (2.9)	26 (24.8)	2 (1.9)	4 (3.8)	0 (0.0)	20 (19.0)	14 (13.3)	1 (1.0)	16 (15.2)	19 (18.1)	105
Total	11	75	7	11	5	31	49	7	89	51	336

been produced (Figure 6.8). The knives are of the single-edged type and relatively small, virtually identical to contemporary types in Finnmark (e.g. Simonsen 1961: 327, 355). At first glance, two types of slate points were made: a stemmed variety and a beveled straight-base variety (Figure 6.7). However, it is possible that the latter are preforms for the stemmed points, because the medial ridges and converging bevels on the stemmed points are precisely the same as on the beveled base implements. The production process may have involved first creating preforms with broad, straight-ground bases, and then proceeding with flaking, cutting or grinding shoulders at the appropriate height, thereafter grinding down the sides of the stems. Of course, the straight-based implements could also have been used as-is. Additionally, there is the proximal end of a very narrow (11 mm) stemmed point (Figure 6.7), which is reminiscent of the "Nyelv" points known from Finnmark (Jørgensen 2021; Olsen 1994:54; Sommerseth 1997:39–45). These points date to the first portion of the Late Stone Age (5000–3500 BC), much earlier than the House 5 locality.

Table 6.3 shows the distribution of the slate implements in relation to the main depositional units. Also included is one axe made of sandstone, and whetstones (all but one of sandstone), as the latter may have been used in the production and maintenance of ground stone implements. The table indicates that a considerable slate technology component was present in most of the depositional units, except for the basal northern area, with only one item, and the floor of the chamber, with only three (or perhaps four) items. Excluding unidentifiable tool fragments, the overall greatest proportions of implement types are generic preforms (23.4%), knives (15.3%), whetstones (13.1%), and points (9.7%). If we ignore the low frequency basal northern area and the chamber, the proportions of the different implement types in each depositional unit vary somewhat, but for the most part not greatly.

Figure 6.6. Ground slate knives. Photo: Knut Helskog.



Figur 6.7. Ground slate points and preforms. Photo: Knut Helskog.

Figure 6.8. Ground slate chisel/adze and axe. Photo: Knut Helskog.

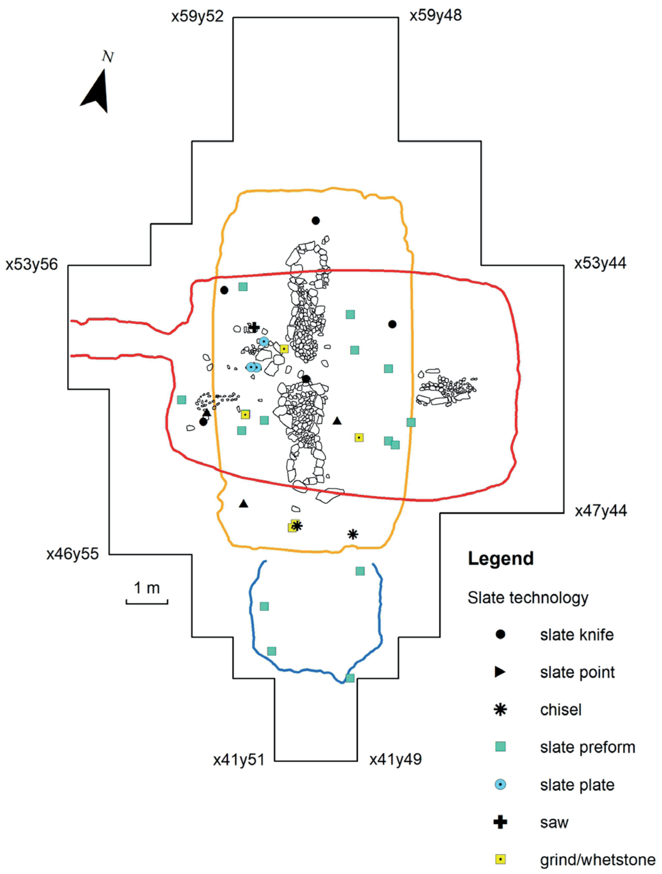


Figure 6.9. Distribution of slate technology components in relation to the house and circular chamber floors.

However, a greater divergence is seen if we drop the low frequency units and the low frequency tool types, as well as tool fragments and whetstones, and instead focus on four implement classes: plates-cores, generic preforms combined with point and knife preforms, points, and knives. The resulting cross-tabulation (table not shown here) produces a chi-square value of 23.92 (12 df), significant at the p= 0.02086 level. Examination of the observed/expected frequencies indicates the result is mostly a consequence of larger than expected numbers of preforms in the "other" midden areas and a larger than expected frequency of points in the post-house fill deposits. The archaeological significance of these results is not clear, except insofar as it might underline the impression received from the quartz assemblage that there was a considerable amount of activity or deposition in the dwelling depression after House 5B was abandoned.

Figure 6.9 shows the distribution of slate-related technology in relation to the house floors. The impression is that most of it could be associated with House 5B, although some material in the area of house-floor overlap may be related to House 5A. As noted in Chapter 5, resin from one of the slate points associated with the floor area was AMS-dated to 3609±33 (2026–1922 BC; Wk-35070). The circular chamber contained three, and possibly four, preforms. The slate tool distribution parallels that of the slate debitage (Figure 6.2), which appears to be associated primarily with House 5B and the circular chamber.

Chert/flint Assemblage

The chert/flint assemblage was the smallest component of the lithic technology. As was noted for the debitage, the term "chert" is reserved for the gray-black materials that are believed to occur locally in Ivanovskaya Bay, while multi-coloured microcrystallines were considered as flint. Tables 6.4 and 6.5 outline the distribution of tool classes of chert and flint, respectively. The implement classes used for both the chert and flint assemblages were points, preforms/bifaces, scrapers, blades, utilized flakes, and tool fragments, while bipolar cores and nodules were also present in the flint assemblage. The category "blades" is problematic. While some of this material might represent earlier Mesolithic material incorporated into the Early Metal Age deposits, it is likely that much of it is the product of bipolar reduction of small flint and chert nodules. No technological study of this material was undertaken, however.

Only 27 tools were made of chert, so the numbers can indicate little about depositional patterns. The flint sample of 58 tools is also rather modest, and most of these were of the dubious "blade" category. Nevertheless, it is notable that 60% of the flint implements were found in the post-house fill deposits. A significant proportion of the chert and flint debitage was also found in these deposits (Table 6.1). Chert debitage was also abundant in the basal deposits of the northern area, but there were very few tools of these materials in that area. Given the low frequencies of

Table 6.4. Chert tool assemblage in relation to the main depositional units.

	Points	Preforms/ bifaces	Scrapers	Blades	Utilized flakes	Tool fragments	Total
West midden	2	1	1	1			3
East midden		1	2	1	1		7
House floors			3				3
Other midden		2		1	1		4
Chamber							0
North basal	1				1	1	3
Post-house fill	2			3	2		7
Total	5	4	6	6	5	1	27

Table 6.5. Flint tool assemblage in relation to the main depositional units.

	Points	Preforms/ bifaces	Scrapers	Blades	Utilized flakes	Tool fragments	Bipolar cores	Nodules	Total
West midden	3		1		1	1			6
East midden				3	1		1		5
House floors		1	2	1	1				5
Other midden	2			3					5
Chamber				1					1
North basal								1	1
Post-house fill	6	4	6	15	3	1			35
Total	11	5	9	23	6	2	1	1	58

Figure 6.10. Bifacially retouched flint points and preforms. Photo: Knut Helskog.

both chert and flint items their distributions are not mapped here.

Figure 6.10 illustrates examples of bifacial points and preforms of flint. Leaf-shaped forms with pointed or rounded bases might be finished points or preforms, and a slightly stemmed specimen is a likely product of these preforms. There are also points and preforms of triangular form with flat or slightly concave bases.

Soapstone Assemblage

Perhaps the most unexpected dimension of the House 5 assemblage was the abundance of soapstone materials (Table 6.6). The considerable quantity of what is probably both raw materials and processing debitage (simply termed "clumps" in Table 6.6) suggests local sources, but none have been identified as of yet. These clumps consist of 567 amorphous pieces of varying sizes without clear indications of modification, and another 28 pieces with low-grade modification traces ("modified" items). There are 8 possible vessel fragments. One is from a possible shallow bowl, two are vessel rim fragments, four are wall fragments and one is a slightly hollowed-out chunk that may be an unfinished or expedient oil lamp, or other vessel. Notable within the soapstone assemblage are 11 figurines and three engraved pieces. These are described in more detail below. There are also two fishing sinkers.

What is striking about the soapstone assemblage is the small quantity of finished products relative to the amount of raw material and processing debris. It is possible that implements were produced here and then transported to other locations; for example, the oil lamps and a mould for copper or bronze tools found at Mayak II in the outer portion of Drozdovka Bay (Figure 8.4 in Chapter 8; Gurina 1997: Figure 35; Shumkin 1984; 2001). Another possibility is that many more fishing sinkers were produced, but were lost in the sea during the course of use. Another use of soapstone was as temper for ceramics. For this purpose the soapstone clumps had to be crushed with a hammerstone and pulverized into the tiny fragments that were incorporated into ceramic paste. However, the quantity of soapstone far exceeds that needed for the local production of ceramics, as only 5% of the sherds were tempered with soapstone (see below).

The distribution of soapstone clumps varies relative to the main depositional contexts (Table 6.6). It was almost absent from the circular chamber and the northern basal deposit (only one clump each) and relatively little was associated with the house floors (4.6%). By far the greatest proportions of clumps were found in the "other midden" unit (36.7%) and the post-house fill (25.4%). The west midden accounted for 17.6% and the east midden for 15.3%. The percentage for the post-house fill indicates that soapstone processing continued at a significant level after the abandonment of House 5B. Frequencies of the other soapstone material classes are too low to draw any distributional conclusions, but it can be noted that most of the vessel fragments occur in the post-house fill, and that figurines and decorative objects are fairly evenly distributed, although they are absent from the chamber floor and the basal northern deposits.

The spatial context of the soapstone technology can be visualized in distribution maps. Figure 6.11 shows the distribution of soapstone items

Table 6.6. Soapstone assemblage in relation to the main depositional units.

	Clumps	Modified	Figurine-Decorated	Vessels	Sinkers	Total
West midden	100	12	4	1	0	117
East midden	87	0	3	0	0	90
House floors	26	4	1	0	0	31
Other midden	208	7	3	1	1	220
Chamber	1	0	0	0	0	1
North basal	1	0	0	0	0	1
Post-house fill	144	5	3	6	1	159
Total	567	28	14	8	2	619

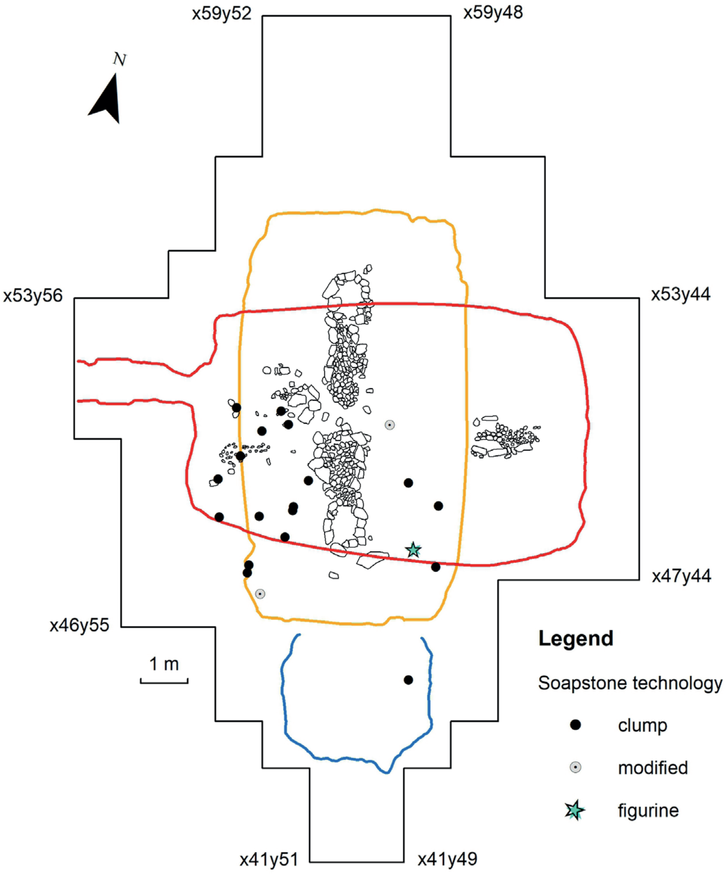


Figure 6.11. Distribution of soapstone technology components in relation to the house and circular chamber floors.

Table 6.7. Frequency of soapstone clumps in relation to arbitrary layers in the midden areas. The abbreviation "n.a." indicates "not applicable," i.e., the levels were absent in that context.

Level	**West midden**	**East midden**	**Other midden**	**Total**	**%**
4a	40	22	110	172	43.9
4b	39	22	60	121	30.9
4c	16	14	22	52	13.3
4d	2	7	11	20	5.1
4e	0	4	5	9	2.3
4f	1	10	n.a	11	2.8
4g	n.a.	4	n.a	4	1.0
4h	n.a	1	n.a	1	0.3
4i	n.a.	2	n.a	2	0.5
Total	98	86	208	392	

associated with the house floors and the circular chamber. Most of the few items present might be associated with House 5B. Figure 6.12 depicts the distribution of soapstone technology in the other depositional units at the site, collapsed into a single diagram for the sake of economy. Clumps of unmodified soapstone are widely distributed throughout the middens and the post-house fill, as are the much fewer modified pieces. Figurines and vessel fragments are also broadly spread. Thus, aside from the low frequency of soapstone items on the house floors, and their virtual absence from the chamber and the northern basal deposit, there is little spatial patterning in the occurrence of soapstone within the other depositional contexts.

Chronological variation in the intensity of soapstone processing and deposition can be explored by looking at the frequencies of clumps in the various layers of the middens. Table 6.7 indicates that in each of the three largest midden contexts the vast majority of soapstone clumps were deposited in the upper two 5 cm arbitrary levels; indeed, for the middens as a whole, 75% of the clumps occur in these two levels. For the west midden we are unable to distinguish clearly between midden components deposited during the House 5A and 5B occupations, but the uppermost part of this midden was most likely associated with the later House 5B. Most of the eastern midden probably was associated with House 5B because these deposits filled the eastern end of House 5A. Thus, these midden deposition

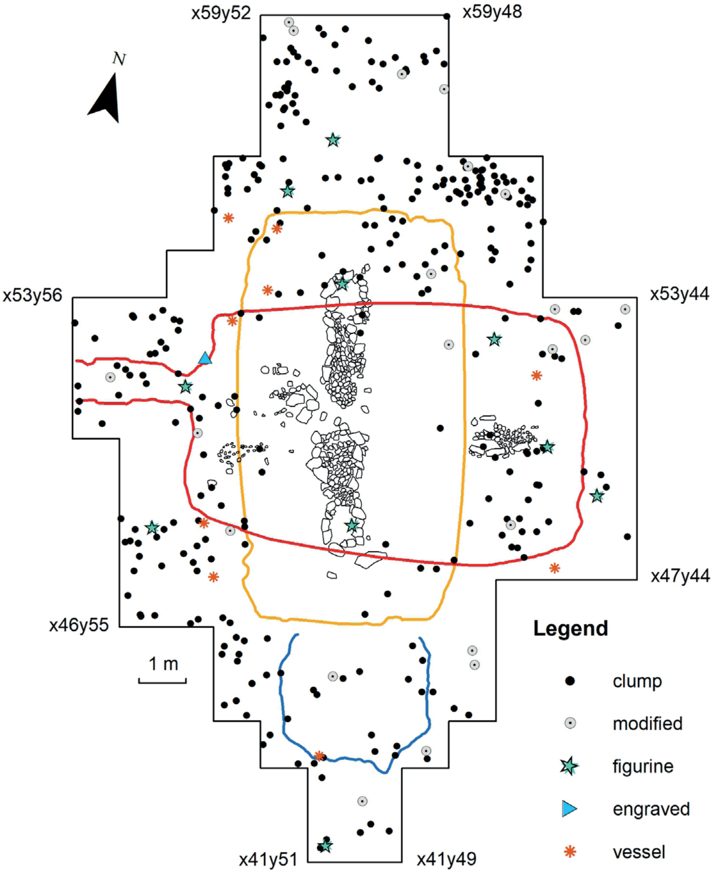


Figure 6.12. Distribution of soapstone technology components in relation to the other depositional units.

figures suggest that soapstone processing was more likely to have been associated with the later House 5B than 5A.

The figurines and decorated pieces of soapstone are illustrated in Figure 6.13. They consist of two animal head figurines – one certainly a bear, the other possibly a bear or fox – a small, possibly unfinished, bear figure, an unfinished elk/moose depiction, a human-like head, and an engraved plaque. More detailed descriptions:

- bear head, 5 cm long and 1.5 cm wide, with eyes, ears and mouth. Around the base of the neck is a furrow for hanging on a string (Figure 6.13f).

- animal head, 4.5 cm long and 3 cm wide (Figure 6.13c). A mouth is indicated by a clear incision, bumps may represent ears. Possibly a bear.

- bear figure, 3.5 cm long and 1.5 cm wide (Figure 6.13d). Four short legs, incised lines on each side of the head suggest a mouth.

- animal figure, 5 cm long and 1 cm wide, roughly shaped like a European elk/moose, with a distinct beard and the beginning of what could be ears/antlers (Figure 6.13e). Possibly a bull.

- human-like head with rough facial features, 3.5 cm long and 1 cm wide (Figure 6.13a).

- plaque, 3.5 cm wide, 6 cm long and 1 cm thick; on one side there are nine horizontal engraved lines and two vertical lines, on the other side there are six horizontal lines and two vertical lines (Figure 6.13b). The pointed corner of the plaque has a suspension furrow.

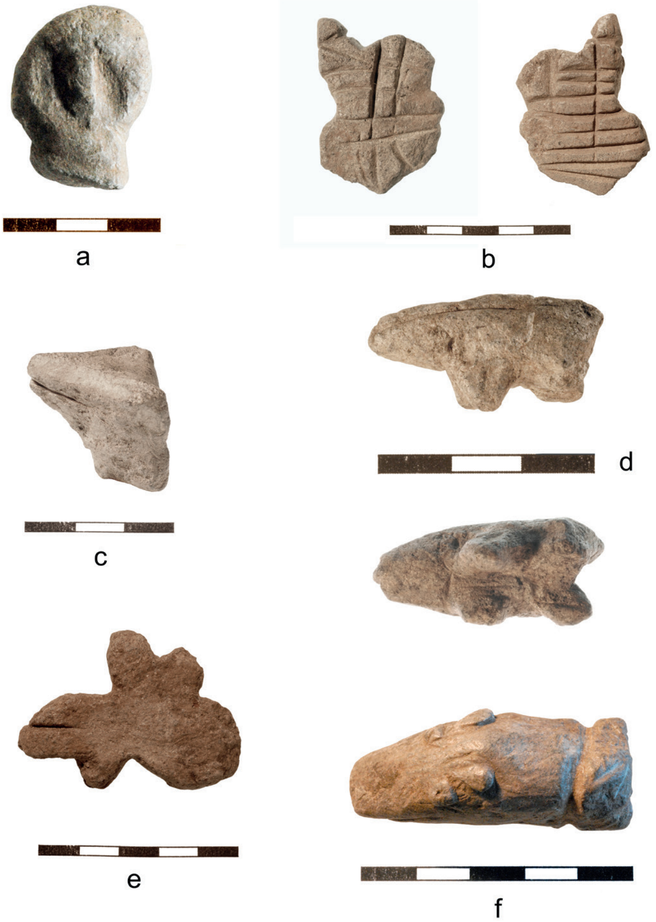


Figure 6.13. Soapstone figurines and engraved piece. a) anthropomorphic head, b) engraved plaque with suspension furrow, c) bear head, d) bear figure, side profile and underside showing legs; e) elk/moose head, f) bear head with suspension furrow. Photo: Knut Helskog.

Ceramic Assemblage

A total of 279 ceramic sherds were found at House 5, but their frequency varied considerably between the main depositional units (Table 6.8) (one specimen lacked a level designation, so it was omitted from the table). According to the table, most of the sherds were found in the western midden, but this is misleading because the vast majority of these were derived from one concentration of 83 small fragments. If we adjust for that, then it is the post-midden fill and the other midden areas – and specifically the midden north of House 5B – that contain the most ceramic material.

Figure 6.14 shows the distribution of sherds associated with the house floors. Given the stratigraphic overlapping of the two houses it is difficult to associate the house floor ceramics with one or the other dwelling, but the distribution pattern could imply that all the floor-related ceramics pertain to House 5B. As noted in Chapter 5, residue from an undecorated vessel of asbestos-tempered ceramics found on top of the southern end of the northern hearth at House 5B was AMS dated to 3712±25 BP (2190–1939 BC, 68.3% prob.; Wk-35069). However, this is clearly too old relative to the sherd's superpositioning on a hearth dated to 1743–1622 BC. A 50% marine reservoir correction to 1734–1563 BC (68.3% prob.) was suggested to be reasonable in relation to the hearth date.

Figure 6.15 maps the sherds associated with the middens and post-house fill. Most of the map points represent only one sherd, but six consist of

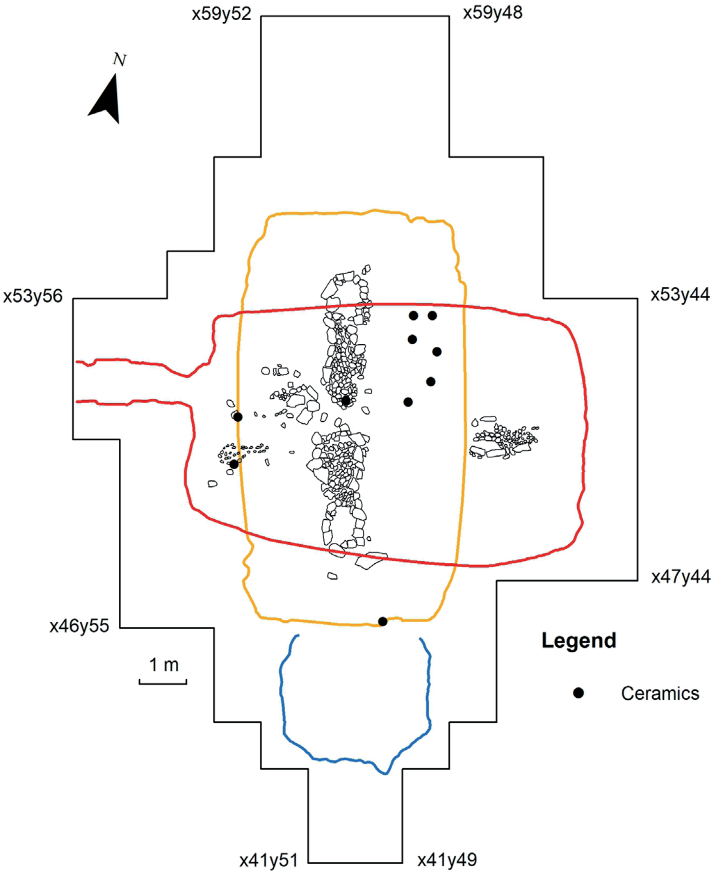


Figure 6.14. Distribution of ceramics in relation to the house and circular chamber floors.

Table 6.8. Relative frequency of ceramic sherds in the various depositional units.

Unit	N (%)
West midden	109 (39.2)
East midden	12 (4.3)
House floors	10 (3.6)
Other midden	69 (24.8)
Chamber	0 (0.0)
North basal	1 (0.4)
Post-house fill	77 (27.7)
Total	278

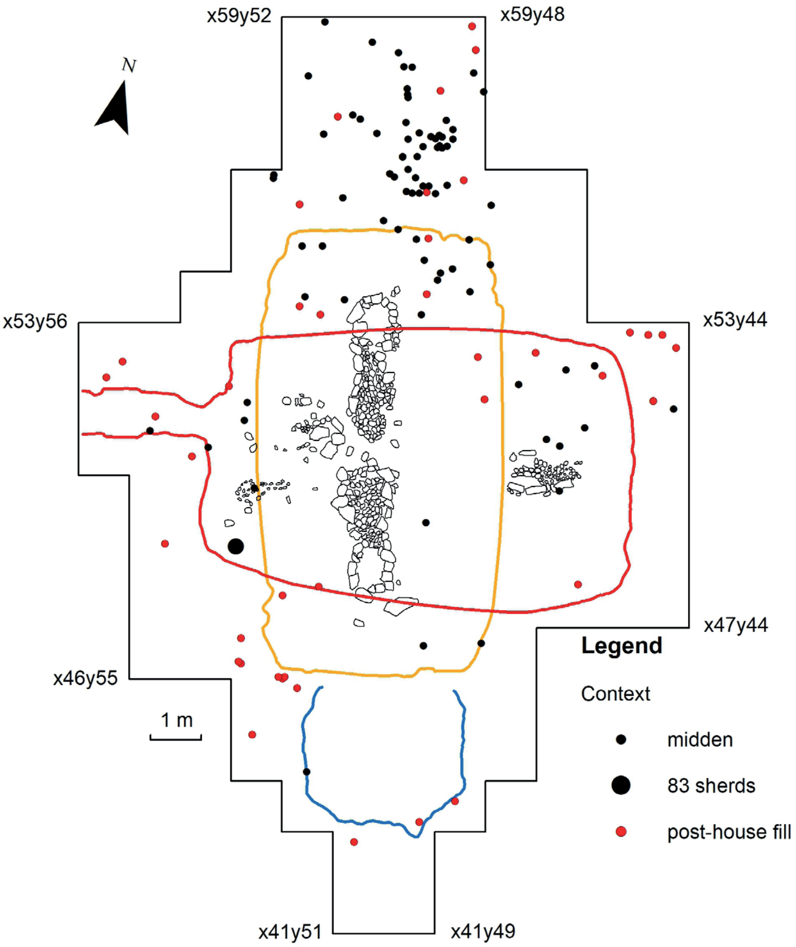


Figure 6.15. Distribution of ceramics in relation to the middens and post-house fill deposits.

2–18 sherds and one of 83 sherds. The mapping indicates that with the exception of one find-spot in the western midden with 83 sherd fragments, the majority of midden-associated ceramics occur in the midden deposits north of House 5B. However, we should not jump to conclusions regarding the possible association of these northern ceramics with House 5B, as the midden has no certain connection with House 5B and it may contain a depositional contribution from neighboring House 3. In the post-house fill, ceramics are evenly distributed around the flanks of the House 5 depression, and a few occur on the upper slopes of the depression, but none are found at its bottom, in contrast to the accumulation there of lithic material.

Figure 6.16. Ceramic rim sherds: a) asbestos temper, undecorated, b) asbestos temper, incised lines, c) asbestos temper, comb-stamp, d) asbestos temper, undecorated, e) asbestos, organic and sand temper, everted rim, f) asbestos temper, undecorated, repair hole. Courtesy of Anton Murashkin.

Figure 6.17. Ceramic body sherds: a-c) asbestos temper, comb-stamped, d) asbestos temper, shallow pits, e) asbestos temper, undecorated exterior, grooved interior. Courtesy of Anton Murashkin.

Virtually all the ceramics are similar to those found in other second millennium BC Early Metal Age settlements on the Kola Peninsula (Gurina 1997: Figures 8–9, 43, 47–48; Shumkin 1984; 2001). Some of the sherds resemble Lovozero Ware, as defined by Jørgensen & Olsen (1988: 17) and Carpelan (2004: 31–34), for example the specimens pictured in Figure 6.16 a, d, and f. A set of refitted body sherds exhibits interior grooving (Figure 6.17 e), which in Norway is associated with the Pasvik type (Jørgensen & Olsen 1988: 15–17), but which Carpelan (2004: 34) includes within his Lovozero Ware. However, there is one body sherd with crushed rock (granite) temper and comb-stamp decoration that resembles Neolithic comb-ceramics (Figure 6.18 b). The latter was found in the eastern midden overlying House 5A, a deposit associated with the House 5B occupation. No specimens of Textile or Imitation Textile ceramics were observed.

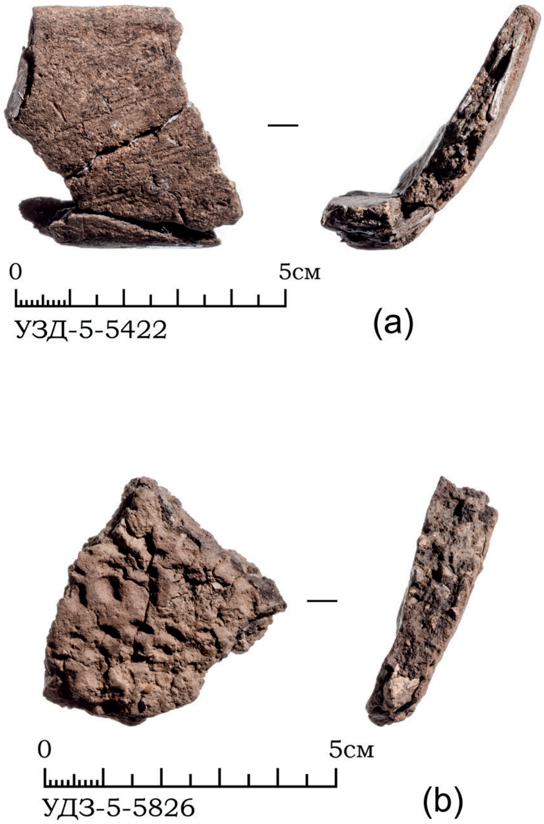


Figure 6.18. Ceramics: a) shallow flat-bottomed vessel, asbestos temper, undecorated, b) comb-impressed sherd with crushed rock (granite) temper. Courtesy of Anton Murashkin.

The Early Metal Age vessels are thin walled (5–10 mm) and their color can be brown, gray, yellow, or reddish. Of the total 279 ceramic fragments, 19.9% were rim sherds, 2.6% base portions, and 77.5% fragments. Most of the rim elements are straight with flat or rounded lips, however one sherd displays a strongly everted rim (Figure 6.16 e). One sherd is the side and partial base of a shallow, flat-bottomed, rounded rim lip, asbestos tempered vessel (Figure 6.18 a). Of the 116 sherds for which temper could be determined, 48.3% were tempered with only asbestos, 6.9 % with only sand/grit, 5.2% with only soapstone fragments, 4.3% with only rock fragments (probably granite); 15.5% had a combination of asbestos and sand-grit, while the remainder exhibited varying combinations of the above materials, as well as mica and quartz. The amount of soapstone temper seems rather low, relative to the large quantity of soapstone raw materials found at the site

Few sherds were decorated (n= 29). Some vessels were only decorated on their upper portion along their rounded rims. Of these, 55.2% had fine comb impressions, 24.1% incisions (including grooves parallel to the rim), 6.9% both comb impressions and incisions, 10.3% pits/shallow depressions, and 3.5% had a grooved interior. Although the numbers were too low to properly assess associations between decoration and temper (n=24), the strongest associations were between sherds tempered solely with asbestos and both comb decoration (n=9) as well as incisions (n=4).

Bone Implements

A total of 22 artefacts of worked bone and antler were found in the midden deposit. Of these, a small pendant of bone, an ornamented paddle-like implement of antler, and a possible net-weaving tool appear to be complete, while the rest are fragments. Seven of the artefacts are ornamented with incised lines forming a zig-zag-like pattern similar to artefacts from other sites from the same period, including the Varangerfjord area in Norway. A more detailed analysis of some of these items is presented by Murashkin et al. (2019). Here we shall only summarize the material, illustrated in Figure 6.19.

One artefact is a 3 cm curved bone pendant that might represent a bear (Figure 6.19b). The piece has been polished through production and use, and the tip of its "stem" has been modified with an apparent suspension groove. On the sides and the back there are altogether 28 small parallel cuts; perhaps these are simply decorations, but they could also mark the number of animals killed, a sequence of days, etc. (see also Murashkin et al. 2019: 96, Figure 5: 9, 99).

Another specimen is a small (3–4 cm wide) decorated tablet/plaque upon which the widened top part has two oblong slits that resemble the eyes of an owl (Figure 6.19a). On the top section of this piece there are short vertical parallel cuts, while on the front there are six parallel horizontal lines of figures that resemble swimming birds, probably loons, which can be seen more clearly in Figure 6.20 (see also Murashkin et al. 2019: 96, Figure 5: 11a). Below these are teeth as in a comb, as if the artefact was meant to be a hairpiece or possibly for combing feathers, or both. Gurina (1997: Figure 57: 2) illustrates a more complete specimen of a double-slitted comb from the Mayak II site (reproduced in Figure 8.3 in this vol-

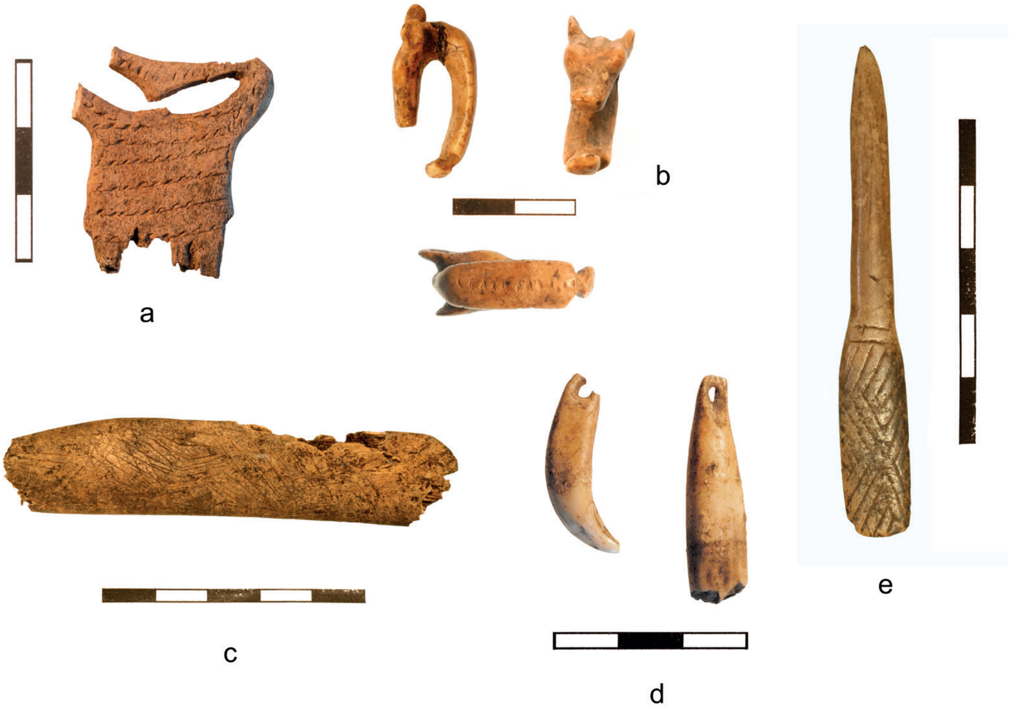


Figure 6.19. Decorated bone artifacts: a) comb, b) possible bear head pendant in three perspectives, c) bone with geometric incisions, d) perforated bear canine and elk/moose incisor, d) spatula. Photo: Knut Helskog.

Figure 6.20. Close-up of the decorated bone comb, with swimming bird figures, probably loons. Photo: Knut Helskog.

ume). For comparison, Simonsen (1961: Figure 131) illustrates a bird-headed bone comb from a Gressbakken house in Varangerfjord.

A third piece is a 7.5 cm long polished paddle or spatula-shaped artefact with incised lines on both sides of the "paddle blade"/handle (Figure 6.19e). The incised patterns on the two sides are different. Murashkin et al. (2019: 95–97) note that the handle of the implement bears traces of planing during its production, and that micro-wear patterns overlying the ornamentation suggest use for grinding some substance, possibly ochre. A somewhat similar item was recovered from the slightly younger Kola Oleneostrovskiy cemetery (Kolpakov et al. 2019: 338). Murashkin et al. (2019: Figure 4: 17) illustrate a fragment of another bone implement from House 5 that bears a couple of incised lines and wear traces related to grinding.

There were also two pendants made of perforated animal teeth (Figure 6.19d), one of which is a small bear canine, the other an elk/moose incisor.

Functional analysis of the bone artefacts has identified other implements: a needle-like form, an awl with incised geometric decoration, a possible pressure-flaker of antler, three tool blanks of antler, and five pieces with manufacturing traces (Murashkin et al. 2019). Two of the latter exhibit incised lines in a geometric pattern (Figure 6.19c). Additionally, there is an awl-like implement of antler that has been interpreted as a net-weaving tool (Russ: *kochedyk*) (Figure 6.21). This specimen has a pointed spatulate end, with a raised ridge running across the width of the tool. Similar implements were found at Mayak II (Gurina 1997: Figure 62: 23–26, 28).

With respect to comparisons with Finnmark, Norway, the most similar decorated bone artefacts to those from Ust-Drozdoka III, House 5, are found in houses at Gressbakken Nedre Vest in Varangerfjord, especially House 4 (e.g. Simonsen 1961: 325, Figure 140).

Figure 6.21. Worked antler interpreted as a *kochedyk* (net-weaving tool). Photo: Knut Helskog.

Metal Implements

One piece of metal was recovered from the House 5 deposits. A 3 cm long edge fragment of what might have been a bronze brooch was located 6–7 cm distant from the northern end of the hearth associated with House 5B (Figure 6.22). A. Egorkov's emission spectroscopy analysis of the object determined the composition of the find to be 91.68% Cu, 8.2 % Sn, 0.05 % Ag, 0.05 % Ni and 0.02 % Co. This composition is somewhat similar to finds from the cemetery at Kola Oleneostrovskiy (Bolshoy Oleni Ostrov), which were composed of 10–16 % tin along with lead, nickel, iron, arsenic, antimony and minor amounts of zinc, silver, cobalt and manganese (Kolpakov et al. 2019: 348–349). How the bronze item's composition should be interpreted with regard to the origins of the metal is an open question. Murashkin (2019) suggested the high amount of tin in Kola bronzes might indicate they were imported from the North European (south Scandinavian) tradition (see Ling et al. 2013; 2014), but tin bronzes were also produced in the "eastern" Seima-Turbino tradition (Chernykh 1992: 222–226), so no definitive sourcing is possible.

Conclusion

The artifact collection from House 5 is large and varied, reflecting a wide range of activities performed at or near the settlement. We conclude with a brief summary.

The lithic assemblage is dominated by locally available quartz, which was used in large quantities and very expediently, mostly for scrapers and sharp edges. The next most frequent material was slate, which likely was procured within the region. Slate technology was organized quite differently than quartz and featured a full production sequence from raw plates to preforms to finished tools, most of which were points and knives. Chert and flint (presumably non-local) were relatively low in frequency; these materials were mostly used for bifacial points and preforms. Most surprising was the large quantity of soapstone, which suggests a local source. The many unmodified soapstone clumps indicate this material was worked on-site, with the final products consisting of figurines, vessels, sinkers, and possibly ceramic temper.

The ceramic assemblage consists almost exclusively of initial Early Metal Age styles similar

Figure 6.22. Bronze brooch fragment. Photo: Knut Helskog.

to Lovozero Ware, and most sherds exhibited asbestos temper. Despite the large quantity of soapstone clumps in the House 5 collection, only a few sherds exhibited temper of that material. Relatively few sherds were found on the house floors; most occurred in the midden areas and post/house fill, probably in secondary refuse contexts. The vessels presumably were used for food preparation.

A few bone implements were recovered from the midden areas. Some of these were "practical" implements (a possible net-weaving tool, an awl, a pressure flaker, and pieces related to tool manufacturing), but several were decorative in nature. Although the sample is small, and a significant portion of the shell-bearing midden remains uninvestigated, this contrasts sharply with the Mayak II site in outer Drozdovka Bay, where a wide range of Early Metal Age bone implements of varied function were recovered (Gurina 1997: 85–89, Figures 35–41; see Figure 8.3 in Chapter 8).

The metal fragment from House 5 indicates the locality was tied into interregional exchange systems. A soapstone mould for a bronze axe found at Mayak II (Figure 8.4 in Chapter 8; Gurina 1997: Figure 35) suggests that some metal tools may have been produced locally from imported raw materials. Perhaps the large quantity of soapstone debitage found at House 5 signals involvement in the production of smelting accessories.

Chapter 7
Faunal Remains from Ust-Drozdovka III, House 5

The faunal material from House 5 (Table 7.1) was derived primarily from the shell-bearing midden on the northeastern side of the excavation, but smaller amounts were found in some of the other midden deposits. A total NISP (number of identified specimens) of 3063 was recovered. In addition, small fragments of calcined bone were found throughout the midden deposits flanking the houses and on the house floors. Given that only a small portion of the midden deposits was excavated, the collection should not be regarded as statistically representative. All back-dirt was dry-screened through 4 mm mesh, but no further fine-screening was undertaken, so bones from small fauna are undoubtedly absent or under-represented. The material was transported to the Zoological Museum, St. Petersburg, where the non-calcined bones were identified by Mikhail Sablin and Aleksey Kasparov; the small, calcined fragments have not been analyzed. This description is a modification of the Sablin-Kasparov report. Each of the main bone-bearing deposits is described in turn.

The only bone context sampled completely was the midden dump on the northeastern floor of House 5A (Figures 5.1, 5.5 and 7.1). This feature was oval, ca. 1.3 by 1.0 m in size, 30 cm thick, and about 1.0 m distant from the hearth. The lower portion of the midden intruded slightly into the underlying sterile yellow sand and there was no stratigraphic distinction between the lower and upper portions of the midden. The feature might have been deposited during the House 5A occupation or at the time of abandonment of the house, or it could have been deposited during the House 5B occupation. Charcoal samples from the base of the midden provided radiocarbon dates of 3671±25 BP (2132–1981 BC, 68.3% prob.; Wk-35066) and 3560±130 BP (2128–1698 BC, 68.3% prob.; LE-5973). The former is an AMS date that corresponds with the dates for the earliest hearth and ventilation channel events at House 5A, so the lower part of the midden might be related to the earliest phase of House 5A, unless the charcoal sample dates the house floor rather than the midden. The total NISP of 418 consists primarily of seal bone, including at least six individual harp seals, one of which was near complete at the base of the deposit. Only a few fragments of reindeer and bird (duck, guillemot, ptarmigan) are present, as well as single brown bear and fish (cod) bones. The miniscule amount of bird and fish bone might be attributable to the complete absence of shell in this area.

The largest sample (NISP= 1251) came from the external midden deposits northeast of the houses (53x53y), which were rich in mussel shell and therefore more conducive to organic preservation. Only the upper 30 cm of these deposits was excavated, but coring indicated that the midden was up to 80 cm deep. In contrast to the House 5A floor dump, reindeer, small mammals, bird and fish are better represented, although seal still dominates when the MNI counts are considered. The small mammals include hare, beaver, lemming, vole (the last two possibly from burrowing into the midden), as well as polar and red fox. Reindeer are represented by a wide range of skeletal elements, including three fragments of antler. A single brown bear bone was present. As far as seals are concerned, harp, bearded seal and grey seal are present. Walrus is represented by a single fourth metatarsal. The small number of bird bones include: little auk, eider, guillemot, puffin and ptarmigan. The identifiable fish bone was exclusively cod.

A smaller amount of bone (NISP= 690) was recovered from outside the house area at the northern end of the excavation, where a dark brown sand deposit up to 30 cm deep contained bone in varying degrees of preservation. This deposit lay adjacent to two flat-bottomed circular pits with fire-cracked rock, the easternmost dated to 3500±25 BP (1882–1771 BC, 68.3% prob.; Wk-35067) and the westernmost dated to 3755±60 BP (2283–2041 BC, 68.3% prob.; TUa-3536). The upper portion of the midden probably post-dates the earliest radiocarbon determination and the area may contain deposits from both House 5 and adjacent House 3. The NISP figures are dominated by reindeer, which includes a high frequency of broken metacarpals, metatarsals and phalanges, as well as six fragments of antler. Both harp and bearded seals are present. The few bird bones include sandpiper, guillemot, puffin and ptarmigan. Among the fish remains are cod and a single example of salmon. Also present in the deposits were several highly decayed bone smears of large skeletal elements, possibly whale ribs.

The other location that contained some quantity of bone (NISP= 661) was a single square meter of midden deposit (55x47y) lying just outside and between the northwestern corners of the two houses. This small sample is dominated by fish bones, the vast majority of which are cod, but two specimens of sculpin and a single salmonid are also present. A few fragments of reindeer, harp seal, grey seal and ptarmigan are also represented. No shell was present.

Such a small and unrepresentative faunal sample can only provide a general glimpse of subsistence resource procurement at House 5. What seems evident, however, is the relative diversity of species represented and the balance between terrestrial and marine resources, which together imply multi-seasonal occupation. Reindeer are most likely to have been present in the coastal area around Drozdovka from late spring to early fall, while winter pastures were located in the interior near the forested areas. Most of the reindeer skeletal elements are represented in the house assemblage, with the exception of the humerus, tibia and tarsals. The missing elements are all relatively low in meat value but have moderate to high marrow and bone grease values (Binford 2012 [1978]: 27, 33), suggesting they may have been highly fragmented. The presence of most reindeer bone elements in the assemblage implies that the animals were hunted in the vicinity of the site. Elk/moose is represented by a single incisor

Figure 7.1. Vladimir Shumkin excavates the midden dump on the eastern floor of House 5A, which contained mostly harp seal bones. Photo: Bryan Hood.

Table 7.1. Faunal material from Ust-Drozdovka III, House 5.

	5A floor	**NE midden**	**N midden**	**NW midden**	**Other**	**Total NISP**	**MNI**
Reindeer (*Rangifer tarandus*)	4	54	68	8	4	138	6
Hare (*Lepus timidus*)		2				2	1
Beaver (*Castor fiber*)		1	1			2	1
Lemming (*Lemmus sp.*)		5	1			6	2
Vole (*Arvicola terrestris*)		7				7	1
Polar fox (*Alopex lagopus*)		16	11	1		28	2
Fox (*Vulpes vulpes*)		3				3	2
Brown bear (*Ursus arctos*)	1	1	1			3	1
Marten (*Martes martes*)			1			1	1
Land Mammal Total	5	89	83	9	4	190	17
Harp seal (*Phoca groenlandica*)	58	26	15	10	1	110	11
Bearded seal (*Erignathus barbatus*)		4	12			16	3
Grey seal (*Halichoerus grypus*)		1		1		2	2
Walrus (*Odobensus rosmarus*)		1				1	1
Phocidae indet.	162	35	11	24	7	239	
Sea Mammal Total	220	67	38	35	8	368	17
Indet. Mammal	186	852	497	72	31	1638	
Duck (*Anatinae* indet.)	1					1	1
Little auk (*Alle alle*)		1				1	1
Sandpiper (*Calidris sp.*)			1			1	1
Eider (*Somateria sp.*)		1				1	1
Guillemot (*Uria aalge*)	1	2	2			5	2
Common puffin (*Fratercula arctica*)		4	1			5	3
Rock ptarmigan (*Lagopus mutus*)	2					2	1
Willow ptarmigan (*Lagopus lagopus*)	1	4	2	1		8	3
Ptarmigan (*Lagopus sp.*)		2				2	2
Bird indet. (*Aves* indet.)	1	14	4			19	
Bird Total	6	28	10	1		45	15
Cod (*Gadus morhua*)	1	45	12	141		199	6
Salmon (*Salmo salar*)			1			1	1
Salmonidae indet.				1		1	1
Sculpin (*Cottidae* indet.)				2		2	1
Fish indet.		170	49	400		619	
Fish Total	1	215	62	544		822	9
NISP TOTAL	418	1251	690	661	43	3063	

that was perforated for use as a pendant (see Chapter 6, Figure 6.19d), so it might not have been procured locally. Several fur-bearing land mammals are present: hare, beaver, fox, bear and marten.

The identifiable sea mammal material is dominated by harp seals and most of the indeterminate phocid material is also likely to be harp. The presence of a new-born and several probable juveniles indicates at least some of the harps were killed in the late winter to spring (March to May) when they enter the fjords to feed prior to moving towards their summering areas near the edge of the pack ice, far to the north in the Barents Sea. Bearded seals are generally an ice-edge species, but they may enter the bays during the summer and haul out on the shore. The single example of walrus is a fourth metacarpal, representing a flipper element. Walrus are also an ice-edge species; their presence in Drozdovka Bay could be related to an unusual extension of the pack-ice west of its normal limit near the mouth of the White Sea (see Figure 1.4), or simply the presence of itinerant individuals. They were likely hunted during the winter or spring while hauled out in the outer fjord area. Given their size, they were probably butchered at the hunting localities, so the trace of walrus at House 5 may simply indicate movement of selected body parts. Significant traces of walrus hunting are found at the outer fjord site of Mayak II (see Chapter 8).

The bird remains contain a mix of terrestrial and aquatic species, but it is difficult to draw seasonality inferences because the sample is so small and some taxa are only identified at the genus level. Guillemots and the common puffin are summer visitors, while the common eider winters on the Kola coast and ptarmigan could be hunted year-round. Mussel shells were most likely to have been collected during the warm season. It is hardly surprising that the fish remains are dominated by cod, which is present in the fjord year-round. The two salmonid bones undoubtedly under-represent the significance of salmon. The site is located at the mouth of what today is an excellent salmon river, although with higher sea-levels the hydrography of the river mouth might have been quite different. The lack of salmon bones in sites nearby potential salmon fishing streams is a longstanding problem in northern Norway (Olsen 1967: 60–62; Renouf 1989: 225–226) and elsewhere (Carlson 1988; Whitridge 2001), so it needs to be considered further whether this rarity is a result of taphonomic processes or settlement logistical organization. Recent work with sediment mineralogy in northern Finland, however, suggests that calcium-magnesium phosphate minerals can be used as proxies for identifying otherwise elusive salmon remains (Butler et al. 2019).

Chapter 8
Mayak II: An Outer-Bay Settlement

Mayak II lies adjacent to a small inlet on the northwest side of Drozdovka Bay (Figures 3.2 and 8.1). Excavated by Nina N. Gurina in 1978–1982, the site consisted of unbelievably rich midden deposits containing the astounding quantity of over 250,000 bones (Gurina 1987: 43, 45; Gurina 1997: 80–89 [in Russian], 151–152 [English summary]). The lower portion of the midden was associated with Neolithic occupations radiocarbon dated between 4689 and 2344 BC, but most of the material dates to the Early Metal Age, for which only one radiocarbon date is available: 3330±40 BP (1666–1533 BC; 68.3% prob.) (Gurina 1997: 138; Shumkin 2001: 112; all dates calibrated in Oxcal 4.4 with IntCal20). The single Early Metal Age date overlaps with the later House 5B at Ust-Drozdovka III. The Mayak II midden contained several hearths and pits, as well as rock alignments that Gurina interpreted as the remains of surface dwellings from the late Neolithic and Early Metal Age.

The Neolithic occupation was marked by the presence of pit-comb ceramics of the Säräisniemi I type and later types of comb-ceramics, as well as bifacial points (bipoints or slightly concave bases) and their preforms (Gurina 1997: Figures 22–25). The Early Metal Age assemblage was much larger (Gurina 1997: Figures 33–43, 52–55, 57–58, 61–62). Lithic artifacts included both lanceolate and stemmed bifacial points, ground slate points and single-edged knives, ground stone adzes and perforated stone axes or maces. A soapstone assemblage was present, with handled bowls or oil lamps, a mould for a bronze axe, and small cy-

Figure 8.1. The Mayak site, summer 2000, view east. The site lies on the flat, relatively open, area between the point and the birch scrub. Photo: Bryan Hood.

lindrical end-knobbed items that in Norway have been interpreted as fishing jigs, as well as perforated maces. There were also asbestos-tempered ceramics, some of which are similar to the so-called Lovozero Ware (Carpelan 1979; 2004; Jørgensen & Olsen 1988).

The midden deposits contained many well-preserved implements of bone and antler: toggling and non-toggling harpoons, projectile points of various forms, fishhooks, and eyed needles. Many bones and antlers bear traces of tool manufacturing processes. Walrus ribs were modified into what were interpreted as "plane knives". There were many flakes of walrus ivory in the midden, as well as a decorated ivory tusk fragment (Gurina 1997: Figure 52:10). Walrus ivory may have been a resource introduced into exchange systems to acquire metal, as evidenced by the soapstone axe mould mentioned above. There were also many decorated bone items, including anthropomorphic figures, possible depictions of reindeer, geometrical designs, animal sculptures (moose, bear, bird), and pendants (including perforated animal teeth). Some of the anthropomorphic and animal effigies may have been personal amulets. Several bone fragments seemed to have been cut by metal tools (Gurina 1997: 140). Figures 8.2 to 8.4 depict a selection of Early Metal Age lithic and bone artifacts from Mayak II, reproduced from Shumkin (1984) and Gurina (1997).

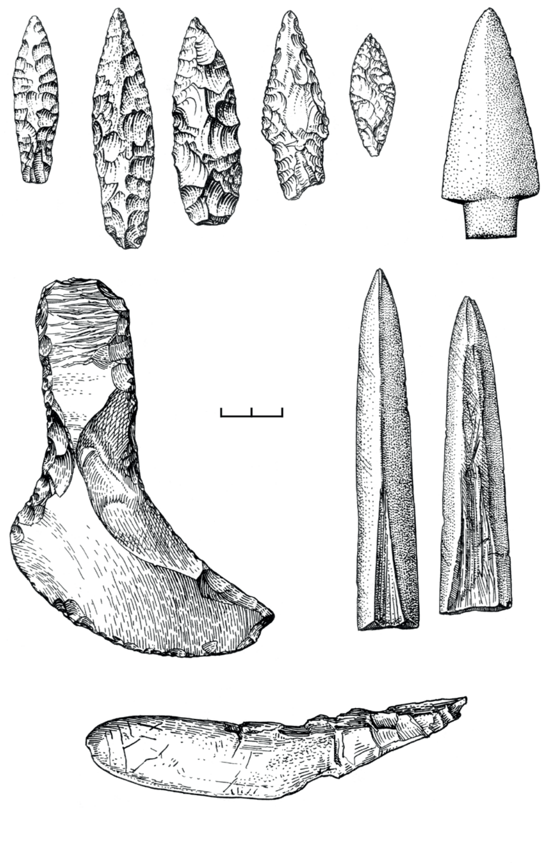


Figure 8.2. Selected Mayak II Early Metal Age lithic artifacts, originals in Shumkin (1984), reproduced in Gurina (1997: Figures 34 and 37). Top, left to right: bifacial points of flint (Figure 34: 3-6, 22), ground slate stemmed point (Figure 34: 28). Middle: ground slate single-edged knife (Figure 37: 24), ground slate basally fluted points, in Norway the Sunderøy type (Figure 37: 11, 12). Bottom: ground slate single-edged knife (Figure 37: 25).

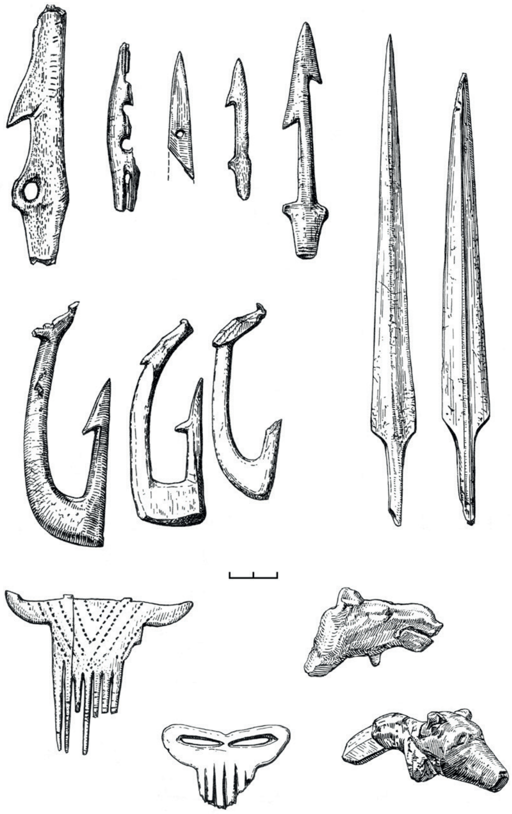


Figure 8.3. Selected Mayak II Early Metal Age bone artifacts, originals in Shumkin (1984), reproduced in Gurina (1997: Figures 37, 40, 57). Top, left to right: harpoons – second and third specimens are toggling (Figure 40: 30, 23, 24, 26, 34), points (Figure 37: 14, 15). Middle: fishhooks (Figure 40: 7-9). Lower: combs (Figure 57: 1, 2), elk/moose effigy (Figure 58: 1), bear effigy (Figure 58: 3).

Figure 8.4. Early Metal Age soapstone artifacts from Mayak II. Left: mould for a small bronze axe; right: handled bowl. Photographed at the Murmansk Regional Museum by Knut Helskog.

Spatial Patterning

As noted above, during the Mayak II excavation several rock alignments were interpreted as the remains of surface tent-dwellings. According to one of the present authors, nothing was found that might point to the presence of semisubterranean dwellings similar to those at Ust-Drozdoka III and elsewhere (Shumkin, personal reflection). A more detailed analysis of the artifact find-contexts and site chronology has been undertaken by Kiseleva Alevtina Mikhailovna (2019). To explore the Mayak II site structure further, we present an analysis of the density patterns of bone and ceramic materials at the site using Gurina's (1997: Figure 20) data on Neolithic and Early Metal Age ceramic distributions and her tabulation of bone frequencies in different levels at the site (Gurina 1997: 141–144). The results raise interesting questions concerning spatial patterning.

The original bone data tables display the frequencies in relation to four "horizons", which apparently represent arbitrary divisions of the deep midden. In the limited documentation of the faunal material (see below), the only chrono-stratigraphic distinction provided is between Neolithic and Early Metal Age layers, so it is not clear how the horizons in the bone tables correspond to chronological distinctions, except that Horizon 4 – the lowest layer and the smallest sample size – presumably represents the Neolithic phase. Totaling the bone fragments recorded in Gurina's tables results in a sum of 12,190 bones from the assumed Neolithic horizon 4 and 250,581 bones from the three assumed Early Metal Period layers.

Neolithic Horizon 4 had a very different bone distribution pattern than the three overlying layers. Figure 8.5 shows an inverse distance weighted (IDW) interpolation of the Horizon 4 bone densities against a simple graduated circle

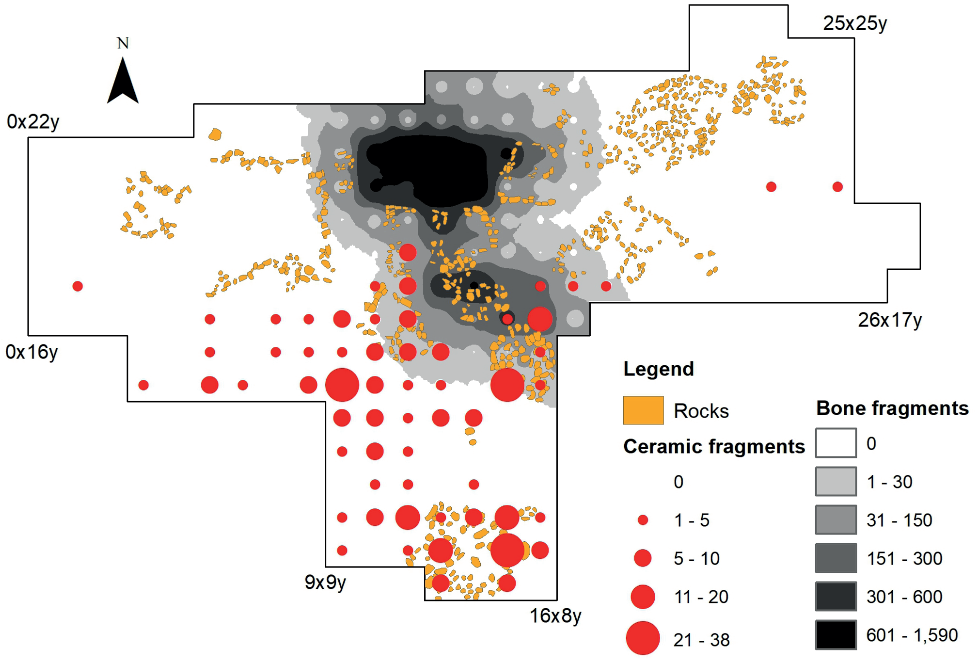


Figure 8.5. Mayak II, Neolithic Horizon 4: interpolated bone density, ceramic frequency, and rock distribution (from all layers combined). Data from Gurina (1997: Figures 20 and 21); the coordinate system is not the original.

quantification of the Neolithic ceramics, as well as the distribution of rocks (from all levels of the site). The bone materials are concentrated exclusively in the north-central part of the excavation, in an area 5–6 m in diameter, with a tendency towards a larger and denser northern cluster and a smaller less dense southern cluster. Although some Neolithic ceramics occur in the bone-bearing units, most of them occur at the southern end of the site, outside the bone accumulation. One of the rock alignments ("complex 5") at the north-eastern end of the site was interpreted as a surface dwelling and was associated with a Neolithic radiocarbon date of 4290±40 BP (3002–2880 BC, 68.3% prob.; Gurina (1997: 87, 151).

For Early Metal Age Horizons 1–3, the bones display the same basic spatial distribution in each horizon, so these three levels have been merged into a single analytical unit for quantification. Figure 8.6 provides an IDW interpolation of these merged bone data together with the distribution of the Early Metal Age ceramics, represented as graduated circle quantities, and the distribution of rocks. The overall pattern is radically different from that of the Neolithic material. Bones and ceramics are both concentrated on the northern side of the site. The bone density patterns exhibit two parallel west-east running concentrations, the one on the north comprised of three distinct clusters and the one on the south comprised of two clusters. Three of the clusters are about 5 m by 3 m in size, the fourth 6–7 m by 3 m, and the fifth only 3 m by 2 m. In between the two lines of clusters is an area of lower bone density ca. 2 m wide and ca. 12 m long. Interestingly, the ceramic distribution is most dense in this middle corridor of low bone density. Given the lack of more precise stratigraphic control, it is unclear what we should make of this beyond that there are distinct contrasting depositional patterns for these two

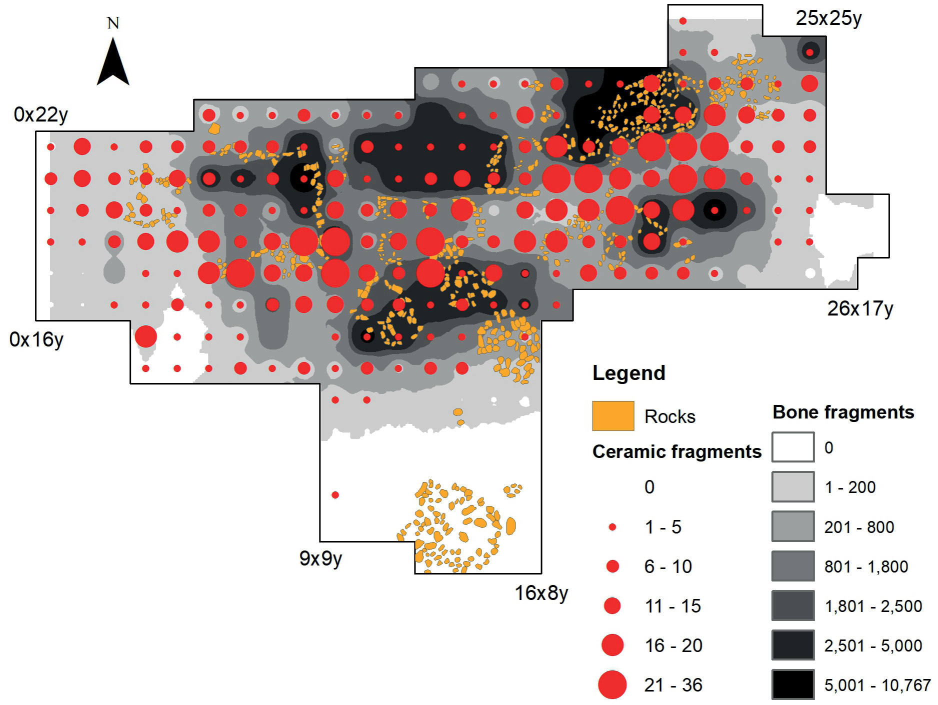


Figure 8.6. Mayak II, Early Metal Age, merged Horizons 1-3: interpolated bone density, ceramic frequency and rock distribution (from all layers combined). Data from Gurina (1997: Figures 20 and 21); the coordinate system is not the original.

classes of material culture. Again, Gurina (1997: 86–87, 152) believed that some of the rock distributions indicated surface dwellings.

One possibility is that there may have been a semisubterranean dwelling structure in the central space between the four main bone clusters, with each cluster representing a separate wall midden. However, according to Vladimir Shumkin no traces of such a dwelling were recognized during the excavation, so this retrospective interpretation seems dubious. Perhaps a more viable inference is that the bone concentrations represent organized dumping areas resulting from some degree of site maintenance during or after the butchery of large numbers of animals, predominantly seals (see below). The dimensions of these dumps are quite staggering; the most northeasterly cluster contains over 58,000 bones, while the adjacent cluster to the west contains over 48,800 bones. The distinct concentrations could suggest individual mass deposits made on different occasions (e.g. in different years), more gradual accumulation of each cluster over several seasons of repeated use, or simultaneous accumulation by different butchering parties, although the latter seems unlikely given the prodigious number of bones involved. Unfortunately, given the paucity of radiocarbon dates we do not know how long it took for the Early Metal Age deposits to accumulate.

Faunal Remains

As noted above, the astounding quantity of 262,771 animal bones was recovered from the site (Gurina 1997: 141–144), but the material is, to say the least, extremely problematic. Initially, faunal identifications were done on-site by a zoologist, N. Ermolova, but after her death the work was completed by Gurina and A. Antoniyk. Some of the material was crated up for shipment to St. Petersburg, but very little was actually delivered to the Zoological Museum. A

Figure 8.7. Mayak II: heaps of bones sorted by skeletal element, left on the site surface by the excavators. Photo: Pavel Ivanov.

Figure 8.8. Mayak II: closer view of the archaeological bone heaps. Seal and walrus ribs in the foreground, rear left are seal ulnas, rear right are seal vertebrae. Photo: Pavel Ivanov.

large quantity of material was sorted into various skeletal elements and then left on top of the site, where it is still visible today (Figures 8.7 and 8.8). Little effort was made to control the stratigraphic provenience of the faunal samples; the field notes (kindly translated by A. K. Kasparov) simply specify "Neolithic layers" and "Early Metal Age" layers. Tragically, the material is virtually useless for anything other than a general impression of subsistence practices.

Faunal frequencies from the midden as calculated from the Ermolova/Gurina fieldnotes are summarized in Tables 8.1 and 8.2. These data should be viewed with caution. The field notes are certainly incomplete. There was no information on bird remains and almost nothing on fish, although these taxa were definitely present; Vladimir Shumkin remembers geese and ducks in the material. Data on some of the seal skeletal elements was inexplicably missing, while a walrus crania fragment was observed on the surface in 2000, but none are mentioned in the field notes. Some of the seal material may not have been correctly identified as to species, because taxa distinctions based on postcranial elements other than the humerus are challenging, particularly without a comparative collection. Gurina (1997: 87–88) refers to the presence of mollusk shells in the midden, but there is no indication of which taxa or what quantity.

The quantities in the tables present the number of identified specimens (NISP). We have based the seal species NISPs on the most diagnostic skeletal elements: the skull, mandible, auditory bulla and humerus. Other elements are more difficult to identify reliably in the field, so they are classed as indeterminate seal. We also provide rough estimates of minimum numbers of individuals (MNI) based on best-guess interpretations of the element representation recorded in the field notes. These are not methodologically sound, but they are provided as an alternative assessment of taxa proportions and, more importantly, as a

Table 8.1. Faunal taxa recorded in the Neolithic level at Mayak II. MNI is a rough approximation.

Taxa	**NISP**	**MNI**
Seals indet. (*Phoca sp.*)	850	160
Harp seals (*Phoca groenlandica*)	552	150
Ringed seals (*Phoca hispida*)	3	2
Reindeer (*Rangifer tarandus*)	91	5

Table 8.2. Faunal Remains from the Early Metal Age levels at Mayak II. MNI is a rough approximation.

Sea Mammals	**NISP**	**MNI**
Seals indet. (*Phocidae*)	16,046	1400
Harp seals (*Phoca groenlandica*)	4449	1400
Ringed seals (*Phoca hispida*)	32	16
Walrus (*Odobenus rosmarus*)	117	12
Whale (*Cetacean*)	1	1
Total:	20,645	2829
Land Mammals		
Reindeer (*Rangifer tarandus*)	1964	150
Polar bear (*Ursus maritimus*)	124	3
Elk (*Alces alces*)	12	2
Beaver (*Castor fiber*)	21	2
Otter (*Lutra lutra*)	4	1
Polar fox (*Alopex lagopus*)	6	3
Red fox (*Vulpes vulpes*)	13	4
Hare (*Lepus timidus*)	1	1
Wolverine (*Gulo gulo*)	82	1
Wolverine/otter	1	1
Marten (*Martes martes*)	1	1
Wolf (*Canis lupus*)	2	1
Human (*Homo sapiens*)	2	1
Total:	2233	171
Fish		
Salmon (*Salmo salar*)	4	1

conservative tally of the quantity of individual animals deposited in the midden.

Table 8.1 outlines the bones identified as pertaining to the Neolithic occupation; only seals and reindeer were tabulated in the field notes. The high frequency of harp seals and minimal representation of ringed seals might be an indication of spring (May) settlement, but the obviously deficient recording of other taxa renders these data highly questionable. Data on the representation of skeletal elements is mentioned in the field notes, but it appears that only those elements of particular interest to the analysts – mostly limb bones – are included. Ribs and vertebrae are conspicuously absent. Consequently, these data are not presented here.

Table 8.2 outlines the material from the Early Metal Age layers. Looking at the total NISP numbers (22,882) in relation to the total bone counts for the site noted above provides additional evidence that the field note data only pertain to a small portion of the total faunal assemblage. Nevertheless, this is what we must work with. The faunal material indicates a clear focus on harvesting seals in general, and harp seals in particular, with an approximate MNI of 1400 harps. The presence of bones from newborn and juvenile harp seals indicates kills in the late winter to spring (March to May), when they visit the north Kola coast on their way to their summer feeding areas to the north near the polar ice-edge. Migrating harp seals travel in herds, so well-organized boat-based hunters potentially can kill large numbers if they can surround them, drive them into enclosed inlets, or harpoon them in constricted passages. The small number of ringed seals (MNI= 16) perhaps indicates relatively little winter sealing.

The seal skeletal element representation data in the field notes are difficult to use because they were not recorded systematically or consistently. The analysts only recorded information for the skeletal elements they were interested in: cranium, atlas vertebra, scapula, humerus, radius, ulna, innominate, femur, and astragalus. Conspicuously absent in the notes are the other vertebrae, sacrum, ribs, sternum, tibia, fibula, and the flipper bones. During the summer 2000 field season at Ust-Drozdovka III, an inspection of the piles of sorted seal bones remaining on the surface of Mayak II indicated that many of these missing elements were, in fact, present in the material. Given that several of the elements missing in the field notes are those with the highest meat utility indices (see Diab 1998), even a qualitative assessment of skeletal element representation relative to economy is impossible. All that can be said is that virtually all the skeletal elements seem to have been present, indicating that the seals were transported back to the camp as whole carcasses.

The next most important exploited taxon is reindeer, with an estimated MNI of about 150. The field notes mention that the antler remains indicate different points in the shedding sequence, from unshed male antlers still attached to the frontal bone, to cleanly shed antlers. This implies seasonal kills ranging from November to March. Based on recent migration patterns one might expect reindeer to have been available on the coast during the summer, but that they were further inland during the season indicated by these kills. Either the migratory patterns may have been different during the Early Metal Age – a possibility given that the modern vegetation zones were only established at 3500–3100 cal. BP (1700–1300 BC) – or the reindeer may have been hunted elsewhere during the winter and the antlers transported to Mayak for use in toolmaking during the spring and summer. The field notes refer to the presence of both young and adult animals (determined by epiphyseal fusion), but there is no mention of calves, which would provide a strong seasonality indicator.

With respect to the skeletal element representation as reported in the field notes, reindeer bones exhibit some of the same problems as with seals. Some crucial elements were not reported, but it is not clear whether this says anything about their presence in the midden. Cranial elements (aside from portions of frontal bone fused to antlers) were not reported, and there were very few mandibles and teeth. Given typical ethnographically observed butchering patterns (e.g. Binford 2012 [1978]: 75–85), it seems likely that this absence is real, with the heads having been left at kill sites. Vertebrae and ribs were reported in only one of the four field seasons. Innominate (pelvic) bones seem somewhat underrepresented. Shoulder and leg bones, however, are well represented and were tabulated in almost all of the field seasons. A large number of phalanges are also present. It can be concluded that the meat and marrow-rich bones from the legs were regularly returned to the site.

The paucity of ribs and vertebrae is troubling. They were counted in one field season – so they were present – but their omission in the other field seasons is suspicious because it is virtually the same pattern of non-reporting of these elements as was practiced for seal bones, which we know were present in the faunal assemblage. Given that reindeer ribs and vertebrae have moderately high meat utility indices (Binford 2012 [1978]: 23) we might expect them to be represented more consistently in the midden. Of course, it is possible that their relative absence signals butchery, transport or storage decisions (see Friesen 2001: 323–329), but on the whole it seems more likely that they were not recorded for some reason. With that conclusion, a tentative suggestion is that, except for the cranial elements, most reindeer skeletal elements were returned to the site, which might indicate hunting in the general vicinity of Mayak.

Elk/moose is represented in the faunal material, but it is limited to 12 fragments from two individuals. Combined with the absence of this species in the Ust-Drozdovka III House 5 midden assemblages – apart from a single perforated incisor pendant – this could suggest that elk/moose seldom ranged over this part of the coast. Alternatively, elk/moose bones may have been disposed of differently than those of reindeer.

Perhaps most surprising is the presence of bones from a dozen individuals of walrus. Although isolated walruses occasionally are sighted as far west as the Norwegian coast, they are mainly an ice-edge species with their primary distribution closer to the mouth of the White Sea and eastwards (see Chapter 1). An unusually heavy sea-ice winter might have shifted the distribution of walrus further westwards, or the bones may simply represent late winter to spring visits by individual animals, or perhaps a single small pod of walrus. The field notes mention the presence of "young walrus", which might support the inference of a late winter or spring hunt, as the walrus calves in late December-early January (Haug & Nilssen 1995: 85). It seems most likely that walruses were taken while hauled out on the low, rocky outer coast near Mayak. The representation of skeletal elements could suggest that only selected parts of the animals were returned to the site. The most frequent elements are flipper and limb bones (85.6%), but a scapula, some ribs, some vertebrae, and a mandible fragment were also present. Missing from the field notes, but present on the site surface in 2000, was part of a cranium, which exhibited cut-marks. A rib observed on the surface in 2000 exhibited small hack-marks made with a knife or small axe, as well as a thin incision running around the circumference of the bone that might have been made with a metal tool. As mentioned above, flakes of walrus ivory were found scattered in the midden, indicating that the tusks were returned to the site for processing.

A total of 124 polar bear (*Ursus mari-timus*) bones were identified, representing three individuals. Included in the count are limb bones and phalanges (including a claw phalange), a scapula fragment and an axis vertebra. Polar bears were probably infrequent visitors to the area, perhaps arriving in years when the winter sea-ice expanded westwards from the mouth of the White Sea.

Conclusion

In sum, the primary function of Mayak II seems to have been as a late winter to spring processing camp for sea-mammals hunted in the outer fjord area, particularly herds of migratory harp seals. But the presence of a significant number of reindeer in the faunal assemblage points to summer-fall occupation as well. Gurina interpreted several rock alignments as indicating surface dwellings, but no evidence suggestive of semisubterranean houses was identified during the excavation. A spatial analysis of the bones and ceramics reveals a striking pattern, but it does not shed much light on the dwelling structure question. The marked spatial clustering of the prodigious quantity of bones strongly suggests some form of organized butchery and/or site maintenance practices. The distribution of the Early Metal Age ceramics, however, is virtually the complete opposite that of the bones. This contrast suggests there were clear spatial distinctions between areas devoted to animal processing and bone deposition, and areas related to cooking activities or ceramic deposition. The artifact assemblage from Mayak II is very diverse but is dominated by lithic and bone technology for hunting and processing sea mammals, and probably reindeer. It also contains decorative objects that depict some of the animals represented in the faunal materials, which implies the carrying out of some form of ritual practices, if only on the personal level of amulet accessories. The find of a soapstone mould for a bronze axe, as well as the presence of bones that appear to have been worked by metal implements, indicate that the inhabitants of Mayak II were connected to the inter-regional networks of the Bronze Age.

Chapter 9
Conclusions: Early Metal Age Settlement Patterns in Drozdovka Bay, and an Inter-Regional Perspective

In this chapter we attempt to integrate the preceding chapters at two levels. First, we shall gather the various threads from the Drozdovka Bay area to provide a summary discussion of Early Metal Age settlement patterns in the region. Second, we will position Drozdovka in relation to broader issues of Early Metal Age culture-history on the Kola Peninsula as a whole, and with respect to neighboring areas in Russian Karelia and the coast of Finnmark in northern Norway.

Early Metal Age Settlement Patterns in Drozdovka Bay: A Summary

Although a considerable number of archaeological sites have been identified in Drozdovka Bay, including many with house structures, relatively few have been investigated with excavations or even test pitting, and aside from Ust-Drozdovka III, House 5, which has been presented here, very few radiocarbon dates are available. We know there is variation in house forms, but we do not have any chronological control over this. However, large rectangular semisubterranean houses, some with entrance passages, probably date to the Early Metal Age, and like House 5, the time span of about 2300 to 1500 BC. The Mayak II site suggests there may be Early Metal Age localities lacking in dwelling structures. In the absence of more systematic data concerning the latter, we must focus on the house sites.

The distribution of presumed Early Metal Age houses extends from the outer coast on the south side of Nokuyev Island – overlooking the sound providing access to Ivanovskaya Bay – to Ivanovskaya Bay itself, as well as the outer, middle and inner portions of Drozdovka Bay (see Figure 3.1). Several houses are located on the banks of the Drozdovka River. Given this broad distribution, the use of houses is not restricted to any particular ecological context, and thus is probably not linked to specific seasonal or functional activities. The outer coast/bay houses, such as on Nokuyev Island, are probably situated to take advantage of marine fishing (cod), the late winter to spring migrations of harp seal herds, grey seal colonies, and the occasional visiting walrus. The inner bay houses, such as at Ust-Drozdovka III, could perhaps exploit a slightly broader variety of resources, including terrestrial mammals and salmon.

The faunal material from Ust-Drozdovka III House 5 is insufficient to provide a robust indication of seasonality and settlement dynamics, but it does point to general aspects of subsistence resource procurement. Most pertinent is the diversity of species represented and the balance between terrestrial and marine resources, with a significant representation of reindeer. The fish remains are dominated by cod, which can be fished in the fjord year-round. Only two salmonid bones were identified, but significant summer salmon fishing is likely, as the site is located at the mouth of a modern salmon river. Mussel shells were probably collected during the warm seasons. Harp seals dominate the sea mammal remains, indicating late winter to spring hunting when the migratory seals enter the fjords of the Kola coast prior to moving towards their summering grounds near the edge of the northern pack ice. The presence of most reindeer skeletal elements in the assemblage suggests that the animals were hunted near the site, probably during the summer when they grazed near the coast. Thus, based on the faunal remains, a multi-season and perhaps year-round occupation seems possible.

Several of the construction details of the House 5 dwellings may indicate use during the winter, such as the distinct entrance passage at House 5A and that both houses have well-constructed hearths associated with heating rocks. The midden deposits around the houses exhibit significant refuse accumulations and contain numerous fire-cracked rock fragments. On the other hand, we were not able to identify traces of substantial turf walls, which we might expect with winter dwellings.

Further out in Drozdovka Bay, the Mayak II site – with components ranging in time from the Neolithic to the Early Metal Age – contained evidence for surface dwellings but apparently lacked semisubterranean house structures. On the other hand, the site was excavated during the period when house pits were not recognized on the Kola Peninsula. In any event, the huge quantity of bones in the site deposits suggests it was a late winter to spring processing camp for outer-bay sea mammal hunting, particularly for migratory harp seals, but also for occasional walrus. The presence of a considerable amount of reindeer bones points to summer-fall occupation as well. The artifact assemblage is quite diverse, however, perhaps more so than would be expected from a specialized mass-processing camp. In any event, the differences between Mayak II and Ust-Drozdovka III suggest intra-bay seasonal/functional variability.

At this point it is uncertain whether Early Metal Age groups in Drozdovka Bay were primarily tethered to single house settlements, combined with the use of smaller logistical camps elsewhere, or whether they used a series of different house-settlements as part of a regular seasonal round within the bay. The inference that Mayak II was an outer bay sea mammal processing site, combined with the great quantity of bones that were deposited in distinct spatial clusters, could imply that site activities involved the cooperation of personnel aggregated from different settlements throughout Drozdovka Bay. Indeed, the presence at Ust-Drozdovka III House 5 of a single bone from a walrus flipper might indicate the movement of meat cuts between outer and inner fjord locations, or the participation of inner bay hunters in late winter to spring hunting in the outer bay.

Stone Age/Early Metal Age use of the areas inland from Drozdovka Bay has not yet been documented archaeologically aside from a few semisubterranean houses located along the Drozdovka River, just slightly inland from the bay. The latter were likely used at least partly in connection with seasonal salmon fishing. Based on the ethnographic information outlined in Chapter 1, Sámi winter hunting camps were located in the interior lake district, ca. 35–80 km from the coast (Figure 1.5; Charnoluskiy 1930). It is not unlikely that similar camps were used occasionally during the Stone Age and Early Metal Age to access reindeer on their winter pastures near the tree-line.

The Early Metal Age Settlement on the Kola Peninsula

Cultural history overviews of the Early Metal Age occupation of the Kola Peninsula have been presented by Gurina (1987; 1997) and Shumkin (1984; 2001). In this section we provide an updated summary focusing on house forms, regional settlement patterns and the Kola Oleneostrovskiy (Bol'shoy Oleni Ostrov) cemetery site. More information on artifact typology and assemblages can be found in the previously cited works.

House Forms

As noted in Chapter 2, prior to the 1990s there was very limited recognition of semisubterranean houses on the Kola Peninsula aside from the early finds on the Rybachiy Peninsula, which lay close to the national border with Norway. Since the 1990s the situation has changed dramatically, with many houses being registered along the Kola coast (Kolpakov et al. 2016). However, as very few of these have been excavated or radiocarbon dated, we should probably be somewhat circumspect when identifying dwellings as belonging to the Early Metal Age. Some examples from Drozdovka Bay underline this dilemma. At Ust-Drozdovka, difficult to discern, small, very shallow, round features have been observed but not investigated. Superficially, they resemble the "Karlebotn" house type in Finnmark (Olsen 1994: 68–69; Simonsen 1979: 367–371; see more detailed discussion below), which might imply a dating to the early Neolithic (ca. 5000–3000 BC), although they could also be late Mesolithic. At Ust-Drozdovka III, a pair of small, square, and deep houses have been noted adjacent to the large Gressbakken-like structures, and the same is the case at the Kumzha site on the west side of Drozdovka Bay. None of these small dwellings have been investigated, but they are reminiscent of the smaller variants of the "Mortensnes" house type in Finnmark (Olsen 1994: 112–114), which are little researched but probably date ca. 1500–1000 BC. Finally, on an extensive flat terrace east of Ust-Drozdovka III there was a row of large rectangular, but very shallow and hard to discern dwellings (Figure 3.8). Some of these seemed to be paired with small, round, and extremely shallow features that were seemingly not dwellings. Their dating is unknown.

More recent investigations have begun to reveal a preliminary picture of house form variation. At Teriberka, a coastal locality 65 km east of Murmansk and Kola Bay, a large-scale archaeological rescue project was implemented in 2010 (Kolpakov et al. 2016; Shumkin 2014: 38; Shumkin et al. 2012). At the Zavalishina-5 site, semi-subterranean houses of different forms and lying at different heights above sea level were excavated. The earliest radiocarbon dated house was from 3500–2800 BC, but there are also earlier houses from the Mesolithic and Neolithic that have not been radiocarbon dated. Three houses resembled the Gressbakken dwellings known from Norway, consisting of oval-rectangular depressions bordered by distinct wall embankments (Figure 9.1; description from Kolpakov et al. 2016: 171–173). The inner portions of the structures ranged in size from 6 by 4 m to 14 by 9 m, and they were 1–2.2 m deep, as measured from the top of their wall embankments. The floors had two rectangu-

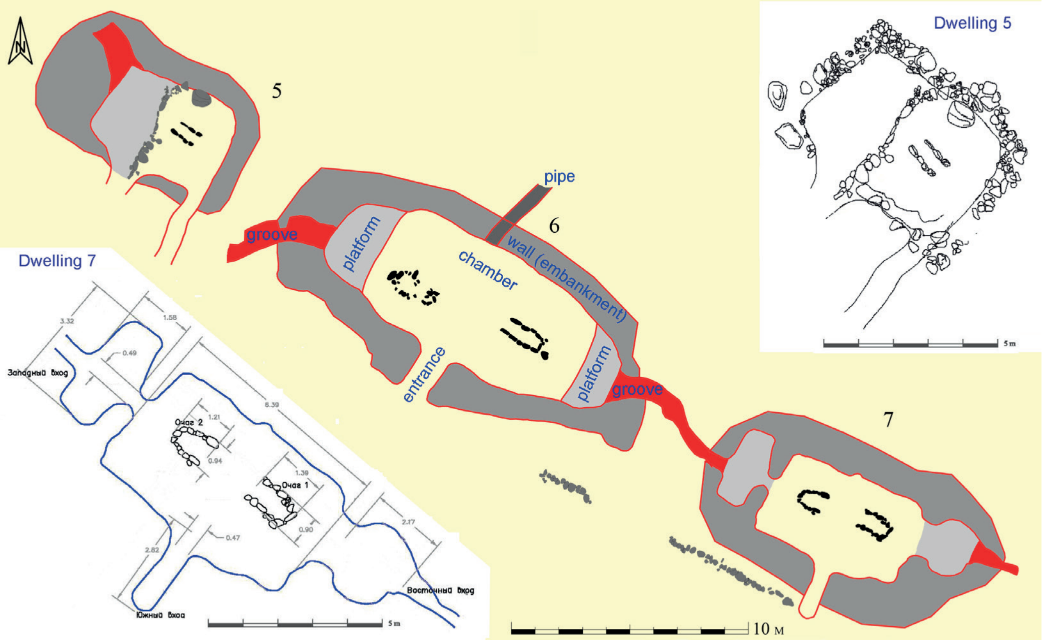


Figure 9.1. Gressbakken-like houses at Zavalishina-5, Kola Peninsula. Reproduced from Kolpakov et al. (2016), with permission of the authors and *Iskos*.

lar stone-built hearths placed along their central axes, with a central gap of 1.5–3 m between them. Each hearth frame was open towards the center of the floor. Each house had an entrance passage on its front wall, dug down to floor level.

At House 6, each long-end of the floor area had a raised platform 0.5 m high and up to 2 m broad. Directly opposite the house entrance, a channel was constructed at floor level through the back wall, extending outside the embankment; this was interpreted as a "chimney". House 6 also had narrow channels ("gates") extending out from the raised platforms at the house-ends to beyond the wall embankments. The end-walls of House 7 had annexes similar to those seen on some Norwegian Gressbakken houses. One annex was rectangular and connected to the house floor by a very narrow constriction (ca. 0.5 m), while the other annex was oval and connected to the house floor by a broader constriction (ca. 1.5 m). Each annex had a narrow channel extending outwards through the wall mound, in one case joining with one of the end-passages from House 6. These channels were interpreted as being related to the heating and ventilation of the houses. A single radiocarbon date from the hearth of House 6 was calibrated to 2900–2600 BC, but a date from a secondary hearth indicates the house was re-used AD 200–500. The former date is considerably earlier than those from Drozdovka House 5. No dates are available from House 7.

Drozdovka House 5B bears some resemblance to Zavalishina-5 Houses 6 and 7 with respect to the form and placement of hearths, but not with their end-wall configurations. Initially, we supposed that the circular chamber at the south end of House 5B might constitute an annex or raised end-platform, elevated about 50 cm above the house floor, as are the platforms at Zavalishina House 6. However, the radiocarbon date analysis (Chapter 5) suggests the chamber may overlap with the later phase of House 5A, implying the chamber was an autonomous feature, not an end-wall component of House 5B. At the north end of House 5B the activity area outside the end-wall does not seem to be structurally related to the dwelling. We are uncertain as to the location of the entrance to House 5B, but if our assessment of the stratigraphy associated with the House 5A entrance passage is correct – that it may have been re-used as the entrance to House 5B – then House 5B may have had an entrance near the mid-point of its western long-wall, like Zavalishina Houses 6 and 7.

The few radiocarbon dates from the other house types at Zavalishina-5 (Kolpakov et al. 2016: 174; Shumkin et al. 2012: 616) are contradictory and differ from the expectations one might have from Finnmark. A "deep square" house was dated 2800–2200 BC. In Finnmark such house forms (a "Mortensnes" variant) might date ca. 1500–1000 BC. One "shallow rectangular" house had several dates ranging between 1000 BC and AD 1 whereas another such house was dated 3500–2800 BC. The former date corresponds somewhat with one of the "Mortensnes" house variants in Finnmark (Simonsen's 1979: 379–381 definition, which differs from Olsen's 1994: 112–114), but the latter is two millennia earlier. There need not be chrono-typological concordance between house types on Kola and in Finnmark, but the dating results are troublesome. The probable re-use of some of the houses at Zavalishina-5 complicates attempts at chronology-building, especially when dwellings are only radiocarbon dated with one sample. Similar problems of re-use have been identified at Stone Age sites in western Finnmark (Vollan 2022).

More recently, the remains of a probable Gressbakken-like house were excavated at Kharlovka, on the Kola coast about 65 km west of Drozdovka Bay (Kolpakov et al. 2021). Although badly eroded, the structure included the remnants of a double hearth with a possible ventilation channel running from the hearth to the back wall of the dwelling. The investigators estimate the house was about 10 by 4 meters in size, with a raised platform at the eastern end of the feature. There are three radiocarbon dates from the dwelling: two conventional dates on charcoal, 3950±45 BP and 3972±50 BP (2565–2349 BC and 2573–2361 BC, respectively, 68.3% prob.) and one on seal bone of 4209±80 BP. If the seal bone date is calibrated with IntCal marine20 and a δR of -238 σ55 (Forman & Polyak 1997), the result is 2622–2316 BC (68.3% prob.). At present, these dates are the earliest for a Gressbakken-like house on the Kola and Norwegian coasts, although early dates are also available from Karelia (see below).

In 1991–1992 Oleg Ovsyannikov excavated a Gressbakken-like dwelling in Dvorovaya Inlet (Kolpakov et al. 2016: 170–171; Ovsyannikov 2012: 279). This sub-rectangular feature was 7.7 m by 4 m in size, 0.9 m deep, and contained two stone-lined hearths. However, unlike many Gressbakken houses, where the double hearths are centrally placed, these hearths were situated only 50 cm distant from each end-wall. There were no traces of entrance passages. Carpelan (2012: 319–320) identified sherds of asbestos-tempered Lovozero ("L-type") ceramics from the house, which suggests a typological dating to the second millennium BC. However, in Varangerfjord, Finnmark, rectangular houses lacking entrance passages and with hearths positioned close to the end-walls are known to post-date the Gressbakken Phase (as determined by shoreline-dating), so the precise chronological placement of the Dvorovaya Inlet feature is unclear.

There are two other excavated Gressbakken-like houses from the Kola Peninsula, both from Guba Mal Volokovaya Bay (Maattivuono Fjord), at the base of the Sredniy Peninsula (southern arm of the Ribachiy/Fisher Peninsula). In 1928 Finnish geologist Väinö Tanner identified a site with eight semisubterranean dwellings, two of which were excavated by the Finnish archaeologist Sakari Pälsi in 1929. The houses were subsequently recognized as being similar to the Gressbakken dwellings in neighboring Varangerfjord, Norway, and were presented as such by Simonsen (1963: 262–266) under the site name Grottug. Seitsonen (2006) discusses these features based on Pälsi's field notes. House 6 was a 5 by 8 m depression described as lacking "structural remains", but seemingly divided into two rooms, a "back room" with a floor somewhat higher than the "anteroom". House 1 was larger, 5.5 by 12 m. One end of the house was destroyed by erosion, but the dwelling contained distinctive structural features. It was divided into a lower "back room" and a raised "anteroom", but in this case the divisions were marked by upright stone slabs. The anteroom floor was partially paved with stone slabs and had a central rectangular hearth constructed of stone slabs. Narrow passages extended out from each end of the house as well as from the middle of the long-walls. The long-wall passages were lined with stone slabs. Although the overall form of the dwellings resembles that of Gressbakken houses, Seitsonen (2006: 230) notes that neither house has the prototypical Gressbakken double rectangular hearths. It can also be said that floor pavements and stone-lined passages are not typical of Gressbakken houses in Norway.

Finally, at Kildin Island on the outer Kola coast, 17 km east of Kola Bay, archaeological surveys between 2004 and 2014 registered 43 sites with houses, ranging from 1–30 houses per site, altogether 299 dwellings. Forms analogous to the Gressbakken (2300–1500 BC) and Mortensnes types (ca. 1500–1000 BC) known from Finnmark were identified (Kolpakov et al. 2016: 175).

At this point we are unable to see much similarity between Drozdovka House 5A and the other excavated houses on the Kola Peninsula, aside from its probable double hearth alignment. The surviving hearth is different in construction from that of House 5B and the hearth ventilation technology is unique, with air channels running out from the hearth-ends and then through the end-walls of the dwelling. Furthermore, the entrance passage is located at one end-wall. Drozdovka House 5B may bear some similarity with Zavalashina-5 House 6 (Kolpakov et al. 2016: 181), although the Drozdovka dwelling lacks elevated end-wall platforms, and we are uncertain where the entrance was located.

Subsistence-Settlement Patterns

Seen on a broad scale, Early Metal Age settlements are found along most of the north Kola coast as well as on the north side of the White Sea (Gurina 1987: 36; Shumkin 2001: 10). Sites have also been identified along rivers and lakes in the interior. The Early Metal Age sites tend to be larger and have more substantial deposition than the Neolithic sites, although sometimes they occur at the same locations as the Neolithic sites. Shumkin (2001: 132) inferred that at this time settlement patterns diverged between populations of generalized hunter-gatherers in the interior and specialized sea-mammal hunting populations on the coast. The coastal settlements were large and permanent, with surface or semisubterranean dwellings, although smaller hunting camps were also in use. Intensification of marine hunting was facilitated by the appearance of toggling harpoons, sometimes tipped with stone or metal points, that were used to hunt walrus and whales in sea-ice conditions. Marine mammal oil was burned in small soapstone lamps (Shumkin 2001: 133–137). The more recent identification of many house-pit settlements at several places along the northern coast reinforces this picture (Kolpakov et al. 2016).

Besides the previously discussed faunal materials from Ust-Drozdovka III and Mayak II in Drozdovka Bay, direct data on Early Metal Age subsistence from the Kola Peninsula is limited. The faunal remains at Zavalishina-5 in Teriberka Bay (ca. 6000 fragments), so far only characterized from the site as a whole rather than by individual house contexts, are dominated by harp seals (89% NISP, 79% MNI). Other mammal species present are Arctic fox, bearded seal, white whale, reindeer, wolf and walrus (all 3 or less MNI). A smaller number of fish and bird bones were also recovered (Kolpakov et al. 2016: 174). At the Ekaterininskoy site, near the Kola Oleneostrovskiy cemetery in Kola Bay, a small excavation of 4 m^2 produced ca. 35,000 animal bones. Only one-sixth of these were identified, of which 2270 (ca. 40%) were harp seal, from which 24 MNI were identified (Gurina 1953: 380; 1997: 103). The presence of Kjelmøy ceramics at the site (Gurina 1953: 383–384) suggests a dating to the first millennium BC (Jørgensen and Olsen 1988: 13–14, 65; Olsen 1994: 106–108). Kharlovka 1–6 produced a faunal sample of 10,678 NISP of mammal and bird bones (Kolpakov et al. 2021: 36–40). The identifiable mammal remains were dominated by harp seals (96% NISP, 62% MNI [n=25]), but they also contained 2 MNI each of walrus and reindeer. The fish remains are not yet analyzed completely but include cod, and a variety of migratory bird species were present. The investigators conclude that the bone material can indicate year-round occupation, but that late winter and spring hunting is strongly represented, while summer-fall indicators are limited. These data, together with those from Ust-Drozdovka III House 5 and Mayak II, point to the significance of the late winter to spring harp seal hunt on the north Kola coast.

Kola Oleneostrovskiy (Bol'shoy Oleniy Ostrov): A Cemetery Site

Kola Oleneostrovskiy is a large prehistoric cemetery on a small island on the west side of the Kola Fjord, northwest of Murmansk (Kolpakov et al. 2019; Murashkin et al. 2016). It was previously known as Bol'shoy Oleniy Ostrov (Gurina 1953; Shmidt 1930). The two graves that were excavated and reported in 1925 marked the beginning of repeated excavations at the site (1928, 1935, 1947–48, 2001–2004). Including the 25 graves destroyed by the military in 1935, approximately 57 graves were present at the cemetery, of which 32 burials containing 43 individuals were excavated (Kolpakov et al. 2019: 24–25; Murashkin et al. 2016: 178–180). The excavations in 2001 to 2004 showed that most of the bodies were buried in wooden, lidded caskets, which looked like small boats or traditional sledges made of thin wooden planks, probably tarred and caulked (Kolpakov et al. 2019: 460–463; Murashkin et al. 2016: 181). The majority of the grave goods in the cemetery consisted of tools made of bone and antler (e.g. arrowheads, harpoons, fishhooks, and needles), but there were also some lithic artefacts, soapstone objects, asbestos-tempered ceramics (Lovozero and Textile types), a crucible with adhering drops of bronze, and a bronze arrowhead/dagger and bronze plate. Bones of birds, fish and mammals were present, although their specific contexts are unclear. Interestingly, there are distinct differences in the grave goods of male and female burials, such as tools associated with hunting versus shells, reindeer mandibles and "four tooth combs" found only in the female graves (Kolpakov et al. 2019: 406–435; Murashkin et al. 2016: 183–186). The cemetery is radiocarbon dated to 1532 – 788 BC (oldest-youngest dates at 68.3% prob., OxCal 4.4, IntCal20), except for a mineralized tar sample that gave an age of 2573 – 2471 BC (the heat treatment of the tar is suggested to have affected the ^{14}C concentration in the sample) (Kolpakov et al. 2019: 351; Murashkin et al. 2016: 187).

The osteological analysis of 31 postcranial skeletons and 20 skulls shows biological affinities with ancient Altai Neolithic and modern Ugric speaking Siberian groups (Khartanovich et al. 2019: 399; Murashkin et al. 2016: 186). The aDNA analysis points towards an origin among western Siberian peoples rather than populations in north and northeastern Mesolithic Europe (Der Sarkissian et al. 2013; Murashkin et al. 2016: 186). However, the radiocarbon dates are insufficient to reveal if this is the period when these people first settled in the region.

The dates from the cemetery immediately post-date the Ust-Drozdovka III houses as well as the related Gressbakken phenomenon in northern Norway. The artifact assemblage from the burials bears strong similarities to the bone assemblage from Mayak II (Gurina 1997: Figures 35–62), and some of the Gressbakken houses in Varangerfjord (Simonsen 1961). The reindeer-headed "rods" are reminiscent of reindeer "staves" from the much earlier (6000 BC) Mesolithic Oleneostrovskiy Mogil'nik Mesolithic cemetery on Lake Onega (Gurina 1956; Jacobs 1995; O'Shea & Zvelebil 1984). The ceramic types from the cemetery also occur widely on Kola and extend into northern Norway (Jørgensen & Olsen 1988).

A Comparative Perspective: Stone Age Houses and Early Metal Age Settlement in Finnmark, North Norway

Unlike the Kola Peninsula, in northern Norway there is a long tradition dating back to the 1930s of excavating semisubterranean houses, particularly in Finnmark County. In this section we first discuss how the Kola houses from the Early Metal Age compare with those from Finnmark. We then turn to a more general comparison of settlement patterns.

House Form

In a teaching compendium from the late 1970s, Simonsen (1979: 367–381) presented a chrono-typology of house forms that revolved around two primary types. "Karlebotn" houses dated to the earliest portion of the Late (Younger) Stone Age and were generally round/oval, occasionally semi-rectangular, only slightly semisubterranean, and of fairly small dimensions: 3.5–5 m in diameter, 15 m^2 on average. Hearths were always centrally placed, either formally as small stone frames or simply as central concentrations of charcoal and fire-cracked rock. A single entrance was placed on the back wall, that is, facing away from the sea. In rare cases, small midden deposits were found inside and outside the houses (e.g. Simonsen 1961: 154, 161). Extensive radiocarbon dating of these houses in later years has shown that these dwellings mostly date ca. 5000–3500 BC (data presented in E. K. Jørgensen 2020).

In contrast, "Gressbakken" houses dated to the later portion of the Late Stone Age. According to Simonsen, they were oval/rectangular in form, much larger in size (5–6 m wide, 8–10 m long, averaging 50 m^2), and more markedly semisubterranean with substantial wall mounds. Two large rectangular stone-framed hearths were placed centrally on the floor. In a couple of cases, four postholes arrayed around the hearths suggested load-bearing posts for the roof. At each end of the house was a slightly raised platform with a stone pavement, regarded by Simonsen as sleeping areas. The entrance was a passage at the middle of the front wall, facing the sea. Sometimes there were large, deep (ca. 50 cm or more) middens in front of the house on either side of the entrance passage.

In Simonsen's (1961) earlier excavation report for the Gressbakken site, however, he mentioned "depressions" at each of the end-walls of many houses, and in a few cases also in the middle of the back wall. In some cases, he stated explicitly that these cannot be doors, as they did not cut entirely through the wall bank (e.g. Simonsen 1961: 289, 317). In one instance it was possible that an end passage led into an adjacent house. These observations are not mentioned in the later teaching compendium. As noted previously, Gressbakken houses in Norway are currently dated 2300–1500 BC (Jørgensen & Riede 2019; Schanche 1994: 96–98).

Simonsen (1979: 376; see also Olsen 1994: 63, 71–72) suggested there was a transitional house form between the Karlebotn and Gressbakken types, the "Nyelv" house, which was essentially a rectangular Karlbotn house with a double hearth. In addition, he defined a post-Gressbakken house type, characteristic of the Sámi Iron Age: the

"Mortensnes" house (Simonsen 1979: 379–380). These were rectangular with a double hearth, but unlike the other two types, which had long axes oriented parallel to the shoreline, Mortensnes houses were oriented perpendicular to the shoreline. However, in subsequent years the Mortensnes house type was redefined as deeply semisubterranean, quadratic in form and somewhat smaller than Gressbakken houses, lacking distinct entrances, and with a single hearth placed off-center on the house floor (Olsen 1994: 112–113). Very few of these have been excavated and securely dated, but they seem to post-date Gressbakken houses, ca. 1500–1000 BC.

K. Helskog (1984: 63–64) revised Simonsen's estimates of house floor area, arguing that Simonsen's interpretation of sleeping platforms on the wall areas was incorrect, and that a realistic assessment of wall placement and post-abandonment formation processes would result in smaller house floor areas. Accordingly, K. Helskog (1984: 64) suggested a much- reduced average floor area of 25–30 m² for Gressbakken houses. Nonetheless, he still saw the larger Gressbakken dwellings as housing multi-family social units.

During the 1980s it became standard to view Gressbakken houses as characterized by triple entrance passages, one on the front wall and one on each end-wall. In a multivariate statistical analysis of house form, Engelstad (1988: 77) took a cautious tone, noting that "…ditch-like [wall] depressions…are most generally interpreted as entrance passages…". Nevertheless, over time the element of doubt seems to have been dropped and many archaeologists simply assumed these features were entrances. This may have been facilitated by surveys and excavations that revealed distinct round annexes associated with each end-wall at some Gressbakken dwellings (Andreassen 1988: 14; Schanche 1994: 25, 35, 37, 44, Appendix I). Schanche (1994: 220–221) interpreted these annex features as storage or food preparation areas, "warming rooms" using rocks heated in the hearths, or saunas. In Olsen's 1994 textbook for students, the end features are presented as entrances without any qualifications (Olsen 1994: 72). In a dissertation focused on Gressbakken houses, Schanche's (1994: 3) definition of the house form regarded multiple entrance passages as the most characteristic attribute of the type. She also emphasized what she saw as the spatial symmetry of the houses: an entrance passage at each end, two hearths associated with opposite sides of the house floor, and an entrance passage in the middle of the front wall, which together create the impression of a side-to-side distinction (Schanche 1994: 76). Schanche (1994: 76) recognized that some houses deviate from this symmetrical pattern, but these were not given much attention, besides mentioning they may have had another function, as Simonsen (1961: 380–385) had suggested.

As the number of excavated Stone Age houses increased, and as more were investigated outside Varangerfjord, the range of variability became more apparent. Engelstad (1988) used multivariate correspondence analysis to test the veracity of Simonsen's Stone Age house types in the face of this increasingly variable sample. She coded house form using several attributes: number of hearths, depth, size, form (floor shape), orientation towards the shore, terrain gradient and position of the entrances. The statistical analysis aimed to see which of these attributes consistently occurred together and whether these clusters of attributes corresponded to the standard, intuitively defined, house types. The Gressbakken houses in the Varangerfjord region did seem to "hang together" as a type, but outside of Varangerfjord there was much more variation in house form, with little indication of clear sub-types.

A similar quantitative analysis, but with a larger sample, was undertaken on Early Metal Age houses by Johansen (1998), along with a more detailed consideration of regional variation in individual dwelling attributes. Johansen concluded that the Varangerfjord houses were generally larger than those in west Finnmark, and that the houses outside Varangerfjord were generally shallower in depth and lacked middens. In addition, while most of the houses in Varangerfjord had multiple "entrances", the west Finnmark houses never had more than one, and in most cases entirely lacked identifiable entrances. The Varangerfjord houses generally had well-defined double rectangular hearths of similar construction, while elsewhere dwellings tended to have double hearths, but of more variable form and positioning than in Varangerfjord (Johansen 1998: 74–75).

Johansen's (1998) analysis concluded that the defining attributes of Gressbakken houses – size, entrances, and hearth form – exhibit a geographical distribution mostly limited to Varangerfjord. However, houses of the "classic" Gressbakken form also occur further west in Porsangerfjord (Schanche 1994: Appendix II), but they were not included in Johansen's discussion because none of them have been excavated. Other Gressbakken-like houses have been registered on surveys in western Finnmark (Alta, Kvalsund, Sørøy), but few have been excavated and none have been published. The presence/absence of annexes was not specified in Johansen's analysis, but as they are generally associated with entrances, by implication they may be infrequent outside of Varangerfjord. Only one of the Porsangerfjord houses sketched in Schanche's (1994) appendix depicts a possible annex (Schanche 1994: 269). Apparently, only one dwelling with a possible annex is known from Sørøy in western Finnmark (M. Skandfer, personal communication to Hood).

However, even in the Varangerfjord region there is significant variation in Gressbakken Phase house form with respect to size, depth, the presence/absence of entrances and annexes, and the presence/absence of middens. The functional and social significance of this variation is not well understood, particularly as relatively few Gressbakken houses have been totally excavated since Simonsen's original work, and especially few of the "deviant" forms. An example of the latter is Schanche's (1994: 37–43) excavation of House 17 at Kalkillebukta, near Neiden in Varangerfjord (Figure 9.2f). The dwelling had a 7.5 by 5.5 m floor area, but lacked a stone-set hearth, and there seems to have been only one entrance passage – on one of the end-walls – and a small aperture suggestive of a ventilation channel on the opposite end-wall. Several radiocarbon dates indicate the dwelling was re-used in post-Gressbakken time, while the sample from the midden (3510±70 BP; 1929–1744 BC, 68.3% prob.) was regarded as dating the primary house occupation. A relatively high proportion of saithe/coalfish bone in the small sample of faunal material points to summer occupation, and winter season indicators are lacking, so Schanche (1994: 163–164) proposed the Kalkillebukta house may indicate "less permanent" settlement than other Gressbakken houses.

More recently, rescue excavations at the Nyelv Nedre Vest site in Varangerfjord investigated structures that previously might have been classified as "Nyelv houses", the supposed transitional form between earlier "Karlebotn" houses and later "Gressbakken" dwellings. The best-preserved structure had a floor area of 4 by 6 m – of which the northern two-thirds was a platform raised above the southern third – with a single rectangular hearth on the raised section, and an entrance along with a possible ventilation channel positioned at the southern end-wall. Radiocarbon dates indicate the dwelling area had been re-used several times, but the dates believed to be associated with the primary occupation all ranged between 2335 and 1617 BC (68.3% prob.) (Niemi & Oppvang 2018: 43–61). In other words, as was already hinted at by their shoreline dating, at least some "Nyelv houses" are probably a dwelling variant within the Gressbakken Phase.

The houses from Kalkillebukta and Nyelv bear some resemblance to each other, particularly as regards their single entrances placed at an end-wall. Given their contemporaneity with the "classic" stereotyped Gressbakken house, a good argument can be made that they represent a seasonal or functional dwelling variant, perhaps one used during warm seasons. Clearly, more attention needs to be paid to these "deviant" types.

One structural attribute that seems to exhibit important variation during the Gressbakken Phase is the form of the end-wall. If we include the "deviant" house forms noted above, and consider only the Gressbakken houses in east Finnmark that have been totally or mostly excavated, we can identify three variant end-forms: 1) small entrance passages on one of the end-walls, with the opposite end-wall largely unmodified, 2) broad, unconstricted-entry platforms raised above, but continuous with, the house floor, or 3) separate annexes accessed by constricted passages through the house end-wall. This may be an oversimplification, as the older excavations lack detailed documentation, but it helps reveal a more nuanced picture of house form. The first variant is represented by the previously described houses at Kalkillebukta and Nyelv, so it will not be discussed further.

The second variant can be exemplified by several houses. Advik House b (Figure 9.2 a) appears to have at one end a slightly raised, 4 m broad platform with a stone deposit on its floor, with a narrow aperture extending through its outer wall. At the opposite end of the house was a simple narrow aperture (Simonsen 1961: 226–227). A similar one-platform configuration, perhaps 3 m broad, may have been present at Advik House j (Figure 9.2 b), although here there was no stone deposit on the possible platform (Simonsen 1961: 234–235). Gressbakken House 1 (Figure 9.2 c) was not totally excavated, but at one house-end there are indications of a ca. 3 m broad platform with a stone deposit and an aperture through its outer wall (Simonsen 1961: 275). The opposite house-end has a wall aperture, but it is unclear if it was associated with a platform. Gressbakken House 3 has perhaps been the prototype for Gressbakken houses, frequently interpreted as having a long entrance passage on its front wall and entrances on each end-wall (Figure 2.1), although Simonsen (1961: 289) doubted the end-wall apertures were entrances. Almost completely excavated, it might have had a ca. 2 m broad platform at one end, associated with an outer wall aperture, and a narrower upslope aperture at the opposite house-end (Simonsen 1961: 290–293).

Gressbakken House 5 (Figure 9.2 d) was not completely excavated at its ends, but it may have had stone-filled platforms at both ends, each bisected by an aperture extending outward from the floor end-wall and running through the middle of the platform (Simonsen 1961: 347, 353). The hearth had been re-built on several occasions, so one might wonder if other portions of the dwelling were also modified over time. Bugøyfjord House II may have had broad platforms at each end (Figure 9.2 e). At one end the platform was 3 by 3 m in size, raised 40 cm over the floor, contained a substantial stone deposit, and was associated with a narrow outer-wall aperture. The other platform, 3 by 2 m in size, lacked a stone deposit and seemed not to be bounded by an outer wall (Simonsen 1961: 469).

The third end-form variant has been noted at more recently excavated sites. House 1 at Leirpollen, in Lebesby Municipality, 65 km west of Varangerfjord, was a shallow Gressbakken dwelling with passages in each end-wall that led into oval annexes, each ca. 2 m in diameter, one of which had an additional outward-extending passage (Figure 9.2 g). There might have been an entrance mid-way on one long-wall, but this area was regarded as "disturbed" (Andreassen 1988: 14). At Bergeby House 18 in Varangerfjord, one of the ends was partially excavated, revealing a narrow passage through the wall leading to a small rectangular annex 3 by 2 m in size, which had another aperture apparently leading into a smaller oval annex (possibly related to the adjacent house?). The annex was excavated down to the same level as the house floor, which was ca. 80 cm deep. At the other end of the house there was also a narrow passage through the end-wall that appeared to lead into a subsidiary structure, but the latter was not excavated (Schanche 1994: 23–25). At Kalkillebukta House 7 in Varangerfjord, the end-walls were partially excavated. At each end-wall there was a narrow passage that led to a small round annex (ca. 1–1.5 m diameter), which in turn had outward-extending apertures. Unfortunately, the excavation was unable to clarify their configurations (Schanche 1994: 32–35).

This recognition of greater variation in house form during the Gressbakken Phase complicates attempts at inter-regional comparison. Comparing the Drozdovka houses and the few other excavated dwellings on the Kola Peninsula with Finnmark, it seems that several of the common attributes of Varangerfjord Gressbakken houses are shared with Kola, particularly rectangular form, size, single or multiple "entrances", and double rectangular hearths. However, as the range of variation in house form on Kola is not well known, the similarities should not be exaggerated. Nevertheless, some attribute-to-attribute comparisons may be useful.

Drozdovka House 5A, with its double hearths and double air-channel systems extending out each end-wall of the house, as well as an entrance at one house-end, does not compare easily with most of the known Varangerfjord Gressbakken houses. In terms of overall dwelling form, House 5A resembles Kalkillebukta House 17 (Figure 9.2 f), which deviated from the "prototypical" Gressbakken pattern. One end-wall at House 17 had a 40–70 cm wide passage that seems to be a reason-

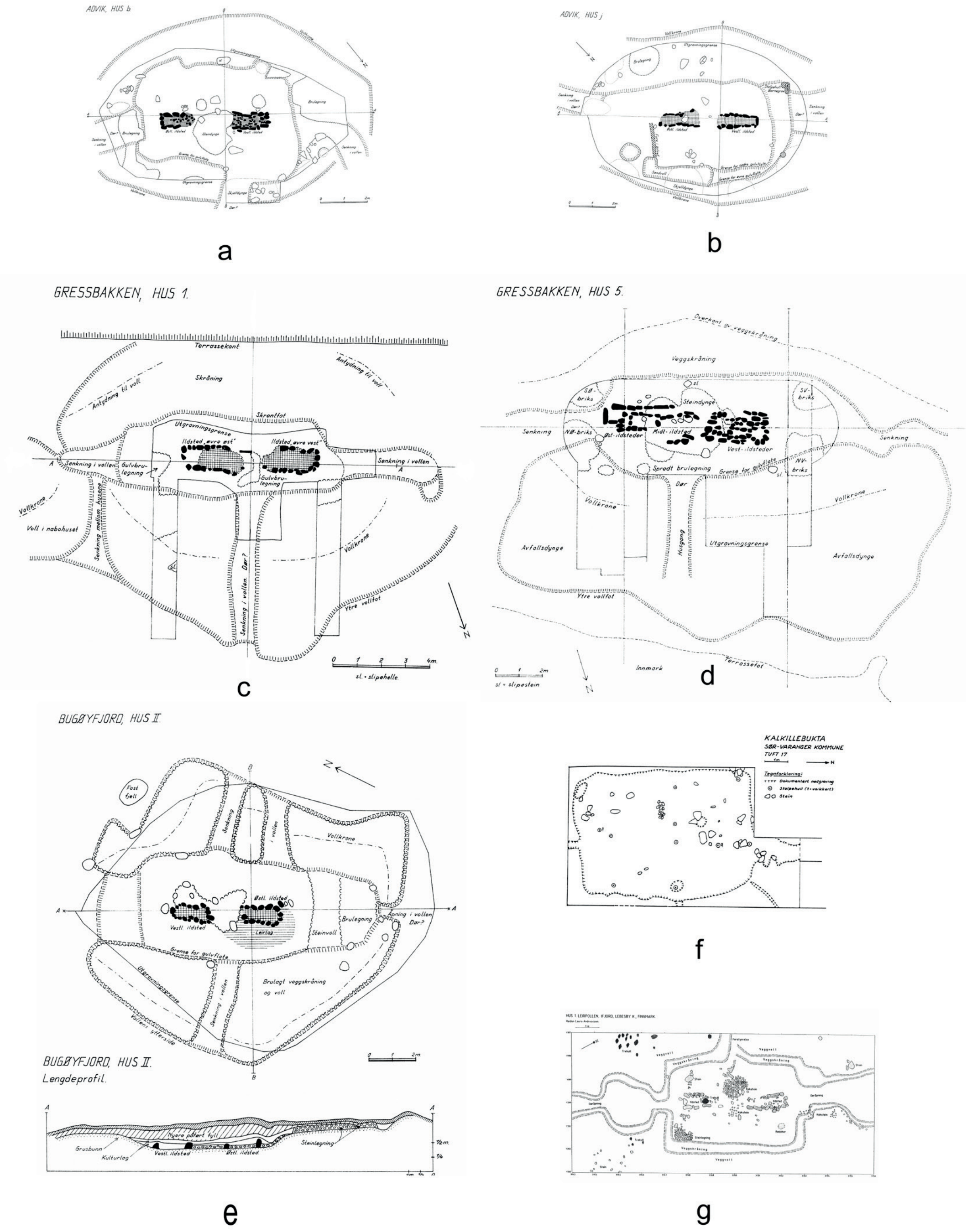


Figure 9.2. Variations in the form of Gressbakken Phase houses in East Finnmark, Norway: a) Advik House b, b) Advik House j, c) Gressbakken House 1, d) Gressbakken House 5, e) Bugøyfjord House II, f) Kalkillebukta House 17, g) Leirpollen House 1. In order of presentation, from: Simonsen (1961: 226, 234, 275, 347, 469), Schanche 1994: 39) and Andreassen 1988: 14). Reproduced with permission of the Arctic University Museum of Norway, UiT – Arctic University of Norway, Tromsø.

able candidate for an entrance, while the opposite end-wall had a narrow aperture said to be 40 cm wide, but it is drawn much smaller, suggesting it was an air channel (Schanche 1994: 39). On the other hand, House 17 completely lacked stone-framed hearths, while House 5A has one surviving such hearth, very well preserved. Traces of possible air channels related to Gressbakken hearths and house floors have been observed in a couple of cases. In Advik House j (Figure 9.2 b), a narrow depression in the floor extended from near the hearth towards one of the long-walls (Simonsen 1961: 234). In Bergeby House 18 a similar floor depression extended from the hearth in the direction of an end-wall (Schanche 1994:25). Finally, as mentioned above, a possible ventilation channel was positioned at the southern end-wall of one of the recently dated houses at Nyelv Nedre Vest, although this was oriented outwards and was not physically linked to the hearth (Niemi & Oppvang 2018: 44, 50).

Drozdovka House 5B also poses some comparative problems, given the uncertain configuration of the house end-walls and location of the entrance passage. As noted previously, we may be looking at a structure with two “plain” long-ends without apertures or annexes and an entrance near the middle of the seaward long-wall. The hypothesized entrance configuration, as well as the double rectangular hearths with substantial accumulations of rocks, are similar to many of the Varangerfjord houses.

The Zavalishina-5 structures can be assessed in relation to the variable attribute of end-wall configurations. At Zavalishina-5, two of the houses had raised platforms at both ends; at House 6 these platforms extended across the entire width of the house, while at House 7 they were accessed through constrictions in the walls and thereby resemble separate chambers or annexes. No information is provided on any additional features or contents of the platforms. Taking this at face value, there seem to be similarities with several Varangerfjord houses that exhibit raised platforms on one or both end-walls.

Settlement Organization

When Simonsen (1979) formulated different house types for the early and later portions of the Late Stone Age, the types were also linked to changes in settlement organization. The earlier Karlebotn houses were viewed as single-family dwellings, similar to the small turf huts known historically among the Sámi. However, the houses sometimes occurred in large multi-house concentrations (ca. 85 houses at the Gropbakkeengen site) suggestive of large villages (Simonsen 1965: 404). Simonsen suggested that half of these houses might have been in use contemporaneously, implying a population in the range of 200 people (40 houses x 5 people per household). In contrast, Simonsen (1965: 405; 1979: 376) regarded Gressbakken dwellings as housing multi-family social units (2–3 households, totalling 15 people) and compared them to ethnographically and historically known Inuit communal structures on Greenland. Gressbakken houses also occurred in groups, such as the 15 at the Gressbakken Nedre Vest site and the nine at the adjacent Gressbakken Nedre Øst site. If half of these were in use simultaneously it would imply a local population in the range of 180 people (12 houses x 15 people per household). According to Simonsen, however, these inferred villages were used only in the winter and spring; parts of the summer and fall would have been spent at other locations in the inland, fishing and reindeer hunting (Simonsen 1965: 400–401).

During the 1980s these interpretations were challenged from several directions. Statistical analyses of radiocarbon dates from Stone Age houses suggested it was unlikely that more than six houses were ever used contemporaneously (E. Helskog 1983; K. Helskog 1984; K. Helskog & Schweder 1989), thus the large village scenario was undermined. Additional excavations and the reanalysis of Simonsen’s earlier faunal collections provided stronger evidence for summer occupation, indicating the possibility of semi-sedentary settlement rather than the winter-spring seasonal locales suggested by Simonsen (Engelstad 1984; Renouf 1989). For some, semi-sedentary settlement raised the question of possible hunter-gatherer social complexity, because reduced mobility would lead to food storage, larger communities with greater longevity, and a need for leadership organization (Renouf 1984).

The complexity theme was pursued further in the 1990s, with some researchers advocating the presence of social hierarchies and group territories in Varangerfjord (Olsen 1994: 85–98; Schanche 1994). In addition to semi-sedentism, this assertion was based on additional radiocarbon dates for Gressbakken houses, which were interpreted as indicating that most of the dwellings at Gressbakken settlements could have been occupied contemporaneously, implying community sizes of hundreds of people (Schanche 1994: 95–100, 176–177). Finds of metal artifacts at a couple of sites believed to date to this period were suggested to indicate participation in metal-exchange networks originating in Russia, and the use of metal in social status demarcation. Other researchers were more circumspect or skeptical concerning the social complexity issue, however, noting that the data exhibited more variability than assumed in the complexity interpretation (Hodgetts 1999; Hood 1995). Furthermore, one of the metal finds used to ground the exchange and status interpretation was found in a midden context that has since been dated to 1000 years earlier (Hood & Helama 2010).

Returning to the data, the general picture in Finnmark is for Gressbakken houses to occur in localized clusters. According to Schanche's (1994: Appendix I) data from 41 sites in Varangerfjord, 27% of the house groups consist of 1–2 dwellings, 58% have 3–10 dwellings, 10% have 11–20 dwellings; one site has 23 houses and one has 30. Looking more closely at the spatial organization of individual settlements, in some cases the houses can be clustered fairly close together (e.g. 14 of the 15 houses at Gressbakken Nedre Vest; Simonsen 1961: 272), but the overall tendency is for houses to be spread out in rows along shoreline terraces (Schanche 1994: Appendix I). In one case, Gressbakken Nedre Vest House 5, it is possible to identify five hearth rebuilding episodes that indicate sequential reworking of the same house floor (Simonsen 1961: 346–353). However, no evidence has been found in Finnmark for a complete rebuilding of a house such as that observed at Ust-Drozdovka III House 5, with its spatial re-orientation from House 5A to 5B. In Finnmark it seems that when more than re-flooring was required, new houses were built at the ends of existing house rows.

The fundamental problem of house contemporaneity has not been resolved. Claims for maximum house contemporaneity were based on simple date range overlap (Schanche 1994: 96–98), not the analysis of probability distributions. Unfortunately, a statistical analysis of the existing dates cannot resolve the problem. These dates are mostly conventional, with large standard deviations, and the few dates from each house surely do not capture the first through last use-phases of the houses, which is required to assess individual house longevity and possible chronological overlaps between dwellings. Thus, we cannot acquire robust answers to the house contemporaneity problem using the currently available radiocarbon data.

What we can infer about house longevity is derived mainly from two site contexts. The best measuring stick is probably a series of seven AMS dates from the bottom to the top of a deep midden at Advik House N in Varangerfjord (Martens et al. 2017: 34–35). Bayesian modelling of the time span represented by these dates ranges from 41 years (68.3% prob.) to 151 years (95.4% prob.) (unpublished analysis run by Hood), but that need not imply a continuous occupation of the dwelling. An alternative approach to estimating house longevity was based on the analysis of annual growth rings (schlerochronology) in the bivalve mollusk *Arctic islandica*, which were abundant in a deep midden at the Karlebotnbakken site in Varangerfjord, radiocarbon dated 3270–2870 BC (68.3% prob.) (Helama & Hood 2011; Hood & Helama 2010). The floating shell-ring chronology developed for this pre-Gressbakken midden demonstrated a minimum 82-year midden deposition time span – again, not necessarily continuous occupation. Consequently, house longevities on these time scales must be considered when assessing dwelling contemporaneity.

On the Kola Peninsula there is not yet enough data from Early Metal Age house sites to assess questions of dwelling contemporaneity and settlement sizes. We do not have systemic data on the number of Gressbakken-like houses on the Kola sites, so we can only make some rough comparisons. In Drozdovka Bay, Ust-Drozdovka IУ and III together appear to consist of eight Gressbakken-like houses, while Kumzha has four. On the lower Drozdovka River, south of Ust-Drozdovka III, there is a cluster of three houses. Thus, like Finnmark, we have several settlements in the same bay, with most localities consisting of multiple houses, perhaps up to 10 dwellings.

At Ust-Drozdovka IУ and III, the Early Metal Age inhabitants chose to pack their settlement into a small sandy point, which was used repeatedly from 2300 to 1500 BC, or according to the overall time span estimates from Bayesian modeling of the radiocarbon dates, 192–693 years (95.4% prob.; Appendix 2: Table A2.5). Unfortunately, we do not have radiocarbon dates from many of these dwellings, but several dates from House 5A overlap with the single date from House 7 (Table 5.1), providing a weak hint of dwelling contemporaneity. However, the Bayesian analyses of the dates from Houses 5A and 5B (Appendix 2: Table A2.2) illustrate the challenges involved in determining house longevity (spans) and the length of occupation intervals. At the 95.4% probability level, the first occupation phase at House 5A was modelled to extend from 2091 to 1916 BC (span= 0–94 years), the second occupation phase from 1981 to 1751 BC (span= 0–95 years) and the more poorly dated House 5B from 1891 to 1511 BC (span= 0–96 years). The interval between House 5A phases 1 and 2 was calculated as 0–145 years, and the interval between 5A phase 2 and House 5B as 0–209 years. In historical reality, the spans and intervals were probably shorter than the statistical maximum estimates. Nevertheless, given such ambiguity there are many obstacles to determining house contemporaneity when we are faced with comparing multiple houses, each with their own complex life-history and varied assortment of radiocarbon dates.

In any event, the dated features at Ust-Drozdovka show a long-term re-use and rebuilding cycle at a very spatially constrained dwelling location, as do the multiple superimposed occupations at Mayak II. This tight settlement clustering could partly be explained by geology. The limited postglacial isostatic uplift in Drozdovka Bay has contributed to the long-term re-use of favorable locales, in contrast to the situation in Varangerfjord, where sea level dropped 2 meters during the Gressbakken Phase, gradually opening additional shoreline space. Nonetheless, it seems more likely that the clustering of the Ust-Drozdovka occupation says something about the social dynamics of settlement. A sense of place, social memory, or social exigencies evidently drove this spatial nucleation, because it was quite possible to have spaced out the houses along the large terrace that was available for settlement at the same elevation (see Hood et al. 2022).

Subsistence-Settlement Patterns

As mentioned above, the Varangerfjord Gressbakken (and earlier) sites were initially interpreted in the 1960s as strictly seasonal villages. Faunal material from the Late Stone Age localities was dominated by bones of codfish and seals, which suggested a winter-spring occupation. Summer and fall would then have been spent in the inland, fishing and reindeer hunting (Simonsen 1965: 400–401). New excavations in the 1970s and reanalysis of the earlier faunal collections provided stronger evidence for summer occupation as well, indicating the possibility of semi-sedentary settlement rather than seasonal winter-spring locales (Engelstad 1984; Renouf 1989). Additional faunal material collected in the 1990s suggested that settlement might have been semi-sedentary in innermost Varangerfjord and more seasonally mobile in the outer fjord area (Schanche 1994: 164–165). Further reanalyses of the Varangerfjord faunal materials have pointed to inter-household variation in procurement practices (Hodgetts 1999; 2010; Hood & Melsæther 2016). Also, as noted above, variation in the form of Gressbakken houses may indicate seasonal or functional differences. Suffice it to say, we have not yet developed a sufficient handle on variability in Gressbakken Phase coastal settlement seasonality and its concomitant organization of logistical mobility. Furthermore, the relationship between coastal settlements focused on maritime resources and seasonal use of the interior areas for salmon fishing, reindeer hunting, and other activities, is still an open question.

The most striking – but hardly surprising – aspect of the Varangerfjord faunal material is the heavy emphasis on marine resources and the modest representation of terrestrial mammals in most of the middens (Hodgetts 1999; 2010; Olsen 1967; Renouf 1989). Fishing was central, with the winter-spring cod fishery at the forefront, and other species such as saithe (coalfish) and haddock exploited during the summer. Salmon remains are conspicuously absent in the middens, considering the presence of several salmon streams in the vicinity of the sites, and a major salmon source (the Tana River) 25 km or less from the sites in inner Varangerfjord. The other major contribution to the diet came from seals. Ringed seals were probably killed on landfast ice in late winter, and the migratory harp seal was hunted in open water in spring and early summer, when large herds of them entered the fjord chasing capelin. Grey and harbor seals were probably hunted year-round, particularly when hauled out onshore. Harbor porpoises and white-beaked dolphins may have been mass-hunted in pods at some locations, such as near the Gressbakken site (Hodgetts 2010: 50; Renouf 1989: 210). Larger whales may have been hunted occasionally or scavenged when beached. A great variety of marine birds was used. Several species of shellfish were exploited for food and bait, although common periwinkles and blue mussels were the primary mollusks (Hood & Melsæther 2016).

Relatively few small mammals are found in Gressbakken middens, although furbearers are the most usual representatives. Brown bear bones occur occasionally. Most surprising is the relatively modest, perhaps even low frequency of reindeer bones in most of the middens. In the large samples from Gressbakken Houses 3 and 4, Renouf (1989: 191–203) calculated a total of 7 reindeer MNIs (minimum number of individuals) for House 3 and 18 MNIs for House 4. Hodgetts (1999: 162, 269; 2000: 21) calculated reindeer MAU (minimum animal units) of 100 for House 3 and 58 for House 4, but also noted that skeletal elements with high meat utility were rare in the Gressbakken sites (Hodgetts 1999: 166–167; 2001: 23). Instead, she suggested that skeletal element selection was biased towards those elements best suited for making tools: antlers and longbones (Hodgetts 1999: 171; 2000: 26).

Olsen (1994: 96) concluded that during the Early Metal Age there were sharp social boundaries between coastal and interior populations in Finnmark. This inference was based on differences between coastal and inland ceramic and lithic types and the presence of many semisubterranean houses on the coast and their rarity in the interior. However, the differences between the lithic types can be explained in terms of site functions and raw material availability and there are now more examples of house-pits along the interior rivers, so the contrasts no longer seem so stark (Blankholm & Skandfer, *forthcoming*; Hood et al., *forthcoming*). Some of the house-pits along the Tana River (Skandfer & Hood, *forthcoming*) could have been used seasonally by groups from Varangerfjord as bases from which to fish salmon and hunt reindeer. Nevertheless, the mix of coast-interior settlement strategies is open to discussion.

Subsistence-settlement patterns on the north Kola coast and coastal Finnmark are at least broadly similar, with an emphasis on sea mammal hunting and fishing from possible semi-sedentary house sites. It is uncertain whether groups in Drozdovka Bay were based at single semi-sedentary settlements or moved between multiple seasonal settlements within the bay. Houses located on the lower portion of the Drozdovka River were likely bases for salmon fishing. The Mayak II site has a distinct profile as a seasonal sea mammal prosessing site, perhaps used cooperatively by different residential groups in the bay. No comparable specialized hunting site without houses is yet known from the Gressbakken Phase in Finnmark.

Earlier we noted the prominence of harp seal remains in the faunal material from Ust-Drozdovka III, House 5, Mayak II, Zavalishina-5 at Teriberka Bay (Kolpakov et al. 2016), Ekaterininskoy in Kola Bay (Gurina 1953; 1997: 103), and Kharlovka 1–6 (Kolpakov et al. 2021). A comparison with the Varangerfjord middens might be instructive, although for various reasons it can be problematic to compare the bone frequencies and different taphonomic contexts. At Ust-Drozdovka III, House 5, harp seals comprised 85% of the seal bones by NISP (number of identifiable specimens) and almost 20% of the identified mammal bones. At Mayak II, if we assume the taxonomic identifications were correct, harps comprised 99% of the seal bones and 19% of the identified mammal bones. In the three Varangerfjord sites with the largest samples, harp seals comprised roughly 40–85% of all the seal bones (by NISP) (Hodgetts 1999: 114–115), although the percentage of harp seals in relation to the number of identified mammal bones varies considerably, from a high of 21% at Bergeby House 18 to about 6% at Gressbakken House 3 and 2.5% at Gressbakken House 4 (calculated from tables in Hodgetts 1999: 58–59, 71–72, 75–76). The two Gressbakken houses have a rather diverse range of mammalian fauna and unusually high frequencies of bones from small whales.

Whatever the comparability issues, these numbers at least direct attention towards the seasonal importance of harp seals in subsistence-settlement patterns on both the Kola Peninsula and in Varangerfjord. When successful, the organized mass-hunting of large harp seal herds would provide high subsistence return-rates relative to other resources. On an even broader comparative note, the seasonal exploitation of harp seal migrations was probably one of the most important components in the subsistence economy of the coastal indigenous people of Labrador and Newfoundland, Canada, where both spring (northward) and fall (southward) migrations were exploited by the Maritime Archaic "Indians", Dorset Pre-Inuit, Inuit, and other groups (e.g., Cox and Spiess 1980; Fitzhugh 1978: 83; Hodgetts et al. 2003; Renouf 2011).

Technological Attributes

As far as the lithic technology is concerned, the bipolar reduction of quartz that is the predominant practice at Ust-Drozdovka III, House 5, is common at other Early Metal Age sites on Kola, and it constitutes the primary component of lithic assemblages in the Gressbakken houses of Finnmark. In both regions, quartz was locally available in bedrock veins or beach sediments, and it was used in an expedient fashion to produce sharp-edged flakes or was minimally retouched into scrapers. The House 5 and Mayak II ground slate tool assemblages are very similar to those from Finnmark. The small single-edged knives are virtually identical (Figures 6.6 and 8.2; compare: Simonsen 1961: Figure 121: p, q, Figure 141: g–i, Figure 153: f–k; Gurina 1997: Figure 36, 4–7). Ground slate points with fluted bases (termed the Sunderøy type in Norway) are present in both areas (Figure 8.2; compare: Simonsen 1961: Figure 121: d, l, Figure 141 e, f; Gurina 1997: Figure 37: 11, 12, Figure 41: 20, 21), as are stemmed slate points (Figures 6.7 and 8.2; compare: Simonsen 1961: Figure 121: f, h–k; Gurina 1997: Figure 34: 28, 29, Figure 36: 9, 10). The flat-beveled-base points or preforms found at House 5 (Figure 6.7) and Mayak II (Gurina 1997: Figure 36: 1–3, 8) seem to be rare in the Norwegian sites, although the huge quantities of material from recent rescue excavations have not been illustrated sufficiently. Simonsen (1979: 422) depicts some examples from Lenangen, in Ullsfjord, northern Troms County. The grinding patterns on some of the finished slate points in Finnmark and Troms suggest they may have been produced from such flat-beveled base preforms.

The Drozdovka Bay Early Metal Age material contains a good number of flint bifacial points (Figures 6.10 and 8.2; Gurina 1997: Figure 34, 45). These occur in a variety of forms, but are mostly either bipoints, lanceolates with flat bases, or triangular with slightly concave bases. Bifacial points are rare in Norwegian coastal Gressbakken houses, although they were more frequent at a coastal locality lacking in "classic" Gressbakken house forms (E. Helskog 1983: 61–62). Tellingly, no biface-thinning flakes were identified in any of the Varangerfjord Gressbakken house lithic assemblages analyzed by Hood (1992: Appendix E), although a few were found in a small area between Houses 20 and 28 at Gressbakken Nedre Øst. This absence strongly suggests that point production occurred at other localities.

These other localities include several Early Metal Age habitation sites in the Finnmark interior and in neighboring Finland that contain high frequencies of bifacial projectile points of chert and quartzite; these are primarily of lanceolate or triangular form with straight or slightly concave bases (Hood & Olsen 1988:111; Rankama 1997:13; Simonsen 1963: 133). These sites suggest that significant reindeer hunting operations were undertaken in the interior. Hunting-pit systems, some of which have been dated to the Early Metal Age, are concentrated in the interior, although significant numbers of them also occur in the Varangerfjord-Tana River isthmus area, implying that seasonal hunting related to the spring/fall reindeer migrations could have occurred within a reasonable logistical distance of several Gressbakken house sites (Hood *forthcoming*; Myrvoll et al. 2011; Vorren 1998). Hunting-pits have not yet been registered on the Kola Peninsula. The higher frequency of bifacial points in the Drozdovka Bay sites might indicate more coast-based hunting of reindeer than in Finnmark. The frequency of reindeer bones in the Drozdovka House 5 and Mayak II faunal assemblages is consistent with this.

Early Metal Age asbestos-tempered ceramics and other types are very abundant on Kola sites (Shumkin 2001: 105), in stark contrast to the Norwegian coastal sites, where they are much rarer. The ceramics at Drozdovka Bay exhibit significant differences with Finnmark, instead displaying greater similarities with Karelian types to the south. Nevertheless, some ceramic types are present in both Drozdovka and Finnmark. In the Varangerfjord Gressbakken sites, fragments of one vessel of the Lovozero type was found between Gressbakken Houses 3 and 4 (Simonsen 1961: 344–345), only three sherds of undecorated asbestos ceramics were recovered from Bergeby House 18 (Schanche 1994: 28), while at Bugøyfjord House I there was one vessel of Textile ceramics and another undecorated asbestos-tempered vessel. Imitation Textile ceramics have recently been found in a house of indistinct form at Abelsborg on the north side of Varangerfjord, associated with several radiocarbon dates ranging ca. 2000–1700 BC (Oppvang 2018: 34–36, 40). Textile ceramics have also been found in non-Gressbakken house contexts in western Finnmark, where AMS dates on ceramic residue place the sherds later than the Gressbakken Phase: 1400–1200 BC (Oppvang 2009: 85). During the Gressbakken Phase, ceramics seem to be more common in certain inland sites (Hood & Olsen 1988: 112–113; Simonsen 1963: 93). Overall, it appears that ceramic production and use in household activities was more frequent on Kola than in coastal Finnmark.

The bone technology from Ust-Drozdovka III, House 5, Mayak II, Kola Oleneostrovskiy, and Kharlovka 1–6, bears strong resemblances to that known from the Finnmark Gressbakken sites (for a typo-chronological overview see Murashkin et al. 2019: 90). The similarities are particularly strong in the realm of resource procurement tools such as harpoons and fishhooks. Barbed non-toggling harpoons from Mayak II (Figure 8.3; Gurina 1997: Figure 36: 28, 29, Figure 40: 18–46), the Kola Oleneostrovskiy cemetery (Murashkin et al. 2016: Figure 5: 5–7, 18; Kolpakov et al. 2019: 414–415) and Kharlovka 1–6 (Kolpakov et al. 2021: Figure 8:1) are similar in overall form, and particularly in hafting configuration, to those from Gressbakken houses (Simonsen 1961: Figure 130: h, i, Figure 142: a–i, Figure 153: q). A few toggling harpoons are known from Mayak II (Figure 8.3; Gurina 1997: Figure 36: 18–20) and Kola Oleneostrovskiy (Murashkin et al. 2016: Figure 5: 8, 9; Kolpakov et al. 2019: 414). Two antler preforms for toggling harpoons were present at Gressbakken House 4 (Simonsen 1961: Figure 141: w, x). The fishhooks from Mayak II (Figure 8.3; Gurina 1997: Figure 40: 1–17) and Kola Oleneostrovskiy (Murashkin et al. 2016: Figure 5: 21, 22; Kolpakov et al. 2019: 416) exhibit variations in their basal form (curved/pointed, flat) and the configuration of their line attachment knob that are replicated in the Gressbakken house specimens (Simonsen 1961: Figure 130: a–g, Figure 141: m–q, Figure 153: m, Figure 154: m). Shumkin (2001:100) notes that the manufacturing sequence appears similar in the two areas.

Decorated bone combs are known from Ust-Drozdokva III, House 5 (Figures 6.19a and 6.20), and Mayak II (Figure 8.3; Gurina 1997: Figure 57: 1–4, 7). Broadly speaking, these consist of two variants: a long-handled version on a bone shaft and a compact decorated panel type. Both variants have counterparts at Gressbakken houses in Varangerfjord (Simonsen 1961: Figure 121: a, Figure 131: b–d, Figure 140: c–e, Figure 142: n–r, Figure 155: i). In particular, the fragmentary decorated panel variant with double "eyeholes" from House 5 (Figure 6.19a) is very similar to examples from Gressbakken Houses 3 and 4 that feature a motif of two opposed curved-neck birds (Simonsen 1961: Figure 131: c, Figure 140: e). Finally, the decorative patterns on bone tools from House 5 (Figure 6.19) and Mayak II (Figure 8.3; Gurina

1997: Figure 54), which consist of geometrically organized lines and sometimes small pricks, are remarkably similar to those on the Varangerfjord finds (e.g. Simonsen 1961: Figure 132: a–e, h, i, Figure 140: a–h).

In sum, during the Early Metal Age, eastern parts of Finnmark seem to have participated in several aspects of the lithic, ceramic and bone technological traditions that were found on the Kola Peninsula, but the elements of these traditions were not transmitted as a complete package. The similarities are greatest in the ground slate assemblages, the bone tools used for hunting and fishing as well as some other household implements, and in the decorative styles on bone artifacts. These are technologies that are easily replicated by simple copying. Clear differences are seen in the use of ceramic technology, which is less easily replicated because it requires considerable direct training. Two of the ceramic types known from Kola are present in coastal Finnmark (Lovozero, Imitation Textile), but it appears that ceramic production never became a regular household activity in Varangerfjord, and probably elsewhere in coastal Finnmark. Another major difference is the paucity of bifacial point technology in the Varangerfjord Gressbakken sites compared to its frequent presence in the Drozdovka Bay coastal sites. This contrast is explicable as reflecting different ways of organizing reindeer hunting; on Kola reindeer may have been accessed directly from the coastal settlements during the summer, but in the Varangerfjord area they may have been hunted from other sites within, or more likely outside, the logistical radius of the settlements.

Mortuary Behavior

So far, no cemeteries have been identified in northern Norway. Of course, that does not mean they are not there, simply that they have not yet been discovered. The locations of the Early Metal Age Kola Oleneostrovskiy cemetery and the Mesolithic Oleneostroskiy Mogilnik cemetery in Karelia (Gurina 1956) could suggest that such large mortuary sites might be found on small islands. What has been identified in Finnmark are rock cairns, mostly adjacent to Gressbakken houses, although not necessarily contemporary with them; only a few have been excavated (Henriksen 2003; Simonsen 1961; Torgersen, Getz and Simonsen 1959). Very little osteological material is preserved, and very few grave goods were deposited. A well-preserved inhumation of a single extended individual was found in a shell midden pre-dating the Gressbakken Phase, but with very few grave goods (2700 BC; Renouf 1989: 99–104). An infant was buried in a Gressbakken house floor (Torgersen, Getz and Simonsen 1959: 14). Isolated human bones are found occasionally in Gressbakken middens, but it is unclear how they came to be deposited there, as their taphonomic status has not been investigated.

Semisubterranean Houses Elsewhere in Northern Fennoscandia and Northwestern Russia

In recent years there has been increased focus on houses from the Stone Age and Early Metal Age in northern Fennoscandia, as large numbers have been registered in areas where previously few were known. A regional overview has been presented for northern Sweden (Norberg 2008), an overview for Finland as a whole has been compiled by Ranta (2002), and Mökkönen (2011) built the latter into a more comparative perspective. Specific regional studies are available from northern Finland (Ikäheimo 2002; Kankaanpää 2002; Núñez 2009; Pesonen 2002:15–17; Vaneeckhout 2010), but few detailed presentations of the original archaeological data are available. A considerable range of variation in form is known, hardly surprising given the size of the area and time spans represented in the publications.

Northern Finland

Along the Iijoki River in northern Finland, semisubterranean houses dating 3400–3000 BC have sparked particular interest. These dwellings are organized in rows and are connected by passages between them, so they have been referred to as “terrace houses" (Mökkönen 2008: 132). At the Voima-Kuusela locality there were seven such houses, at Purkajansuo/Korvala four, and other sites are known with three to five interconnected houses (Mökkönen 2008: 132–134). Few details of the excavated dwellings have been published, but one of the Korvala houses measured 7.4 by 6.6 m in size (Vaara 2000: 9). These houses are generally interpreted as square/rectangular buildings with low log walls and gabled roofs supported by central posts. Roofing consisting of poles and birch bark has been suggested, but turf and even sealskins have also been proposed (Leskinen 2002: 164; Vaara 2000: 9). Leskinen (2002: 165–168) refers to a "rectangular timber pit house tradition," which seems to be associated with boreal forest regions in the north.

Two excavated localities had dwellings that displayed morphological parallels with "Gressbakken" houses and were dated closer to the latter. A rectangular structure at Akanlahti, on the southern shore of the lake Yli-Kitka in southeastern Lapland, had a floor size of about 3.5 by 5.5 m, with two hearths along its central floor axis and possible entrances in its end-walls. Two radiocarbon dates from the house walls ranged from 2900–2300 BC (Pesonen 1996; 2006). A dwelling at Raahe had a rectangular floor area of 6.5 by 4.3 m that was excavated 40–50 cm below the modern ground surface, with a narrow and somewhat shallower entrance passage slanting into its eastern end-wall, and what appears to be a circular annex on its western end-wall. The annex was dug deeper than the house floor. A radiocarbon date of 3935±35 BP (2474–2345 BC, 68.3% prob.) is believed to date the dwelling (Pesonen 2013). Both of these dwellings therefore seem to slightly pre-date the Norwegian Gressbakken houses.

Northern Sweden

In northern Sweden, house-pits have been registered on raised shorelines dated to the Mesolithic period, but few have been excavated. They tend to be round/oval in form, although some are rectangular, and they are small, mostly under 10 m^2 (Norberg 2008: 77). Most of the investigated house-pits date to the Neolithic and Early Metal Age (see Norberg 2008 for an overview).

At the Vuollerim site in northern Sweden (Baudou 1995: 67; Loeffler 1999; Loeffler & Westfal 1985), a semisubterranean house dated to 4000 BC displayed some interesting attributes that are reminiscent of the ventilation channels associated with House 5A at Drozdovka. The Vuollerim house was rectangular, with an 11 by 5 m floor area and a 3 m long entrance passage on one end-wall. Two pits in the middle of the house floor were filled with heating rocks, as in a sauna. Adjacent to an end-wall was a hearth, from which a 50 cm wide "brown sooty" channel ran alongside the inner wall for 50 cm, then turned 90° eastwards, narrowing to 25 cm, then paralleled the entrance passage. This channel was interpreted as a "chimney" (Loeffler & Westfal 1985: 430).

Lillberget is a Neolithic locality associated with Comb ceramics similar to those from Finland, which has been dated to 3900–3500 BC (Halén 1994). Here there were nine or ten semisubterranean dwellings of square and rectangular forms. Five of them were arranged in a row with direct contact between their end-walls. In addition, there were two cases of two dwellings paired by end-wall contact. The features ranged in size in internal measurements from 3.5 by 3.5 m, to 8 by 6 m, and 11 by 5 m. The two excavated houses were 0.45 m deep, and they each had two hearth areas, positioned near the ends of the dwellings along their central axes (Halén 1994: 83–95). Halén (1994: 96–97) interpreted them as log-walled constructions with support posts and log ceiling beams, perhaps with birch bark on the roofs. The configuration of the site is similar to the Neolithic localities in northern Finland that were discussed above.

A more recently investigated dwelling site is Bjästamon (Holback 2007). There were two house phases here. The earlier dwelling from 2800–2400 BC was a shallow semisubterranean feature of roundish form, 5 by 4.6 m in size, apparently without a hearth. The primary dwelling, dated to 2400–2100 BC, was a "longhouse" measuring 24 m long and 6.5 m wide. The house consisted of three portions: living and storage areas at opposite ends, separated by a narrow 2 m wide entrance area in the middle. The living area was not semisubterranean but built on the ground surface. It was 10 by 5 m in size and bordered along its long sides with berms of sand mixed with fire-cracked rock and artifact debris. The excavators suggested a log-wall construction. Along the central axis of the floor were at least three hearths and three postholes. The storage area was 10 by 6.5 m and was partly semisubterranean. Adjacent to the mid-structure entrance was a large pit, 5 by 2 m in size and 0.6 m deep, interpreted as a storage facility. The roof of the dwelling may have been constructed of small poles and birch bark.

Holback (2007: 175) characterized the Bjästamon house as a culturally hybrid building. The living area had a construction similar to that known from Lillberget and the Finnish Comb Ceramic tradition, while the storage area resembled the south-Scandinavian Neolithic building tradition. Given the above-noted variation in dwelling forms, Mökkönen (2011: 30) suggested there were at least three different building traditions present during the north Swedish Neolithic.

Karelia, Russia

Better formal analogues for the Gressbakken houses can be found in Karelia, northwest Russia. At the Orovnavolok XVI site on Lake Onega in southern Karelia, House 1 was rectangular, 10 by 6 m in size, with passages at each end and double unframed hearths (Figure 9.3a). The two radiocarbon dates are contradictory; a charcoal sample from the northern hearth was dated to the Early Metal Age (3060±70 BP; 1411–1227 BC; 68.3% prob.), while another from a charcoal strip in the northwest corner of the dwelling was dated to the Neolithic (4200±20 BP; 2884–2707 BC; 68.3% prob.) (Kosmenko 1992: 69–71). The results might indicate reuse of the locality. House 2 at the same site was also rectangular and measured 10 by 7 m in size (Figure 9.3b). At one end an oval annex was connected to the house with a broad aperture, while at the opposite end a narrow constriction led to an elongated annex 7 by 2 m in size, which in turn seems to have been connected to another feature. There are two unframed hearth areas. This dwelling was dated to the Early Metal Age (3050±60 BP; 1399–1227 BC; 68.3% prob.) (Kosmenko 1992: 72–74). At Orovnavolok IX a sub-rectangular structure measuring 8 by 4 m in size, with end-passages and a mid-longwall passage, as well as traces of two unframed hearths, was dated to the Mesolithic (7720±100 BP; 6643–6464 BC, 68.3% prob.; Filatova 2004:104, 149–152). This dating seems suspect, however, as it is based on a single sample from a multi-component site. Most of the Karelian Mesolithic house-pits, which date 7300–6400 BC, are round/oval depressions ranging from 4–6 m in diameter (Filatova 2004; Kosmenko 1992: 58–60; Lobanova & Filatova 2015: 207, 270–289).

In northern Karelia, Sumozero XV is the best dated of all the Karelian houses; seven radiocarbon dates provide a summed probability of 2471–1956 BC (68.3% prob.). The dwelling is rectangular (Figure 9.3c), 6 m long and 4.5 m wide, and has “entrances” at each end-wall, one of which is straight and ca. 2 m long, while the other extends straight out for 1 m then bends almost 90° and continues another 2 m. The charred remains of birchbark and poles line both sides of the house floor (Zhul’nikov 2005: 24, 85–96, 163–172).

The Tunguda sites are also located in northern Karelia (Zhul’nikov 2005: 23, 58–84, 141–158). Tunguda III consists of a row of six houses, of which five resemble Gressbakken dwellings. Rectangular in form, they range in size from 7.5 to 10 m long, 4–8 m wide, and 0.4 to 0.8 m deep. All of the houses have two non-framed hearth areas located at opposite ends along the central axes of their floors, although one house also has a third centrally located hearth. All of the dwellings have “entrances” on their end-walls. At Houses 5 and 6 both entrances are straight and 2–3 m long. At House 1 (Figure 9.4d) both entrances are 2 m long, but one is straight while the other is slightly angled at its end. At House 4 both entrances are 2 m long, but one entrance is strongly angled at its end while the the other is only faintly angled. At House 3 (Figure 9.3e) one entrance is 1.5 m long with a short angle at the end, while the other is only 1 m long, but connects to a small annex 2 by 1.5 m in size.

At Tunguda XIV (Figure 9.3f) the house was rectangular, 9.5 m long, 5.5 m wide and 0.4 m deep, with “entrances” at both end-walls (Zhul’nikov 2005: 117, 152). Both entrances displayed a marked right-angle segment, although

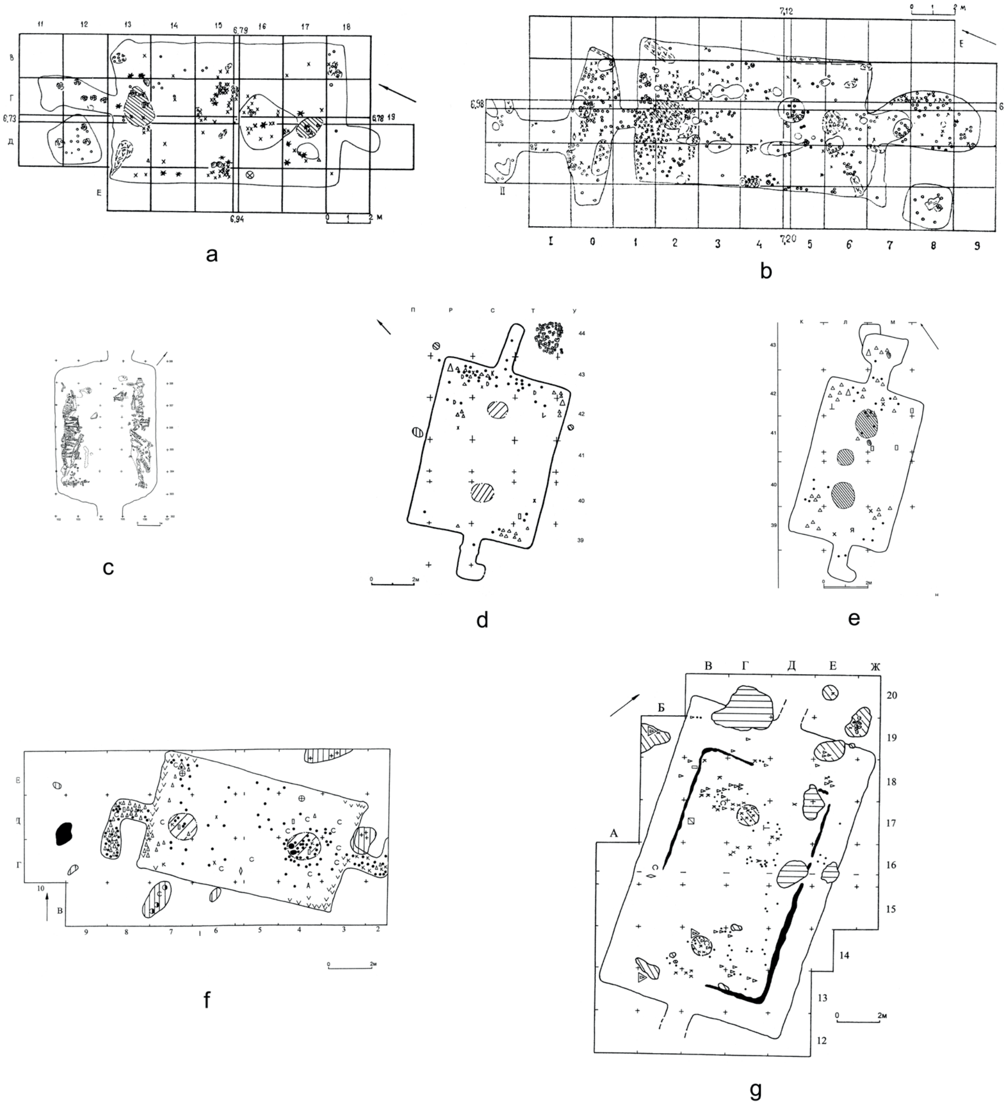


Figure 9.3. Variations in the form of Gressbakken-like houses in Karelia, Russia: a) Orovnavolok XVI, House 1; b) Orovnavolok XVI, House 2, c) Sumozero XV, d) Tunguda III, House 1; e) Tunguda III, House 3, f) Tunguda XIV, g) Tunguda XVII, Houses 2 and 3. In order of presentation, from: Kosmenko (1992: 70, 72), Zhul'nikov (2005: 164, 142, 144, 152, 157, 164). Reproduced with permission of the Karelian Academy of Science and A. M. Zhul'nikov.

pointing in opposite directions. Two hearths were located at opposite ends along the central axis of the house floor. The two radiocarbon dates from the house have probability sums in the range of 3080–2675 BC (68.3% prob.) (Zhul'nikov 2005: 23). The final example is from Houses 2 and 3 at the Tunguda XVII site (Figure 9.3g). Rectangular in form, House 2 measured 14 m long, 9 m wide and 0.6 m deep (Zhul'nikov 2005: 77–79, 117, 156–157). The "entrances" were located at the end-walls, but they were rather short, ca. 1.5 m. On the floor of the house pit was a partial rectangle of black sand measuring 10.5 m long by 6 m wide. This feature – House 3 – indicated House 2 was re-used later by the excavation of a slightly smaller structure into the previous house floor. Two hearths were located at opposite ends along the central axis of the house floor. A radiocarbon date associated with House 2 calibrates to 3088–2907 BC (68.3% prob.), while the intrusive House 3 was dated to 2472–2297 BC (68.3% prob.) (Zhul'nikov 2005: 23).

These examples from Karelia show clear similarities in basic dwelling form and hearth placement, although there is considerable variation in house size. The "entrances" consistently are placed at the end-walls, but they vary in form: straight, right-angled, and annex-associated. If we can rely on the few radiocarbon dates, then this house style began in Karelia as early as 3000 BC, 700 years earlier than the Gressbakken houses appear in Varangerfjord. According to Norberg (2008: 146), semisubterranean houses went out of use in Karelia after 1300 BC, presumably replaced by accommodations compatible with a more mobile lifestyle.

Moving further afield, the Mezen River district of the Komi Republic, east of the White Sea, lies ca. 700 km southeast of Drozdovka. Here, archaeologists have excavated semisubterranean houses that bear a resemblance to Gressbakken forms. Stokolos (1986; 1988) illustrates several dwellings with end-apertures and sometimes double hearths; Figure 9.4 provides some examples of these. The dwellings are all rectangular, ranging in size from 6–8 m long and 4–5 m wide. Five of the six dwellings illustrated by Stokolos have end-apertures, while the sixth does not. Four have double hearths, although these are pits without stone frames. One house has a pile of rocks adjacent to one hearth pit, presumably for heating. One dwelling has a narrow channel extending from one corner (Figure 9.4f), perhaps related to ventilation.

The dating of the Mezen houses is mostly based on ceramic typology, with Stokolos (1988: 199) placing the dwellings from ca. 3500 BC to perhaps the end of the second millennium BC (see also Karmanov 2017). A few radiocarbon dates are available, but as discussed by Karmanov (2018: 122–124), their contextual associations are in some cases uncertain. None of the houses illustrated by Stokolos (1986) and shown in Figure 9.4 have been radiocarbon dated, but a few non-illustrated features do have dates. Based on Karmanov's (2018) presentation, it seems the most reliable dates range 3600–2900 BC. According to Karmanov (2017: 31, 33), some of the apertures that Stokolos regarded as entrances may instead be related to the heating/ventilation systems of the dwellings, and this seems to be a new and distinctive housing attribute that was introduced to the Mezen area at this time in association with a non-local ceramic tradition. Assuming these radiocarbon dates are reasonable, the Mezen houses would clearly pre-date both the Karelian Neolithic houses and the Early Metal Age Gressbakken dwellings on Kola and in Finnmark.

Integration

The Gressbakken houses of the Kola Peninsula and eastern Finnmark bear a strong family resemblance to a dwelling construction tradition that may extend back to the Karelian Neolithic at about 3000 BC and perhaps earlier in the Mezen region. During the Early Metal Age, the housing tradition extended throughout the Subarctic region from northern Norway to east of the White Sea. This technological tradition crosscuts a wide variety of local cultural traditions defined by variations in other forms of material culture (lithics, ceramics). Understanding the development of the dwelling form therefore requires a large-scale geographical view.

One point to consider, however, is that for the more southerly regions surveyed here, the

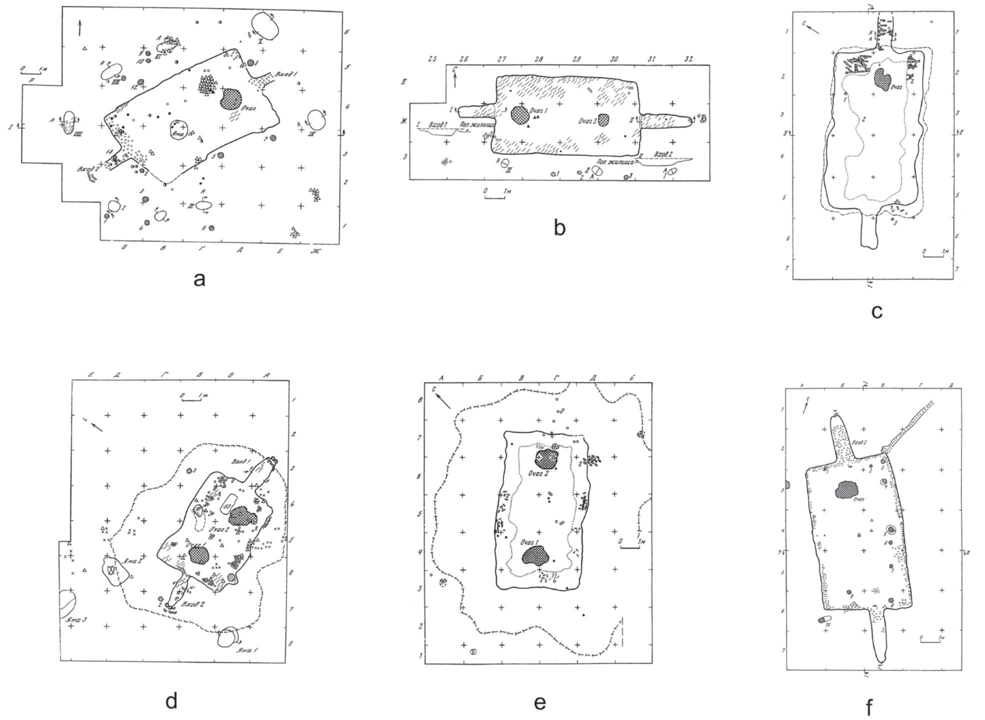


Figure 9.4. Variations in the form of Gressbakken-like houses in the Mezen River region, Komi Republic, Russia: a) Choynovty II, House 2, b) Choynovty II, House 3, c) Choynovty II, House 10, d) Choynovty II, House 11, e) Choynovty II, House 13, f) Chuzh'yayel' II. Reproduced from Stokolos (1986: 120, 124, 137, 142, 150, 163), with permission of the Komi Republic Academy of Science.

houses were all located within the boreal pine forest zone, which provides abundant construction materials for log dwellings, thus facilitating what Leskinen (2002: 165–168) called a "rectangular timber pit house tradition." However, during the Early Metal Age the Kola coast faced a very different vegetation situation. Although pine trees reached the Kola coast during the period 7000–6000 BP (6000–4800 BC), after 6000 BP (4800 BC) pine gradually retreated towards the interior, reaching its present position about 3000 BP (1200 BC) (Gervais et al. 2002). The local Drozdovka Bay pollen core taken at Soldatskoye Lake (see Vuorela et al. in Appendix 1) indicates increased influx of both birch and pine pollen at about 3700 uncal. BP (2000 BC), after which both taper off substantially. However, the pine influx values at this time are at most 800 grains cm-2/year, which according to Hicks' (2001:16) guidelines suggest only a sparse presence of pine at best, and the subsequent lower influx values indicate no trees within 1 km. Given that the calibrated dates for Drozdovka House 5A and 5B range from 2100 to 1500 BC, it would seem likely there was not an abundance of locally growing pine available for construction at that time. On the other hand, suitable logs might have been available as driftwood. Consequently, despite similarities in basic plan, the Kola coast houses might have required somewhat different construction techniques than their forest zone counterparts.

On the Finnmark coast, pollen data indicate there was a mixed birch-pine forest in the inner Varangerfjord area from 7500 to 1600 BC, with a pine reduction occurring from 1600 to 1000 BC, although pine trees may have been present in some places until ca. 100 BC (Hyvärinen 1975; 1976; Høeg 2000: 82, 91; Sjögren & Damm 2019).

At inner Altafjord, pine forest was present from ca. 6400 BC, and has continued until today (Hyvärinen 1985; Høeg 2000: 73–77). Thus, during the period when Gressbakken houses were used, pine trees probably were available as construction material in most of the sheltered inner fjord areas of Finnmark. However, on the outer parts of the Finnmark coast there probably were no pine trees, and after ca. 2200 BC the birch forest may have become sparser (Allen et al. 2007: 1438–1439; Jensen & Elverland 2009; Seppä 1996: 46–47). Consequently, Gressbakken houses in Finnmark would have required varying local adaptations to the available construction materials, which might have affected the realized form of a dwelling.

Demography and Climate Change

The large corpus of archaeological radiocarbon dates available from northern Norway has recently been analyzed using the sum of probability distributions method (SPD), which uses radiocarbon dates as a proxy for human population. Three periods with probability peaks were identified and each was interpreted as indicating a significant human demographic increase followed by a collapse (E. K. Jørgensen 2020: 43–44, 46). One of these peaks occurred between 2100 and 1500 BC, which corresponds to the Gressbakken Phase. There are hints of high amplitude but short-term changes in climatic conditions between 2300 and 1500 BC that constitute a relevant context for this demographic inference. Rapid shifts between warmer and colder atmospheric temperature have been noted in several types of north Fennoscandian proxy data: dendroclimatological (Grudd et al. 2002; Helama et al. 2002), lacustrine chironomids (Seppä et al. 2002), pollen (Seppä & Birks 2001, 2002) and speleothem ^{18}O (Lauritzen & Lundberg 1999). Changes in north Norwegian glacial activity also point in this direction (Wittmeier et al. 2015: 91). Centennial-scale changes in sea surface temperatures are more difficult to monitor because of limits on the chronological resolution of marine cores and because the data from cores taken in varying coastal and deep-sea locations reflect their different contexts relative to ocean circulation patterns (e.g. Chistyakova et al. 2010; Groot et al. 2014; Husum & Hald 2004; Risebrobakken et al. 2010).

The chronological patterns of these various climate proxies are not entirely consistent with each other, but the Gressbakken Phase seems to begin during a warm episode ca. 2300–2200 BC and then declines during a sharp cooling ca. 1600–1500 BC (E. K. Jørgensen 2020: 44, 46). The δ^{13}C data from one western Barents Sea marine core (Berben et al. 2014: 189) suggest that primary productivity increased from 2300 BC, reached a peak about 1800 BC, then crashed after 1700–1600 BC. Thus, the Gressbakken Phase may have emerged during a period of enhanced marine biological productivity and ended when that productivity dropped precipitously. Perhaps this is cherry-picking one core from a multitude, but E. K. Jørgensen (2020: 43) noted strong correlations between all three demographic peaks in the west Finnmark Stone Age SPD and sea-surface temperature data from an inner coastal core. What does seem incontrovertible, however, is that the inferred demographic crash occurs at the same time as an extended period of cold temperatures is recorded in the north Finnish dendroclimatological data (Helama et al. 2002: 683–686). Jørgensen & Riede (2019) relate the dramatic cooling to a series of volcanic events and suggest that the cold trend, along with the convergence of other environmental stressors, led to a demographic crash and the reorganization of Gressbakken settlement patterns towards greater mobility. However, we cannot be certain that the crash side of the SPD is fully representative of archaeological reality. We know there are substantial house-pit sites from the post-Gressbakken period in eastern Finnmark (1500–1000 BC), but they are extremely under-investigated.

If the emergence and decline of the Gressbakken "phenomenon" was at least partly related to changes in marine bioproductivity, then we need to understand the linkages between marine ecosystems and human adaptive responses. It is well-established that warmer water temperatures in the northeast Atlantic and the Barents Sea are linked to higher fish population recruitment and growth rates, as well as changing spatial distributions of species (Bogstad et al. 2013;

Hop & Gjøsæter 2013; Ingvaldsen & Gjøsæter 2013; Klyashtorin et al. 2009; Sætersdal & Loeng 1987). Enhanced fish populations are then linked to the increased populations of their predators: sea mammals, birds, and humans. Conversely, when key marine species such as capelin collapse – due to decreased water temperatures or density dependent reductions – the populations of their predators (cod, birds, harp seals) are also negatively affected (Gjøsæter et al. 2009; Ingvaldsen & Gjøsæter 2013). However, when capelin populations in the southeastern Barents Sea are reduced by cold water conditions, the Norwegian coast of Finnmark is subjected to major invasions of harp seals searching for food (Haug & Nilssen 1995b: 554–555). Given that the archaeological faunal remains show a heavy dependence on cod and harp seals during the Gressbakken Phase – both on Kola and in Finnmark – these kinds of climate-related changes in marine ecosystems need to be considered when explaining the cultural dynamics of the phase.

This general view needs to be tempered by recognition that the effects of such climate-linked changes in marine bioproductivity may have varied regionally. The Atlantic coast area of western Finnmark is directly exposed to the ingress of warm Atlantic waters and is ice-free year-round. The eastern part of the Kola peninsula, where Drozdovka Bay is located, lies at the terminus of the Atlantic waters and not far from where the polar sea-ice forms near the mouth of the White Sea. Thus, each end of the long east-west coastal chain of human populations would have been subject to different kinds of ecological opportunities, pressures and dynamics.

Social Networks and Cultural Change

The high degree of similarity in material culture and social practices between the eastern Kola coast and Finnmark indicate that the entire coastal region was a closely interlinked cultural system during the beginning of the Early Metal Age. The same could probably be said of other periods in the region's prehistory, but it is at this time that changes in house form as well as lithic and ceramic assemblages suggest that something affected coastal societies almost simultaneously over a large geographical area. In Finnmark, ceramics (asbestos-tempered) and bifacial lithic technology reappeared after a nearly 2500-year absence; on Kola, both technologies were present throughout the Neolithic. The distinctive dwelling attribute of "entrances" or ventilation constructions on house end-walls seems to have an early appearance ca. 3600–2900 BC far to the southeast of Kola in the modern Komi Republic area. Their appearance in Karelia could date as early as 3000 BC, and they could be as early as 2500 BC in northern Finland. The recent dating results from the Kharlovka site, not far from Drozdovka Bay, suggest these house attributes were present on Kola by 2600–2300 BC, but the bulk of the Kola and Finnmark dates are younger than 2300 BC. Thus, the period of 2300–2000 BC seems to have been characterized by a westward extension of social networks that resulted in the transfer of several new technological traditions to Finnmark.

In addition to these seemingly mundane technologies, there is also evidence that exchange systems for circulating metals (copper/bronze) utilized some of the same social networks. In this case, finished artifacts, raw materials, and knowledge of production techniques were transferred to Kola from the Volga and Ural regions to the south and east. Ust-Drozdovka III, House 5, produced a fragment of a bronze brooch. At Kharlovka 1–6, dated slightly earlier at 2600–2300 BC, the excavators found a bead made of a rolled sheet of copper and an amber pendant, as well as an antler object with indications of planing by a metal tool (Kolpakov et al. 2021: 34–35). A soapstone mould for a bronze axe was found at Mayak II (Figure 8.4; Gurina 1997: Figure 35: 1). At the Kola Oleneostrovskiy cemetery, dated to the post-Gressbakken time period (1500–800 BC), there was a ceramic crucible with bronze traces, a bronze arrowhead/dagger and a bronze plate (Kolpakov et al. 2019: 66, 159, 330, 348–349). The evidence for metallurgy in Finnmark during the beginning of the Early Metal Age is more limited: two pieces of copper and two soapstone moulds (Olsen 1994: 125–126).

One might speculate that some aspects of maritime hunting intensification along the Kola and Norwegian coasts could have been related to participation in metal exchange networks. For example, as illustrated by the faunal remains from Mayak II, walrus tusks may have been acquired and processed for use in metal exchange. In eastern Finnmark, a single decorated walrus ivory object of uncertain function was recovered from a Gressbakken midden in Varangerfjord (Schanche 1994: 28–29, 193–195).

Given the transfers of both materials and information along the Kola-Varanger coast, it should be no surprise if there were also movements of personnel. Population dispersals are a theme that has been avoided in north Norwegian archaeology since the 1980s, but it is difficult to conceive of certain types of knowledge and practices having been transferred independent of people. For example, ceramic technology cannot be replicated easily by imitation, so an argument can be made that some degree of personnel movement was involved in the re-introduction of that technology to Finnmark after 1900 BC in the form of Lovozero Ware and later Imitation Textile ceramics, as suggested by Jørgensen et al. (2023). Analyses of aDNA from individuals at the Kola Oleneostrovskiy cemetery point to the presence of haplotypes related to western Siberian populations (der Sarkissian et al. 2013), implying some degree of cross-continent demic diffusion. The long stretch of coastline from the White Sea to southeastern Varangerfjord presents a continuous low-relief Precambrian landscape/seascape and marine ecosystems that would have appeared rather familiar to anyone moving through the environment, so there were few natural or landscape knowledge barriers to limit east-west population movements. Whether there were cultural mechanisms that sometimes inhibited such movement is a question for future research.

Conclusion

The emergence and demise of the "Gressbakken Phase" is one of the fascinating questions of north Fennoscandian and northwest Russian archaeology. We are beginning to map the contours of both social and environmental changes along the coasts of the Kola Peninsula and northern Norway. Major gaps remain in our archaeological understanding of house forms, settlement size (house contemporaneity), subsistence variability, coast-interior interactions, mortuary variability, and the nature of social networks. Hopefully, continued cooperation between Norwegian and Russian archaeologists will gradually fill in the gaping holes in our knowledge.

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Appendix 1

Holocene Pollen Diagram from Lake Soldatskoye, Drozdovka Bay, Northern Kola Peninsula, Russia: Vegetation History, Tree Line Fluctuation and Consideration of Settlement Indicators

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Abstract

The Lake Soldatskoye (Soldier's Lake, 68°16'N lat. and 38°28'E) pollen record from the Drozdovka Bay area on the north coast of the Kola Peninsula covers nearly the entire Holocene, i.e. 11,500 cal years BP. It is situated at the Barents Sea coast some 70 km north of the spruce forest limit, with isolated stands of mountain birch (*Betula pubescens* ssp. *czerepanovii*). The pollen stratigraphy starts with abundant pollen characteristics of open mineral soil including Cyperaceae, Lamiaceae, *Artemisia*, Chenopodiaceae, Rosaceae, Ericaceae and *Salix*. The proportion of *Betula* already begins rising by at least 10,900 cal. BP and around 9500 cal. BP the tree pollen accounts for more than 80% of the total pollen sum. Pollen influx values show the expansion of birch and alder to the area at ca. 9500 cal. BP. By that time *Pinus* pollen values have increased to ca. 20% of total pollen, thereafter varying between 20 and 35% up to the present day, being highest between ca. 6900 and 1400 cal. BP. The influx values for *Pinus* are highest between 8900 and 4500 cal. BP and for *Picea* between 5800 and 2000 cal. BP. All *Pinus* pollen is long distance in origin, and it is suggested that the pattern of air transportation has been stable since at least 9500 cal. BP. A continuous *Picea* pollen curve starts ca. 7800 cal. BP but spruce never reached the Drozdovka Bay area. The present northern limit of grey alder (*Alnus incana*) is more than one hundred kilometres south of the site. No fossil conifers were found in the Drozdovka area despite intensive search. The Holocene climate optimum peaked ca. 7000 cal. BP when the cooling trend towards the present commenced, intensifying ca. 3500 cal. BP.

A slight anthropogenic influence on the vegetation can be suggested for three time periods, all indicated by increasing frequencies of *Isoëtes*: 6800–4500 cal. BP (4900–2550 cal BC), 3850–1650 cal. BP (1800 BC–AD 300) and from ca. 1400 cal. BP (AD 530) until close to the present day. The earliest period also shows changes in the herb pollen taxa, and the second and third periods increasing pollen of e.g. *Rumex*, *Urtica*, *Melampyrum* and *Artemisia*. The suggested settlement periods are broadly in accordance with abundant archaeological discoveries within the area.

Introduction

The Drozdovka Bay area on the north coast of the Kola Peninsula and about 200 km east of Murmansk is known for numerous prehistoric dwelling sites and rich discoveries have been made there (Helskog et al., this volume; Gurina 1987; 1997; Shumkin 2014: 32–33). Considerable new material has accumulated in recent years and Drozdovka Bay is now a key area in the Holocene prehistory of the Kola Peninsula. Consequently, the main aim of the present palaeoecological study, in addition to determining the Holocene vegetation history, was to search for anthropogenic indicators in a pollen diagram from a tundra site which has witnessed in its vicinity an obviously more or less continuous human occupation of varying intensity throughout the Holocene. The present pollen diagram from Lake Soldatskoye, south of Drozdovka Bay (Figures A1.1 and A1.2) covers nearly the entire time span of the Holocene, i.e., 10,000 radiocarbon years (11,500 calendar years), and contributes to the vegetation history of the northern and northeastern Kola where only limited pollen data have been available. The coring was performed in connection with a Russian-Norwegian-Finnish archaeological expedition in 1994 which began excavations at an Early Metal Age dwelling site immediately south of Drozdovka Bay. Preliminary results from the Lake Soldatskoye pollen study site have earlier been presented only orally (Saarnisto & Vuorela 1998). So far, the probable prehistoric settlement indicators have not been dealt with in any available pollen studies on the Kola Peninsula, but the Lake Soldatskoye sediment cores were also sub-

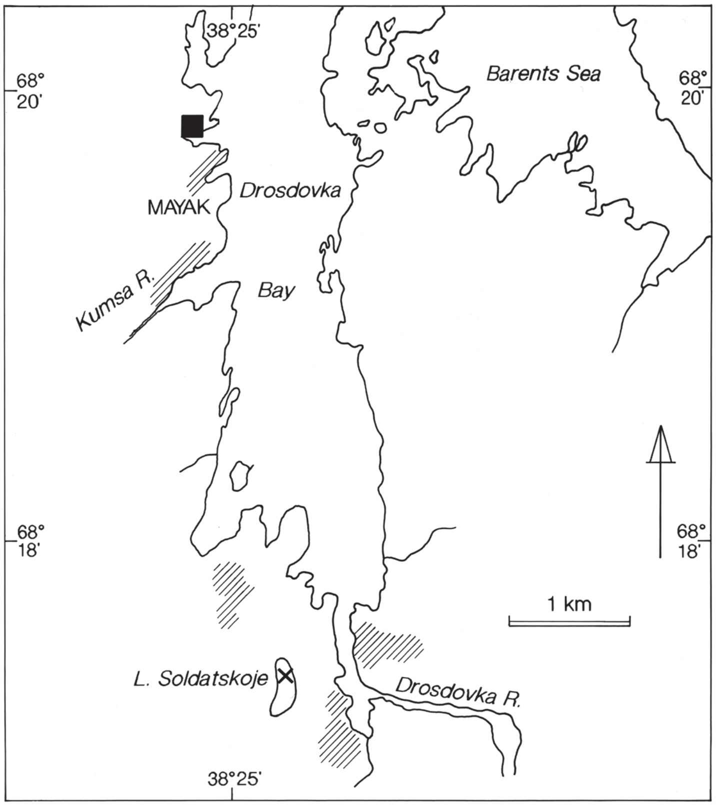


Figure A1.1. Location of Lake Soldatskoye south of Drozdovka Bay and relative to archaeological sites spanning from the late Mesolithic to the present day. The investigated areas are shaded but they cover only part of the area where former human occupation is evident. The investigated sites closest to the lake include late Mesolithic, Neolithic, Early Metal Age and probably later components (see Chapter 3, this volume).

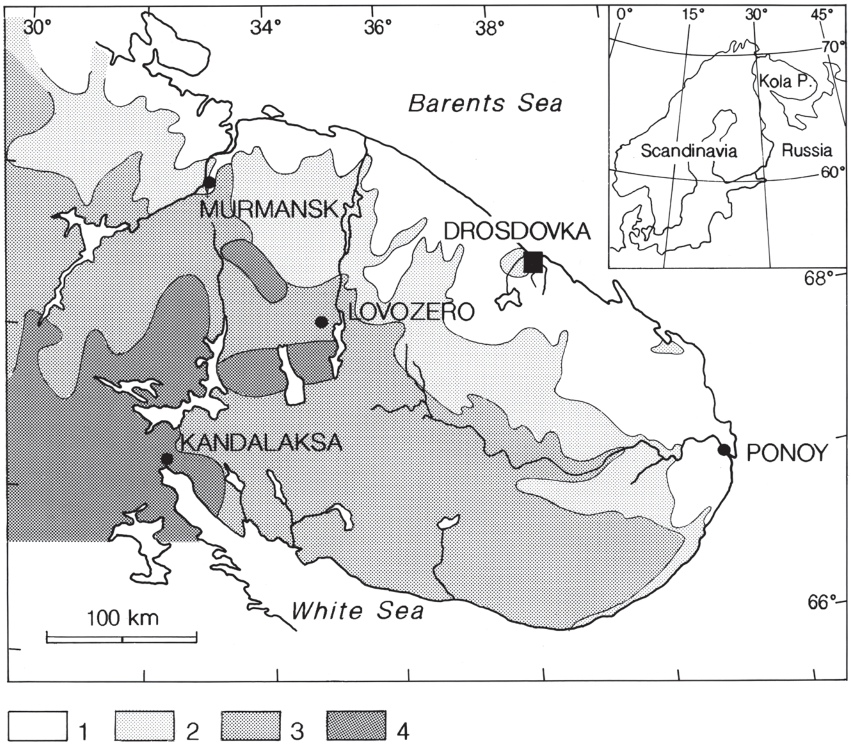


Figure A1.2. Location of Lake Soldatskoye on the north coast of the Kola Peninsula, in relation to the major vegetation zones of the region (Flora Murmansk Oblast 1953). 1. = tundra, 2 = birch-dominated forest tundra, 3 = boreal forest, 4 = mountain regions with boreal forest.

mitted to a detailed diatom analysis (Grönlund & Kauppila 2002), which contributes to the discussion on anthropogenic impact on a tundra lake.

There has recently been a rapid increase in Holocene pollen data from the Kola Peninsula. Most of the new data comes from the western and southern parts of Kola and represent the period from the middle Holocene to the present, i.e., from approximately 7500 BP (8300 cal. BP) (Kremenetski et al. 1997; 1999). Two dated pollen diagrams from southeastern Kola cover the entire Holocene (Kremenetski & Patyk Kara 1997). They are of particular importance when considering the immigration of trees to Kola. One pollen diagram from the northwestern coastal area spans the entire Holocene from the Younger Dryas time (Snyder et al. 2000). Pollen diagrams are lacking from the eastern and northern coastal areas of Kola, but much modern information on pollen influx relevant to the tree line fluctuation is available from Holocene sequences from western and northwestern Kola, west of the Drozdovka Bay (Gervais et al. 2002; Kremenetski et al. 2004; MacDonald et al. 2000; 2008; Wolfe et al. 2003). Recent and sub-recent influx values from western Kola have been available for some time following the classical pioneering work of Aario (1940; 1943). For comparison, extensive pollen data covering the Late Weichselian and Holocene and including abundant pollen accumulation rate (PAR) information are available west of Kola in northern Finland and in the Varanger Peninsula area of northern Norway (e.g., Hyvärinen 1975; 1976; Prentice 1981; 1982). The comparison between the Kola pollen data and that from northern Finland and Norway is of particular interest because in eastern Kola the northern conifer limit is composed of pure spruce forest whereas further west, north of the spruce tree limit, pine forms virtually mono species forests. Northern Fennoscandia, including Kola, is crossed by several northern tree limits (Figure A1.2) and vegetation zones which are also very sensitive to climate changes.

Vegetation and Climate

Lake Soldatskoye is situated within a sparse mountain birch forest surrounded by extensive areas of barren tundra of the Barents Sea coast. The shores of Lake Soldatskoye partly support mountain birch (*Betula pubescens* spp. *czerepanovii*; Flora Murmanskoy oblasti 1953–1966) (Figure A1.3), but the gravelly soil is mostly covered by shrubs (e.g., *Salix glauca* L. and *S. phylicifolia* L.), dwarf-shrubs (e.g., *Empetrum nigrum* L., *Loiseleuria procumbens* L.), and open grass vegetation (Figure A1.4). One remarkable feature in the current vegetation is the abundance of *Veratrum album* on the shores of Lake Soldatskoye. A hummocky *palsa* bog with *Rubus chamaemorus* covers the area north of the lake (Figure A1.5). Outside the Drozdovka valley the terrain consists of barren bedrock over wide areas (Figure A1.6). The spruce (*Picea abies* ssp. *obovata* Ledeb.) limit is 70 km to the south. Despite intensive search in numerous shallow lakes and ponds in the vicinity, no fossil trees were found. The northern limit of *Alnus incana* L. runs approximately 100 km south of Lake Soldatskoye (Kremenetski et al. 1997).

According to Hultén (1971) and Flora Murmanskoy oblasti (1953–1966), typical grasses of the northern coast of the Kola Peninsula are *Poa alpigena* (Fries) Lindman, *P. annua* L., *P. arctica*, R.Br. *Festuca ovina* L., *F. rubra* L., *Deschampsia flexuosa* (L) Trin., *D. cespitosa* (L.), *Anthoxanthum odoratum* (L.), *Agrostis mertensii* Trin., *Calamagrostis stricta* (Timm.), and *C. purpurea* (Trin.). Common among the Cyperaceae growing in the area are, e.g. *Carex rostrata* Stokes, *C. vaginata* Tausch, *C. magellanica* Lam, *C. Bigelowii* Torrey ex Schweinitz, *C. aquatilis* Wahlenb., *C. nigra* subsp. *juncella*, and *C. canescens* L. and among herbs, e.g. *Potentilla palustris* L., *Cornus suecica* L., *Chrysanthemum vulgaris* L., *Alpina genuina* L., *Solidago virgaurea* L., *Trientalis europaea* L., *Melampyrum pratense* L., and *Vicia cracca* L.

The climate is relatively oceanic and affected by the Gulf Stream (Atlas Murmanskoy oblast 1971), the eastern branch of which, north of Drozdovka Bay, turns towards Novaya Zemlya.

Figure A1.3. Lake Soldatskoye as seen looking towards Drozdovka Bay to the north. Mountain birch surrounds the lake shore in places, dwarf birch extensively covers coarse mineral soil, and barren gravel and sand is exposed on the terrace. Photo: Matti Saarnisto.

Mean temperatures vary between +9 C (July) and -8 °C (January). Prevailing winds on the Kola Peninsula are strongly affected by the Arctic coast. In July, high pressure north of the peninsula causes northerly and northeasterly winds to blow towards Karelia and Scandinavia. In the Baltic Sea area these winds meet southeasterly winds coming from the Atlantic Ocean and passing over western Europe. In mid-winter, prevailing southwesterly winds from the northern Atlantic Ocean penetrate through Fennoscandia all the way to the Arctic Ocean.

Figure A1.4. The coarse gravel of the terrace in the surrounding of Lake Soldatskoye is exposed in several places where the thin vegetation cover has been eroded due to human activity and/or reindeer presence. Photo: Matti Saarnisto.

Figure A1.5. A hummocky palsa bog is situated immediately north of Lake Soldatskoye. Reindeer moss covers the frozen hummocks and *Rubus chamaemorus*, *Salix* sp. and *Betula nana* grow extensively on *Sphagnum* mosses. The pools support dense sedge vegetation. Photo: Matti Saarnisto.

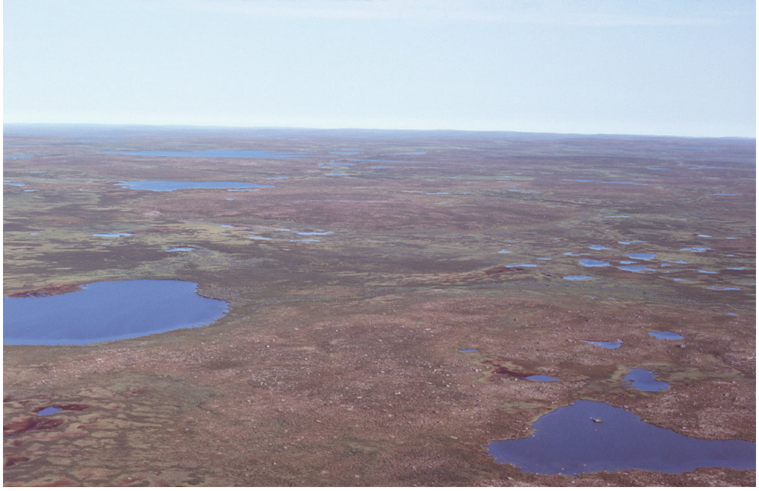


Figure A1.6. The almost barren tundra east of Drozdovka Bay. The widely exposed bedrock is covered by boulders and the depressions by lakes or thin layers of peat and mire vegetation. Photo: Matti Saarnisto.

Archaeological Setting

The Arctic Ocean coast of northern Fennoscandia has been inhabited since the Early Holocene. On the coast of Finnmark in Norway, the oldest radiocarbon dated Mesolithic sites are found in Varangerfjord, with dates ranging 11,600–10,700 cal. BP (9650–8750 BC) (Kleppe 2014; 2018). These and other Preboreal chronozone sites appear to be traces of a technological tradition that colonized northwards along the western coast of Norway. A different technological tradition is represented at the interior Sujala site in northern Finland, dated 10,600–9700 cal. BP (8650–7750 BC), as well as at some coastal localities in Varangerfjord (Rankama & Kankaanpää 2011). This tradition is believed to have colonized the region from the east or southeast. On the Kola Peninsula, over 80 Mesolithic sites are known (Gurina 1987; 1997; Shumkin 1986; 1990); the typologically oldest sites are located on the coast, but no radiocarbon dates are available. Many of the sites are similar to the western technological tradition known in Norway, but recently discovered localities on Kildin Island display typological affinities with the eastern tradition (Murashkin & Kolpakov 2019). The Drozdovka Bay area has hosted intensive settlement since the Mesolithic and rich discoveries have been made in systematic investigations since 1973 (Shumkin 2014: 32–33; personal communication). Several important Neolithic sites have been excavated, including Mayak II (radiocarbon dates ranging from 4690–2340 BC) and Ust-Drozdovka I (dated 4460–4250 BC) and also open sites and house pits from the Early Metal Age, such as Mayak II (dated 1670–1530 BC) and Ust-Drozdovka III (dated 2300–1500 BC) (Gurina 1997: 138; Helskog et al. this volume).

In the vicinity of Lake Soldatskoye there are abundant signs of prehistoric to recent human presence, but few of the sites have been archaeologically investigated. Several Mesolithic localities are situated north of the lake (Figure A1.1; Shumkin, personal communication 1995) and ruins of the foundations of a sub-recent house are situated immediately east of the lake. The 1990s archaeological excavations of Early Metal Age house pits were conducted ca. 0.5 kilometres to the east, on the eastern shore of the Drozdovka River (Figures A1.1 and A1.7).

Material and Methods

Coring site and cores

Lake Soldatskoye (68°16'N lat. and 38°28'E) is an oligotrophic-eutrophic clear-water lake situated at the mouth of the Drozdovka River, less than 1 km from the shore of Drozdovka Bay and 8–9 km south of the outer coast on the Barents Sea. The area was deglaciated during the Late Pleistocene/ early Holocene transition, ca. 10,000 BP (11,500 cal. BP) (Kagan et al. 1992; Yevzerov & Kolka 1993). Since the deglaciation no major changes have taken place in the landscape as the highest lateglacial Arctic Sea shoreline is only 22 m above the present sea level. Lake Soldatskoye is the central one of three small lakes ca. 200 metres west of the mouth of the Drozdovka River. The lake measures ca. 100 x 400 metres, its surface is 15.4 m above the mean sea level (the *Balanus* limit) and 7.5 m below the terrace level at 22.9 m. This is nearly the same as the level of the glaciofluvial delta at the mouth of the Kumzha River at 22.6 m, two kilometres further north. These levels indicate the highest local late-glacial marine limit at approximately 11,500 cal. BP at the end of the Younger Dryas cold stage.

As noted previously, the lake lies within the mountain birch tundra, characterized by discontinuous stands of healthy mountain birch (*Betula pubescens* ssp. *czerepanovii*; Flora Murmanskoy oblasti 1953–1966), while most of the area outside the river valley consists of barren bedrock.

The sediment cores from Lake Soldatskoye were taken in August 1994 using a 50 mm diameter piston corer with a 90 cm core length. The cores were extruded on the lake shore. The coring site was 150 m from the north shore and 30 metres from the west shore where the water depth is 2 m, a common depth in a lake which has abundant submerged aquatic vegetation.

Coring was performed from a rubber boat anchored by ropes to both shores (Figure A1.8). The subsequent cores could therefore be accurately located but difficulties arose in the accurate recording of coring depths in cases when the pis-

Figure A1.7. Southward view of the southern end of Drozdovka Bay. The inlet at the center is the outlet of the Drozdovka River (barely visible to the left). The arrow on the left marks the location of the Ust-Drozdovka III archaeological site, while the arrow on the right indicates Lake Soldatskoye. Photo: Knut Helskog.

ton rod could not be properly anchored against the boat edge. This became apparent in the radiocarbon-dated sediment age/depth curve, which showed unreasonable fluctuation at the depth of ca. 400 cm (Figure A1.9). Two controlling radiocarbon analyses (Su-2829 and Su-2830) confirm this and show that the correct depth of core 3 was 20 cm deeper than that recorded in the field. Fortunately, in the pollen curves no major fluctuations take place between 375 and 410 cm, which is the interval of cores 2 and 4. In calculating the sediment accumulation rates the radiocarbon date of core 3 (Su-2599) has been omitted.

Twelve samples from the sediment cores were dated in the radiocarbon laboratory of the Geological Survey of Finland. Details of the dated levels are given in Table A1.1. The oldest radiocarbon date of 9650±50 BP (Su-2533) from the lowermost organic sediment, which was composed of coarse organic detritus, was determined from a duplicate core where coarse sand and gravel was retained below the bottommost organic layer. This minerogenic sediment was lost from the other core but a correlation between cores could be accurately made on the basis of lithostratigraphy and loss on ignition analysis. Conventional radiocarbon dates BP are used, but when appropriate in comparison, calibrated dates (cal. BP) are also given.

It was not possible to penetrate the core through the gravel layer to possible finer minerogenic marine sediments below. The lowermost coarse detritus gyttja was identified as having been deposited in a freshwater basin on the basis of diatoms (Grönlund & Kauppila 2002). The bottommost date is reasonable when considering the late-glacial age, i.e. ca. 11,500 cal. BP, of the terrace where the lake is situated.

Lithostratigraphy of the cores

The lithostratigraphy of the coring site where the water depth was 200 cm is as follows. The coring stopped in organic-bearing sand at a depth of 610 cm. Loss on ignition (LOI; Figure A1.10), determined at 550°C, rises in grey brown sandy gyttja from 8% at 600 cm to 15% at 595 cm, where a gradual change to brown organic gyttja takes place. The bottommost gyttja is mixed with

Figure A1.8. The rubber boat used in coring operations was anchored by a rope from shore to shore. The piston rod of the corer was anchored in the device on the left end of the boat. Looking towards the east across Lake Soldatskoye. Photo: Matti Saarnisto.

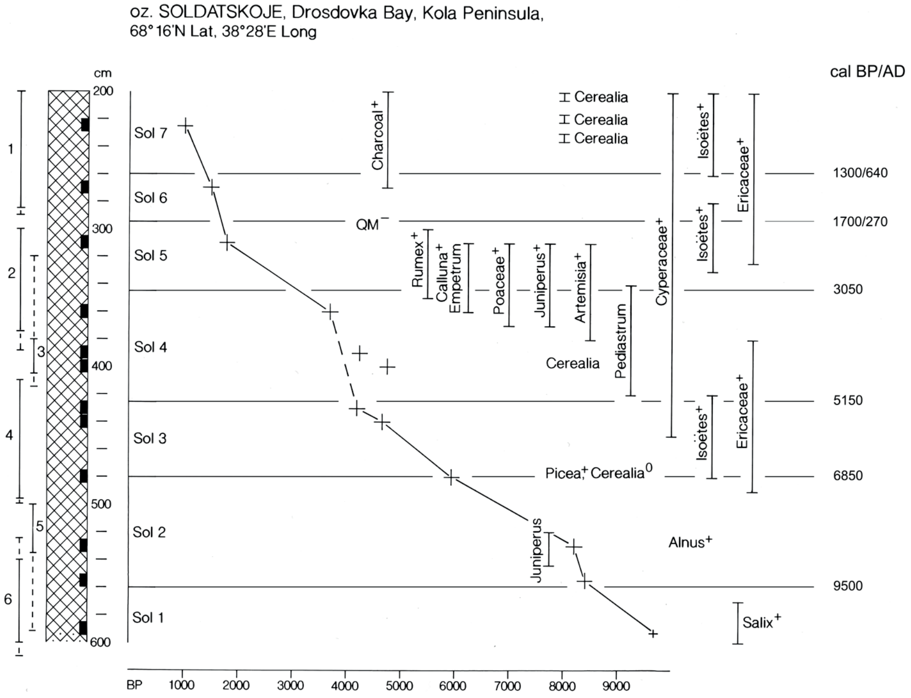


Figure A1.9. Age-depth diagram showing the core investigated, ^{14}C dates, and local pollen assemblage zones in the Lake Soldatskoye sediment. The pollen occurrences probably connected with local human impact are indicated in the depth scale only.

Sphagnum peat and reflected in increasing LOI up to 30% at 580 cm. There is a decline in organic content of the sediment between 567 and 585 cm where LOI is below 20%. Later, LOI for most of the gyttja sequence varies between 25–30% except in the uppermost sediment sequence from 270 cm, where LOI rises gradually to the sediment surface from 30 to 40%. These figures are high for a tundra lake, which can be explained by the high productivity of the lake itself and by the fact that no inlets flow into the basin bringing mineral matter.

Laboratory methods

Pollen and charcoal analyses and calculations of groups of opaque microspherules were carried out at 4-cm intervals. For pollen analysis the material was treated with KOH and the lowermost samples were also subjected to the cold HF method (Faegri & Iversen 1989). The material was mounted in glycerol gelatine. Five hundred tree pollen grains were counted from each level. Tree and herb pollen frequencies were expressed as percentages/promilles of the total pollen sum (P). Spores and aquatics were expressed as percentages/promilles of P+n, "n" being the taxon in question. Opaque microspherules and charcoal particles were counted from the pollen slides (% AP). Only wood charcoal particles exceeding 5µm were calculated. Charcoal "dust" and charred moss matrix was also present in the pollen slides, but they were not recorded.

The herb pollen data is divided into groups: mineral soil vegetation, dwarf shrubs, hygrophytes and aquatics. Pollen grains of *Betula pubescens* and *Betula nana* were not separately identified. The only group of *Betula*-type pollen separated from *Betula* coll. was the type with

Table A1.1. Radiocarbon dates of the sediment from Lake Soldatskoye.

Lab Nr	Depth cm	Object	^{14}C BP	δ^{13}C %	Cal. BP (1σ)
Su-2595	220–230	restart large Poaceae pollen occurrences	1030±80	-29.5	800–1050
Su-2596	265–275	start third Ericales maximum	1560±80	-30.3	1380–1610
Su-2597	305–315	end *Empetrum* phase	1800±70	-30,4	1630–1820
Su-2598	355–365	start *Empetrum* phase	3710±90	-30.4	3910–4220
Su-2829	385–395	checking earlier dates	4240±90	-30.7	4590–4870
Su-2599	395–405	start of local erosion reflected by LOI	4780±70	-30.0	5330–5600
Su-2600	425–435	second Ericaceae maximum	4220±70	-30.1	4630–4850
Su-2830	435–445	checking of earlier dates	4670±50	-31.0	5320–5470
Su-2601	475–485	rise of *Picea*, earliest Poaceae pollen of Cerealia	5930±90	-30,7	6660–6880
Su-2602	525–535	start *Juniperus* maximum	8210±130	-32.6	9020–9400
Su-2603	550–560	end *Betula* maximum	8390±110	-32.2	9290–9520
Su-2533	590–593	start of lake deposits (sample from a parallel core)	9650±50	-29.1	10,830–11,180

four-pore pollen grains and a diameter of 26–28 µm, but these characteristics were not adequate for species determination (cf. Mäkelä 1996).

The pollen diagrams were constructed by using a Tilia/Tilia Graph program and they were subjectively divided into local pollen zones Sol 1 – Sol 7.

The influx values were calculated separately for *Betula*, *Pinus*, *Picea* and *Alnus* in addition to the total tree pollen influx (Figure A1.10). One *Lycopodium* spore tablet containing 11,300 spores was added to each sample before chemical treatment (Stockmarr 1971). The low number of the added *Lycopodium* spores may partly explain the fluctuations in the influx curves. However, another explanation may be that the amount of coarse matrix in the sediment varies so much that the pollen concentration per cubic centimetre also varies, leading to artificially fluctuating influx calculations/values. Nevertheless, the influx values are comparable to earlier studies and show clear trends which can be interpreted in terms of the presence/absence of different species and their abundance.

Pollen influx values for the main tree pollen types were calculated by using a sediment accumulation rate of 0.3 mm per year for the pollen zone Sol 1 and a constant rate of 0.4 for the main sequence (Sol 2–7). This was considered to be correct despite some fluctuations in the time-depth curve, which around 4000 BP (4500 cal. BP) are partly due to inaccurate depth recording during sampling. The influx values and their general trends are reasonable and can be used to reconstruct the Holocene history of selected tree species and the forest limit in the northern Kola Peninsula. For convenient comparison with the earlier pollen influx data, non-calibrated radiocarbon chronology was used in calculations of sediment accumulation rates. Calibration would result in somewhat lower influx values, but the difference would remain less than random variation.

The plant and pollen nomenclature employed here follows that of Hämet-Ahti et al. (1998) and Flora Murmanskoy oblasti (1953–1966). The references to the plant distribution refer to Flora Murmanskoy oblasti (1953–1966) and Hultén (1971).

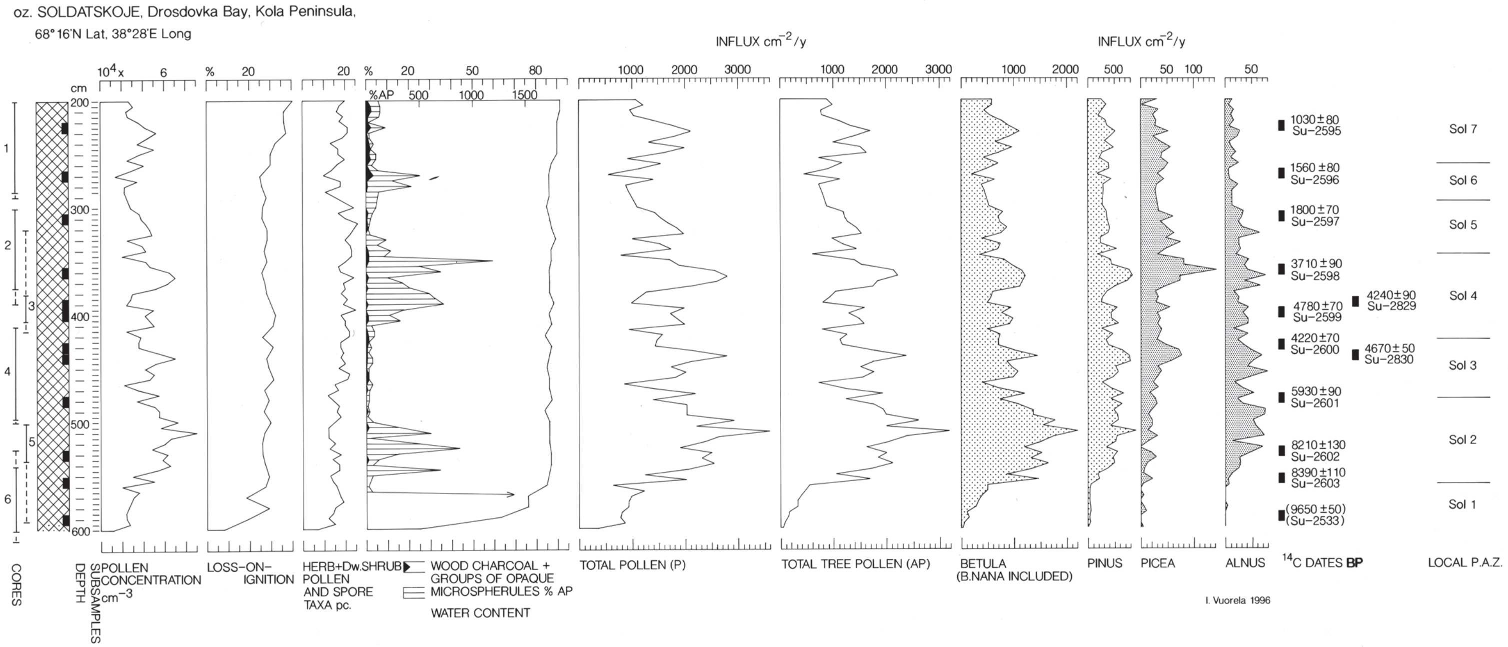


Figure A1.10. Pollen concentration cm-3, loss-on-ignition, number of herb pollen and spore taxa, wood charcoal (>5µm; % AP), opaque microspherules (% AP) water content, pollen influx values, and the ^{14}C dates of the Lake Soldatskoye sediment, Kola Peninsula.

The Pollen Diagrams

The Pollen Zones

The main features of the pollen zones from the sediment cores of Lake Soldatskoye are summarized in Table A1.2. The radiocarbon ages for the pollen zone boundaries are interpolated on the basis of the age/depth curve in Figure A1.9. Pollen concentration, loss-on-ignition, the number of herb pollen and spore taxa, wood charcoal, opaque microspherules, water content and pollen influx values are given in Figure A1.10. Relative pollen frequencies of trees and shrubs are presented in Figure A1.11, relative pollen frequencies of mineral soil vegetation in Figure A1.12, and relative pollen frequencies of dwarf shrubs, hygrophytes and aquatics in Figure A1.13.

Sol 1 (600–560 cm; ca. 9700(+) – 8500 BP) (11,000–9500 cal. BP or 9050–7550 BC); *Salix*-Ericaceae-Cyperaceae pollen zone. This zone is characterized by low pollen concentration values, especially for trees, and rapidly increasing relative frequencies of *Betula*. Cyperaceae is high at the base with a rapidly decreasing frequency towards the top. Ericaceae and *Salix* have distinct peaks in the upper part of the zone.

Sol 2 (560–480 cm; ca. 8500–6000 BP) (9500–6850 cal. BP or 7550–4900 BC); first *Myriophyllum-Betula-Pinus* pollen zone. The main features are high relative frequencies of *Myriophyllum alterniflorum*: the first *Myriophyllum* maximum. The relative frequency of *Pinus* pollen increases at the base of the zone where *Betula* reaches highest values. Ericaceae pollen values are low, *Juniperus* high, and *Isoëtes* pollen values start rising in the upper zone. A continuous *Alnus* pollen curve begins at the base of the zone and a continuous *Picea* pollen curve in the upper part of the zone.

Sol 3 (480–425 cm; ca. 6000–4500 BP) (6850–5150 cal. BP or 4900–3200 BC); first *Isoëtes-Betula-Pinus* pollen zone. The relative spore frequencies of *Isoëtes* increase (the first *Isoëtes* maximum) together with the herb pollen taxa and with relative pollen frequencies of Ericaceae. *Betula* and *Pinus* are the major components of the pollen flora, as also in the following pollen zones Sol 4 – Sol 7, constituting on the average ca. 50% and 30%, respectively, of the pollen flora. A continuous curve of *Sphagnum* begins at the base of the zone.

Sol 4 (425–345 cm; ca. 4500–2900 BP) (5150–3050 cal. BP or 3200–1100 BC); the second *Betula-Pinus-Myriophyllum* pollen zone covers the second maximum phase of *Myriophyllum alterniflorum* accompanied by a decrease in Ericaceae and *Isoëtes* and an increase in Cyperaceae. *Pediastrum* forms a distinct maximum. *Betula* and *Pinus* are the main components of the pollen flora. *Picea* has highest, more than 5%, values in the upper zone.

Sol 5 (345–295 cm; ca. 2900–1750 BP) (3050–1700 cal. BP or 1050 BC–AD 250); the second *Isoëtes-Betula-Pinus* pollen zone includes the second maximum phase of *Isoëtes*, separate maxima of *Empetrum* and *Calluna*, and an increase in Ericaceae and *Equisetum*.

Table A1.2. Local pollen zones of the Lake Soldatskoye sediment core.

Zone	Depth cm	Cal. BP	Characteristic features
Sol 7	200–260	1300– present	***Isoëtes***, Ericaceae
Sol 6	260–295	1700–1300	***Myriophyllum alterniflorum***, Ericaceae, opaque microspherules
Sol 5	295–345	3050–1700	***Isoëtes***, *Calluna*
Sol 4	345–425	5150–3050	***Myriophyllum alterniflorum***, Cyperaceae, *Pediastrum*, opaque microspherules
Sol 3	425–480	6850–5150	***Isoëtes***, Ericaceae
Sol 2	480–560	9500–6850	***Myriophyllum alterniflorum***, *Betula, Juniperus*, opaque microspherules
Sol 1	560–600	11,000–9500	**No aquatics**. *Salix*, Ericaceae, Cyperaceae, herbs

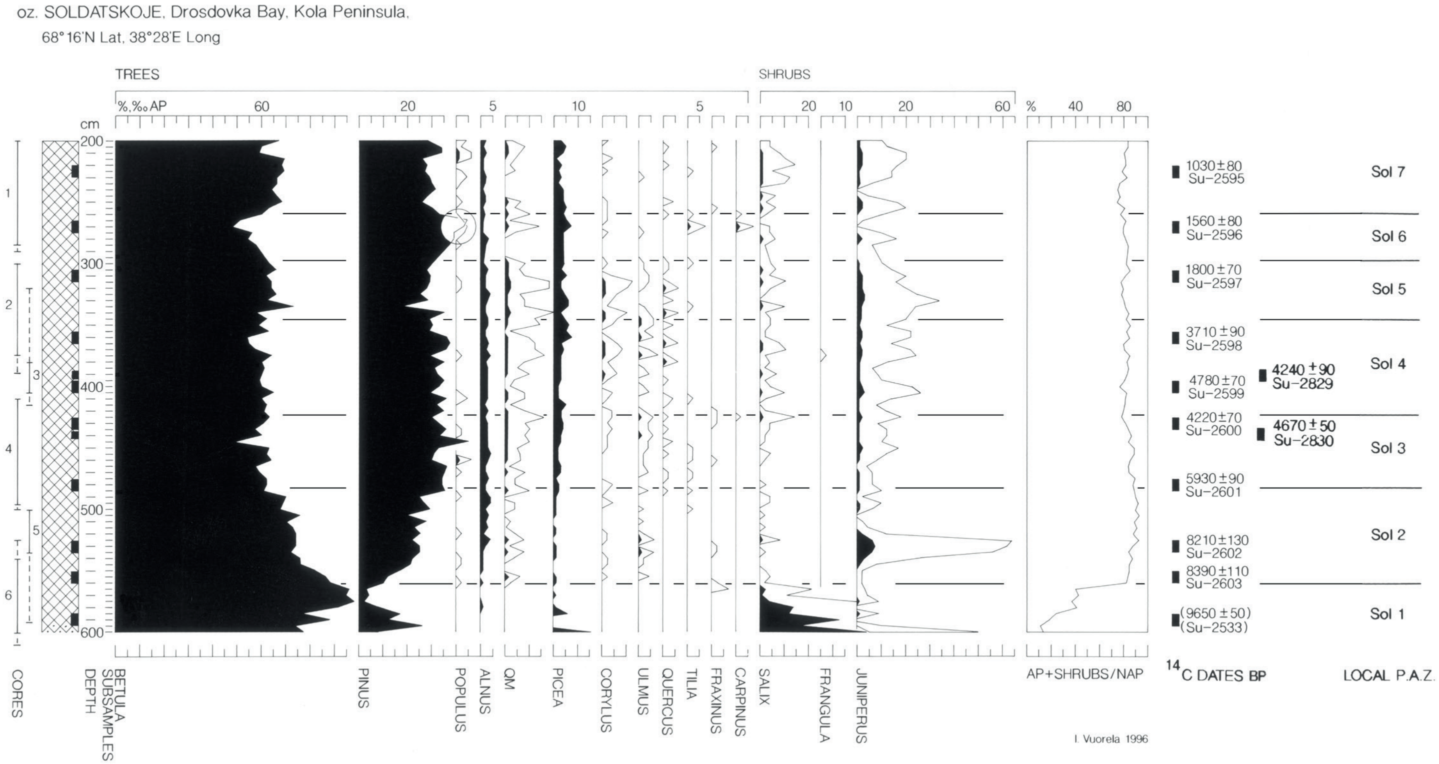


Figure A1.11. Relative pollen frequencies (% AP) of trees and shrubs.

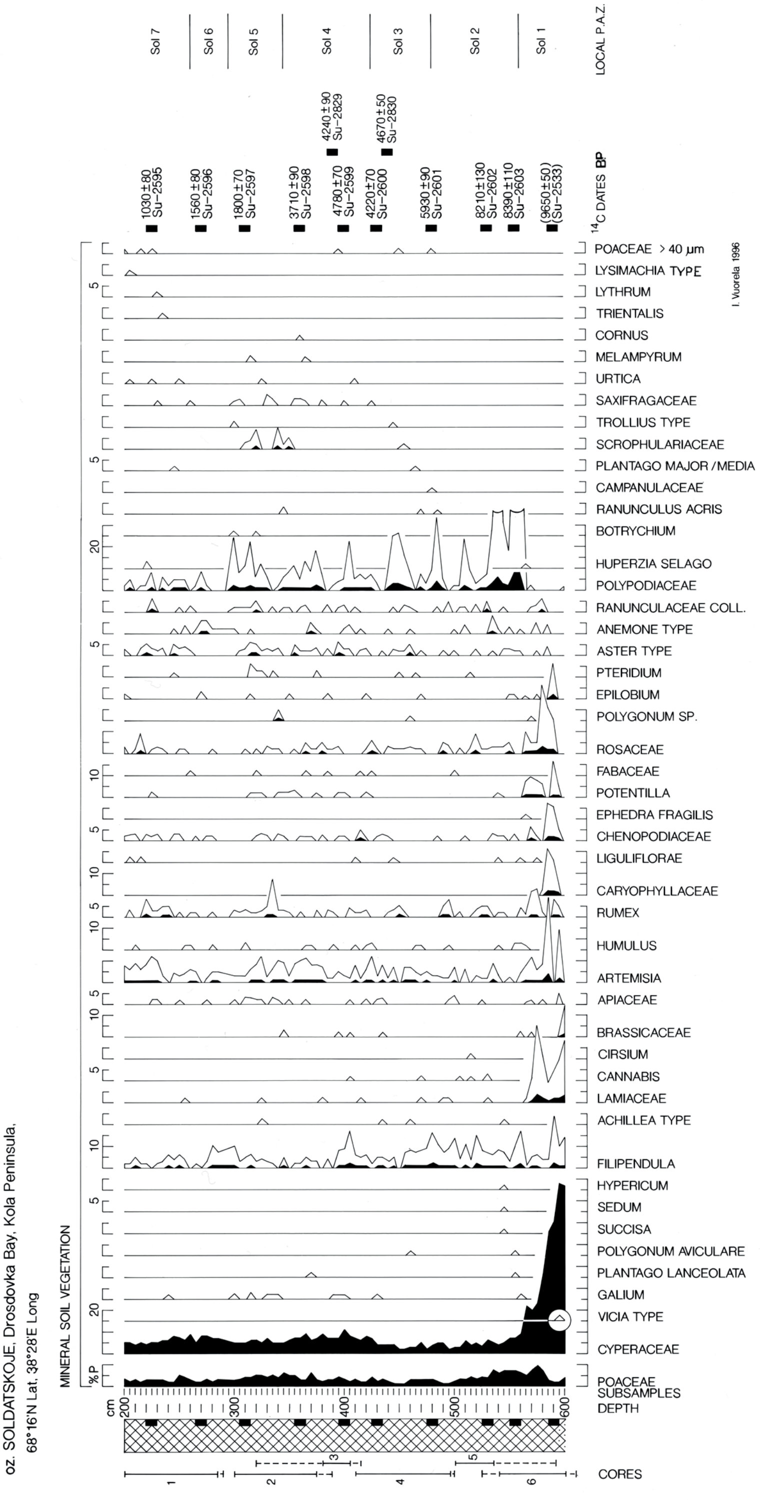
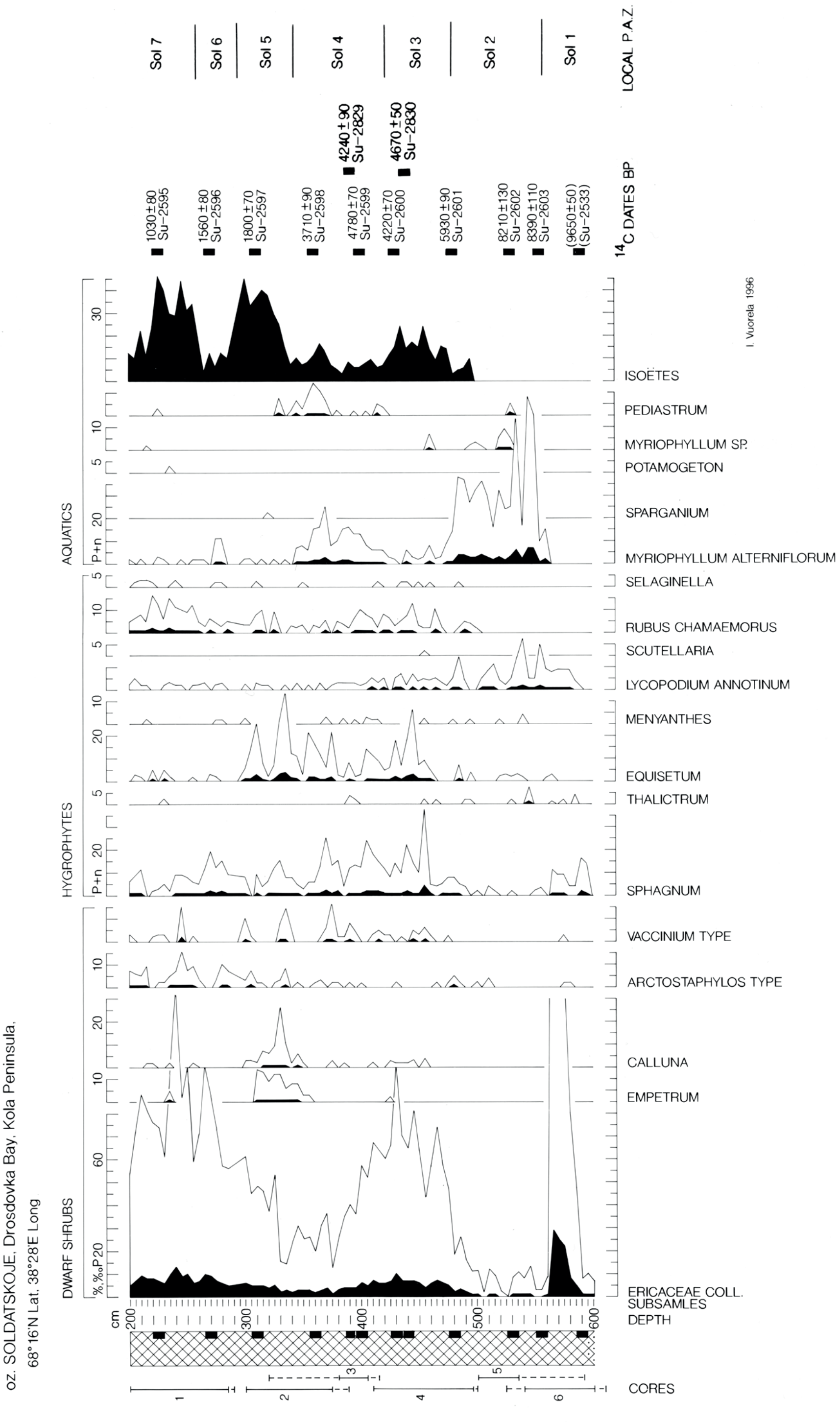


Figure A1.12. Relative pollen frequencies (% P) of mineral soil vegetation.



oz. SOLDATSKOJE, Drosdovka Bay, Kola Peninsula.
68°16'N Lat, 38°28'E Long

Figure A1.13. Relative pollen frequencies of dwarf shrubs (% P), hygrophytes (% P+n) and aquatics (%P+n).

Sol 6 (295–260 cm; ca.1750–1400 BP) (1700–1300 cal. BP or AD 250–650); the *Betula-Pinus*-Ericaceae pollen zone shows an increase of Ericaceae pollen to more than 10% of total pollen, a decrease in *Isoëtes*, and low or absent *Myriophyllum alterniflorum*.

Sol 7 (260–200 cm; ca. 1400 BP – present) (1300 cal. BP or AD 650 – present); the third *Isoëtes-Betula-Pinus* pollen zone is characterized by the third maximum phase of *Isoëtes*. Ericaceae pollen values are high, ca. 10%, and *Salix* and *Juniperus* increase. A distinct decline of *Pinus* occurs at the lower zone boundary from more than 35% to ca. 20% of total pollen, accompanied by an increase in the *Betula* pollen from less than 40% to over 50%. A distinct decline of *Isoëtes* spores takes place near the sediment surface.

Other Microparticles

Fe-Mn microspherules

Groups of opaque, mainly spherical micronodules, 20–40 μm in diameter and most probably representing Fe-Mn oxides and hydroxides by XRF analysis (cf. Rothwell 1989), were found in pollen slides (Figure A1.10). The spherules were often broken up into generally dispersed groups of separate microspherules which were counted as a single unit. Single micronodules were omitted from the count. Three clear maxima were recorded, the two lowest simultaneously with those of *Myriophyllum* and alternating with those of *Isoëtes*. The especially high relative frequencies in comparison with pollen in the bottommost part of the diagram result from low tree pollen concentration rather than a real increase in the microspherules.

Charcoal

The low charcoal quantities in the pollen slides (Figure A1.10) are related to the scarcity of wood in the area. The open landscape supports wind transportation of microparticles. In the bottommost part of the diagram up until ca. 7000 BP (7800 cal. BP or 5850 BC) charcoal particles were practically absent. From Sol 2 onwards, microscopic charcoal (> 5 μm) was temporarily found in small quantities. Charred moss remains were also found, indicating local fires. In Sol 6 and Sol 7 between 200 and 280 cm, i.e. the last 1600 calendar years, somewhat higher occurrences of wood charcoal may indicate more intensive presence of humans who used local mountain birch and/or driftwood as fuel.

Holocene Paleoenvironment of the Drozdovka Bay Area

Relative Pollen Data: Results and Comments

Trees and Shrubs

Wind-transported tree pollen dominates in the total pollen sum on the Fennoscandian Arctic tundra as earlier shown by several authors (e.g., Aario 1940; 1943; Hyvärinen 1972; 1976; Prentice 1981; 1982). The tree pollen curves for the Holocene forest development resemble those of southern Finnish Lapland, the main differences being the relatively high pollen frequencies of *Alnus* (up to 5 % AP) and broad-leaved deciduous trees (0.5–2 % AP) (Figure A1.11). The current ^{14}C dates for the main tree pollen development are as follows: rise of *Betula* pollen ca. 9650±50 (10,900 cal. BP), *Betula* pollen maximum and distinct rise of *Pinus* 8390±110 BP (9400 cal. BP), rise of *Alnus* 8210±130 BP (9150 cal. BP) and an introduction of *Picea* pollen before 5930±90 BP (6760 cal. BP). Since the initial increase of the *Betula* and *Pinus* pollen values their relative frequencies have been relatively stable, which is also the case with *Alnus* and *Picea*.

According to observations by the author M.S. when crossing the area by helicopter, the closest conifer forests, approximately 70 km south of Lake Soldatskoye, are *Picea*. In the pollen diagram, however, *Pinus* and (partly local) *Betula* represent ca. 90% of the arboreal pollen and approximately 60–70% of the total pollen sum. The mean relative frequencies of *Picea* remain <10% AP and <5 % P, like those at a corresponding distance from the spruce tree limit in Enontekiö, western Finnish Lapland (Mäkelä et al. 1994). This is only half of the relative *Picea* pollen values recorded in the Heinäsaari Island, Petsamo-Pechenga, western part of the Kola Peninsula, approximately 100 km north of the closest spruce forests (Aario 1943).

The highest relative Quercetum mixtum (QM) pollen frequencies were found at the 500–300 cm level corresponding to ca. 6900–2500 BP (7750–2550 cal. BP), while sporadic pollen grains of wind-pollinated species (*Corylus*, *Ulmus*, *Quercus*, *Fraxinus* and *Carpinus*) occur from ca. 8500 radiocarbon years BP (9500 cal. BP) up to the present. *Tilia* pollen is surprisingly frequent upwards from the 500 cm level dated to ca. 6900 BP (7750 cal. BP), given that the closest lime stands are nearly 1000 km to the south. High *Tilia* pollen values were also found in the material investigated from the Heinäsaari Island, Petsamo-Pechenga, by Aario (1943). The explanation given by Aario was the strong vertical air fluctuations in mid-summer during the flowering time of lime, which raised the wind transportation rates of pollen and other microparticles to higher levels than in the cooler parts of the growing season.

Salix pollen is present throughout the diagram, with the highest relative frequencies in the bottom and in the topmost part of the diagram. *Juniperus* is well represented with a maximum phase in Sol 2, dating approximately to 7800–8400 BP (9400–8600 cal. BP). After a clear decline, *Juniperus* pollen again increases from Sol 3 onwards, reaching its maximum (3.5% AP) in Sol 5. In Sol 6 and Sol 7 the pollen frequencies remain below 2% AP.

Mineral Soil Herbs and Dwarf Shrubs

Early Holocene herb pollen data of Sol 1 (Figure A1.12) reflect a rich local vegetation. The results are similar to the early Holocene vegetation described from Arctic Fennoscandia, for example by Hyvärinen (1976) and H. Prentice (1981). In the bottommost subsamples the herb pollen taxa are dominated by Cyperaceae and Poaceae, reflecting sedge-grass meadows on poorly drained areas around the lake (cf. Cwynar & Ritchie 1980). These are first accompanied by *Filipendula*, Lamiaceae, Brassicaceae, *Artemisia*, *Rumex*, Caryophyllaceae, Chenopodiaceae, *Potentilla*, Rosaceae and *Epilobium*, and later also by shortlasting but high frequencies of Ericaceae. Among more sporadic occurrences, pollen of Apiaceae, Cichoriaceae (Liguliflorae), *Ephedra fragilis*, *Polygonum*, *Aster* type, *Anemone* type, Ranunculaceae coll. and spores of Polypodiaceae are present.

In addition to the pollen types met in Sol 1, *Galium*, *Plantago* sp., *Polygonum aviculare, Succisa*, *Sedum*, *Hypericum*, *Achillea* type, Cannabaceae, *Cirsium* type, Fabaceae and *Ranunculus acris* type, together with spores of *Pteridium*, appear in Sol 2.

Ericaceae pollen (Figure A1.13), together with Poaceae and Cyperaceae, dominate throughout the diagram (Figure A1.12). Two later maxima of Ericaceae with a regression phase in Sol 4, about 2000–4000 radiocarbon years ago (2000–4600 cal. BP), are also reflected in pollen frequencies of Poaceae, Cyperaceae, and in certain spore and pollen frequencies of hygrophytes (Figure A1.13). These fluctuations may reflect hydrological conditions and thus the development of the adjacent bog.

No major changes take place among the herb vegetation in zones Sol 3–7. An increase in the herb pollen taxa in Sol 3, in connection with Ericaceae and *Isoëtes* maxima, should be emphasized. Pollen types appearing in Sol 3 are Campanulaceae, *Plantago* sp., Scrophulariaceae and *Trollius* type. Among Ericaceae pollen *Vaccinium*-type is best represented in zones Sol 3–4, and *Arctostaphylos*-type in zones Sol 5–7. In Sol 4, pollen of Saxifragaceae, *Urtica*, *Melampyrum* and *Cornus* appear followed, in Sol 7, by *Trientalis*, *Lythrum* and *Lysimachia*-type. Among these, *Plantago* sp. and *Urtica* could be considered as settlement indicators even though they also occur in river valleys, near springs, and in association with birch. Pollen grains of *Veratrum album* were not recognized.

Large Poaceae pollen grains exceeding 40 μm were recorded in pollen zones Sol 3, 4 and 7, at the levels of 480 cm (5930±90 BP, 6760 cal. BP), 450 cm (ca. 5500 BP, 6300 cal. BP)) and 395 cm (ca. 4500 BP, 5150 cal. BP), and at three levels dated from 1030±80 BP (cal AD 990) to the present.

Hygrophytes

Hygrophytes (Figure A1.13) are reliable representatives of the local vegetation. In pollen zone Sol 1, *Sphagnum*, *Lycopodium annotinum* and *Equisetum* represent the pioneer vegetation around the lake. Due to the overlapping ecological boundaries, even *Thalictrum* is considered as a hygrophyte. These pollen taxa are followed, in Sol 2, by *Menyanthes*, *Rubus chamaemorus*, and *Selaginella*. The appearance of *Rubus chamaemorus* takes place at the 500 cm level, dated to approximately 6500 BP (7400 cal. BP). Spores of *Sphagnum* increase simultaneously, together with considerable vegetational changes in the pollen frequencies of dwarf shrubs and aquatics. These changes are also evident in the plant macrofossil data.

In Sol 3 maximal occurrences of *Sphagnum, Equisetum* and *Rubus chamaemorus* occur together with high Ericaceae pollen frequencies that diminish, however, in Sol 4. Pollen zone Sol 5 is characterized by a marked decline in *Equisetum*, again accompanied by changes in mineral soil vegetation (Polypodiaceae), as well as in aquatics (*Isoëtes*) and dwarf shrubs (Ericaceae).

In Sol 6 and Sol 7 minor changes take place among hygrophytes including, however, an increase in *Rubus chamaemorus* and a decrease in *Sphagnum* spore frequencies.

Aquatics

No palynological evidence of aquatics is available in pollen zone Sol 1, for the period shortly after the formation of Lake Soldatskoye, but the terrestrial pollen predominates the flora (Figure A1.13).

At the 560 cm level, aquatic pollen appears in the form of *Myriophyllum alterniflorum* which, in Sol 2, is accompanied by pollen of *Myriophyllum spicatum/verticillatum* (according to ecological factors most probably *M. verticillatum*) and, at the end of this Sol 2, also by spores of *Isoëtes*. The maximum frequencies of *Myriophyllum* and *Isoëtes* are diachronous. *Myriophyllum* spp. were present in the early Holocene up to ca. 6000 BP (6850 cal. BP) when *Isoëtes* was absent, and the later maximum in Sol 4 coincides with an *Isoëtes* minima reflecting changes in the trophic status of the lake. The *Isoëtes* maxima occur in Sol 3, 5 and 7.

The first occurrence of *Pediastrum* was recorded at the 534 cm level dating from ca. 8200 BP (9200 cal. BP). The second occurrence covers Sol 4, characterized by high pollen frequencies of *Myriophyllum alterniflorum* and a decline in the spore frequencies of *Isoëtes*. *Myriophyllum alterniflorum* and *M. verticillatum* are still growing in the area, while recent observations of *Isoëtes* are from inland sites of the Kola Peninsula and on the Kola Bay shore north of Murmansk (Flora Murmanski oblasti 1953–1966). This information probably reflects the recent eutrophic phase of Lake Soldatskoye and corresponds to the diatom data (Grönlund & Kauppila 2002), and to observations made during the field work.

Pollen Concentration and Total Pollen Influx Values and their Comparison

Pollen concentrations (Figure A1.10) remain below 30,000 cm^{-3} in Sol 1 but in Sol 2 they increase, reaching a maximum value 90,000 cm^{-3} at the 510 cm level. In Sol 3 and 4 concentrations fluctuate between 20,000 and 60,000 cm^{-3} while in Sol 5 they decrease steadily from 50,000 to 20,000 cm^{-3}. Sol 6 is characterized by an increase in pollen concentrations up to 30,000 cm^{-3}, and Sol 7 by an initial increase to 50,000 cm^{-3} and a subsequent decrease from the 230 cm level upwards to approximately 20,000 cm^{-3} in the surface samples.

The total pollen influx values (Figure A1.10) of the lowermost pollen zone Sol 1 vary between 300 and 1000. A rapid increase takes place by 8500 BP (9500 cal. BP), rising to more than 2000 and reaching a peak value of 3600 around 7000 BP (7800 cal. BP) and then declining rapidly. A total pollen influx value of 2000 was attained by 6000 BP (6850 cal. BP), followed by generally declining trends towards the present with most values ranging between 1000 and 2000, and a current total influx of approximately 1000, of which 600 (i.e. 60 %) consists of *Betula* pollen.

Anderson & Brubaker (1986) note that the specific pollen frequencies that characterize each vegetation type vary from area to area (see also Cwynar & Spear 1991; Ritchie 1985). This is clearly also applicable to the tundra on the north coast of Kola when compared with more westerly areas of northern Fennoscandia. In addition to the vegetation distribution as a source of pollen influx, the sedimentary conditions in a lake basin also influence pollen influx values due to sediment focusing, as shown by Davis & Ford (1982). The large inwashed allochthonous component was proposed as an explanation for exceptionally high pollen accumulation rates at Domsvatnet, which is situated in open tundra on the northern Varanger Peninsula (Hyvärinen 1976). Influx values of up to 5000 at Domsvatnet are about twice as high as at Bruvatnet, situated in birch forest in southern Varanger. The morphometry of the lake basins is similar. The total pollen influx at Lake Soldatskoye is ±3000, i.e. closer to the Bruvatnet values. Sediment accumulation rates are rather high at Lake Soldatskoye, 0.44 mm per year on the average, and comparable to those at Domsvatnet (0.37 mm/year; Hyvärinen 1976), but the sediment matrix is different. The sediment of Lake Soldatskoye contains abundant coarse plant detritus, as also shown by its loss on ignition, which at about 30% is high for a tundra lake, whereas the Domsvatnet sediment is composed of silty gyttja nearly devoid of visible organic remains. The pollen concentration curve of Lake Soldatskoye resembles that of Domsvatnet, even though the present concentration values are only half of those on the Varanger Peninsula.

Tree Line Fluctuation

The Lake Soldatskoye pollen record covers almost the entire Holocene, i.e. 10,000 radiocarbon years (11,500 calendar years). The pollen diagram from the sediment sequence is strongly affected by long-distance transport of tree pollen which, after the initial herb pollen maximum, represents approximately 80% of the total pollen sum. The herb pollen and spore data, which have been considered mostly local in origin, consist of 61 pollen taxa.

The pollen stratigraphy starts with abundant pollen characteristic of open mineral soil including Cyperaceae, Lamiaceae, *Artemisia*, Chenopodiaceae, Rosaceae, Ericaceae and *Salix* typical of tundra vegetation. The proportion of tree pollen is only 10% at the bottom, indicating a considerable distance to the pollen source (cf. Hyvärinen 1975; 1976; Seppä 1996).

Betula *Pollen Influx*

The proportion of *Betula* already starts rising before 9500 BP (10,700 cal. BP). This is close to the date 9600 BP (11,100–10,900 cal. BP) for birch pollen increase in the north-central Kola Peninsula 130 km north-northwest from Lake Soldatskoye (Snyder et al. 2000). At around 8500 BP (9500 cal. BP) tree pollen accounts for ca. 70% of the total pollen sum (P), this also being the age of the rise of *Pinus* pollen frequencies on the more westerly coast. After a start from almost zero around 10,000 BP (11,500 cal. BP) the *Betula* pollen influx values rise at ca. 8500 BP (9500 cal. BP) from 500 to 1500 (Fig. A1.10). At around 7000 BP (7800 cal. BP) there is a peak of 2200, subsequently followed by a rapid decline to 1200 and then a declining trend with values between 500 and 1000 until 1500 BP (1400 cal. BP), when a slight increase to over 1000 takes place. The current *Betula* influx values are around 600. It should be noted that in the relative pollen diagram *Betula* already starts declining before it reaches the highest influx values, thus giving an incorrect impression of its abundance. This is also the case in Bruvatnet in the Varanger area of Norway in the mountain birch-dominated vegetation zone (Hyvärinen 1975). The present *Betula* influx value of ca. 600 is a result of pollen rain from the nearby isolated birch stands within the Drozdovka River valley and from the birch forest-tundra 50 km further south (Figure A1.2). The value of 600 was already attained by 8500 BP (9500 cal. BP) and the influx has exceeded this figure for most of the time since then, although since 3500 BP (3800 cal. BP) it has been below this level more often than earlier. Birch had therefore already reached central parts of the northern coast of the Kola Peninsula by 8500 BP (9500 cal. BP), a date which is consistent with results from the Varanger Peninsula (Hyvärinen 1976). However, a slight delay is perhaps evident at Drozdovka. Birch was most abundant between 8000 and 6000 BP (8850–6850 cal. BP) and the values for this

Table A1.3. Macrofossil finds in the Lake Soldatskoye pollen samples. Macrofossils are seeds and fruits if not otherwise mentioned (s=seeds, n=needle, l=leaves, st=stems, sc=scales). Analyzed by Terttu Lempiäinen ca. 1996.

Depth (cm)	200–260	260–295	295–345	345–425	425–480	480–560	560–600	**Sum**
Trees and Shrubs								
Betula nana	-	-	-	-	-	-	1	1
Betula pendula/sc	-	-	1	-	-	-	-	1
Betula pendula/s	-	-	1	2	1	5	5	14
Pinus sylvestris/n	-	-	1	-	-	-	-	1
Wet Meadows, Shores and Marshes								
Cardamine sp.	-	1	1	-	-	10	4	16
Carex acuta	-	-	-	1	-	1	3	5
Carex nigra	-	-	1	1	-	1	5	8
Carex sp.	-	-	1	2	-	1	1	5
Comarum palustre	-	-	-	-	-	-	16	16
Empetrum nigrum/l	-	-	2	-	-	-	-	2
Empetrum nigrum/s	-	-	1	6	-	1	95	103
Juncus alpinoarticulatus	-	-	-	-	-	1	-	1
Juncus compressus	-	-	-	-	-	1	-	1
Juncus sp.	-	-	-	-	-	1	-	1
Montia fontana	-	-	-	1	-	1	43	45
Poaceae/indet/st	-	-	-	+	-	-	-	+
Poa sp.	-	-	-	-	-	-	1	1
Potentilla erecta	-	-	-	-	-	-	1	1
Viola palustris	-	-	-	-	-	-	1	1
Aquatics								
Myriophyllium sp.	-	-	-	-	-	1	1	2
Chara sp.	-	35	3	100	-	283	-	421
Potamogeton natans	-	-	-	-	-	1	-	1
Ranunculus peltatus	-	-	-	2	-	2	13	17
Sum		36	12	115	1	309	190	664
Other Remains								
Bryophyta/l,st	+++	+++	+++	++++	++++	++++	+++++	-
Polytrichum sp.	-	-	-	+	-	-	-	-
Sphagnum sp.	+++	+++	+++	+++	++++	++++	+++++	-
Fungi, scler.	-	-	3	-	-	-	5	8
Charcoal	-	-	+	-	-	-	-	-
Wood/indet	-	-	-	-	-	-	+	-
Cristatella mucedo	-	1	16	85	22	265	37	426
Insecta	-	-	-	++++/Or	++	++	++	-

Or=Oribatidae

period are comparable with the pollen trap data of Hicks & Hyvärinen (1999), who recorded values of 1000–1500 for open birch forest and 500–1000 for sites where birch was present but only sparsely. At Lake Soldatskoye the birch stands perhaps formed a continuous open birch woodland between 8000 and 6000 BP (8850–6800 cal. BP) which was most widely distributed and densest around 7000 BP (7800 cal. BP). Since then the birch forest has generally declined.

Pinus *Pollen Influx*

At ca. 8500 BP (9500 cal. BP) in Lake Soldatskoye, *Pinus* pollen values have increased to ca. 20% of the tree pollen and to 10% of total pollen, subsequently varying between 20 and 30% P up to the present and peaking between ca. 6000 and 1500 BP (6800–1400 cal. BP). *Betula* pollen has formed 60 to 70% of tree pollen and 50 to 60% total pollen since 8500 BP (9500 cal. BP). *Pinus* is second after *Betula* in terms of pollen abundance. Its influx values (Figure A1.10) start rising as early as ca. 8500 BP (9500 cal. BP) and soon reach a level of ca. 500. The influx fluctuates between 300 and 800 up to 3700 BP (4050 cal. BP) and then decreases rapidly to ca. 300, remaining at that level with slightly declining trends to the present. The northern pine limit crosses Kola from NNW to SSE approximately 80 km south of Lake Soldatskoye. No subfossil pines were found in lakes in the Drozdovka Bay area and the pollen influx values have been, with two exceptional levels, lower than the figure of 500 suggested by Hyvärinen (1975) to indicate the local presence of pine around the sampling site. One pine needle was found in Sol 5 (Table A1.3), dated between ca. 3500 and 1700 BP (3800–1600 cal. BP), suggesting proximity of pine stands.

Hyvärinen (1975; 1976) also showed that by 8500 BP (9500 cal. BP) pine had already reached the Barents Sea coast in the Varangerfjord area north of its present limit and started to retreat around 5000 BP (5750 cal. BP) or somewhat later. In Lake Yarnyshnoe-3, 130 km WNW from Drozdovka, the rise of *Pinus* pollen ca. 8000 BP (8850 cal. BP) and *Pinus* stomates dating to 7600 (8400 cal. BP) and 6500 BP (7400 cal. BP) indicate the presence of pine close to the shore of the Barents Sea (Snyder et al. 2000). The Lake Soldatskoye pollen data support these dates and reflect the immigration of pine to Kola and the fluctuation in the pine limit in areas south of Lake Soldatskoye and is in harmony with similar studies by Gervais et al. (2002) and Wolfe et al. (2003). According to Kremenetski et al. (1997), pine reached its northern limit on the Kola Peninsula ca. 7000 BP (7800 cal. BP). This date appears young when compared with the results discussed above and may reflect the maximum abundance of pine at this time, which is evident from many other studies from the western Kola area (Kremenetski et al. 2004; MacDonald et al. 2000; 2008). No fossil conifers were found in the Drozdovka area despite intensive search.

All *Pinus* pollen is long distance in origin and it can be suggested that the pattern of air transportation has been steady since 8500 BP (9500 cal. BP), which was the time of the final disappearance of the Scandinavian Ice Sheet (e.g. Lundqvist & Saarnisto 1995; see also discussion in Wolfe et al. 2003).

Alnus *Pollen Influx*

A continuous *Alnus* pollen curve also starts around 8500 BP (9500 cal. BP) in Lake Soldatskoye, suggesting that alder was present in the Drozdovka Bay area. The present northern limit of grey alder (*Alnus incana*) is more than one hundred kilometres south of the site. The rise in the *Alnus* curve (Figure A1.10) starts before 8390 BP (9400 cal. BP) and it amounts to about 2% of the total pollen throughout most of the sequence, showing a slightly declining trend after 1500 BP (1400 cal. BP). The *Alnus* influx rises to a maximum level of 70 before 8000 BP (8850 cal. BP) and a declining trend starts around 4000 BP (4500 cal. BP), while the current influx level is 10. The immigration of alder to Kola has been investigated by Kremenetski et al. (1999; 2004) and they suggest that alder immigrated to Kola both from Karelia in the south and from the Norwegian coast in the west where alder was already present by 9000 BP (10,000 cal. BP). Our data show that alder also already occupied the northern coast of Kola ca. 8500 BP and not only during the Holocene climatic optimum from 7000 (7800 cal. BP) to 6000 BP (6850 cal. BP) as suggested by Kremenetski et al. (1997; 1999). It is also possible that the isolated stand of alder at the mouth of Ponoy River, in the eastern end of the Kola Peninsula, originated from this early alder immigration to the Kola Peninsula, most evidently from the south. Final confirmation of the immigration history of alder must await actual pollen data from the Ponoy area.

According to Kremenetski et al. (1999), alder has been within its modern range since 4000 BP (4500 cal. BP). The Lake Soldatskoye pollen data broadly support this interpretation, although declining influx values from 70 to the current figures of less than 10 indicate a continuous decline of alder. It cannot be ruled out that the short term fluctuations in alder and similarly in birch pollen influx values reflect the intensity of human occupation at Drozdovka and thus the utilization of local birch and alder stands. The area is surrounded by barren tundra and therefore the variation in the intensity of local pollen production should be seen in influx values. This will be discussed below in connection with settlement indicators.

Picea *Pollen Influx*

Picea pollen values reflect the immigration and distribution of spruce in sites south of Lake Soldatskoye. A continuous *Picea* pollen curve starts ca. 7000 BP (7850 cal. BP), but remains below 3% until ca. 4000 BP (4500 cal. BP), after which values between 3 and 5% are common. Influx values rise to more than 20 already by 8000 BP (8850 cal. BP) and to more than 40 ca. 5500 BP (6300 BP), remaining thereafter almost the same to the present day with a slightly decreasing trend to 30. All *Picea* pollen is derived from long-distance transport and it is likely that spruce never reached the Drozdovka area. *Picea* pollen abundances reflect spruce abundances in more southerly areas where much of the ground became colonized by pure spruce forests.

In Lake Soldatskoye *Picea* influx values (Figure A1.10) reflect the expansion of spruce through the Kola Peninsula. They rise to ca. 20 after 8000 BP (8850 cal. BP) and exceed 40 ca. 5500 BP (6300 cal. BP), thereafter remaining at around 30 almost to the present day, with a slightly decreasing trend and two exceptionally high peaks of 80 and more at 4500 and 3700 BP (5150–4050 cal. BP). These peak values may partly be artefacts of the constant sedimentation rate used in the influx calculations above the Sol 1 pollen zone, but nevertheless, trends in the influx curve appear reliable.

The present *Picea* influx values are close to those recorded by Hyvärinen (1975; 1976) in Finnish Lapland and on the Varanger Peninsula. The values remain below 30 in Akuvaara, within the pine forest 50 km north of the spruce-pine forest, and in Bruvatnet, within the birch woodland.

Spruce had already spread to northern Russian Karelia by 7000 BP (7800 cal. BP) and to the Lovozero area of central Kola by 4500 BP (5150 cal. BP) (Elina et al. 1995). Spruce forests reached the western interior of the Kola Peninsula ca. 4500–5000 BP (5150–5750 cal. BP) and the northern limit of spruce extended to its current position ca. 3000 BP (3200 cal. BP), but it obviously never reached the Arctic Ocean (Kremenetski et al. 1999). These figures are in harmony with the Lake Soldatskoye spruce influx data.

The trends in the tree line fluctuation reflect climate more or less directly. The climate optimum peaked ca. 7000 cal. BP when the cooling towards the present commenced and approximately 3500 cal. BP a further decline in temperature took place.

Probable Settlement Indicators

The above interpretation of the tree pollen values suggests that pine and spruce never reached the Drozdovka area during the Holocene. Birch and alder, on the other hand, have been present during most of the Holocene, although declining towards the present most clearly since 3500 cal. BP. The fluctuation in abundance of birch and alder may be related to the human presence and their use of trees for fuel, house construction and in household activities, but fluctuations of the influx values cannot be directly correlated with human activity.

According to the herb pollen and spore data, at least three phases in the development of local vegetation can be seen. The first is related to the early Holocene plant succession, while the second reflects local hydrological changes, i.e., the development of the adjacent bog which started ca. 6500 BP (7400 cal. BP), indicated by *Sphagnum* and the dominant herbs such as Poaceae, Cyperaceae, Ericaceae coll., and *Rubus chamaemorus*. Corresponding development can be seen in the macrofossil data (Table A1.3).

The third developmental phase, which begins ca. 6000 BP (6850 cal. BP), probably reflects local anthropogenic influence on the vegetation as seen in the herb and spore data. The latter includes regular fluctuations in palynological indicators of soil erosion and changes in eutrophy, and perhaps even evidence of changes in the macrofauna, i.e. in the fish population of the lake (see below). The Drozdovka Bay area has been settled since the Mesolithic (Gurina 1987; 1997). The oldest postulated settlement indicators in the pollen record of Lake Soldatskoye begin ca. 6000 BP (6850 cal. BP or 4900 BC), which corresponds to the terminal Mesolithic and earliest Neolithic. Localities dating to this time frame have been excavated at Ust-Drozdovka I, only 0.5 km east of Lake Soldatskoye, which has been radiocarbon dated to 5500 BP (6210–6410 cal. BP or 4460–4250 BC), and further north at Mayak II, where occupations are radiocarbon dated to between 5700–4000 BP (6490–4300 cal. BP or 4690–2340 BC) (Gurina 1997: 138). This first anthropogenic period lasts until ca. 4000 BP (4500 cal. BP or 2550 BC). A second period of anthropogenic influence on the pollen data occurs from 3500 to 1700 BP (3850–1650 cal. BP or 1800 BC–AD 300). This corresponds with the Early Metal Age construction of large semisubterranean houses at several localities in the area ‑ including nearby Ust-Drozdovka III where they are radiocarbon dated to 3700–3400 BP (4200–3500 cal. BP or 2300–1500 BC) (this volume) ‑ as well as smaller uninvestigated dwellings that probably date later. A third period of anthropogenic influence is registered from ca. 1500 BP (1400 cal. BP or AD 530) until close to the present day, which reflects the historical Sámi occupation of the region. All these anthropogenic periods are indicated by increasing frequencies of *Isoëtes*, while the earliest period also shows changes in the herb pollen taxa, and the second and third periods increasing pollen of *Rumex, Urtica, Melampyrum* and *Artemisia*. Opaque Fe-Mn microspherules are abundantly present during these periods.

Isoëtes and *Myriophyllum* were major components of the aquatic vegetation and their pollen values fluctuate markedly and alternately throughout the sequence. *Isoëtes* favours clear waters and more oxic environments while *Myriophyllum* prefers more brownish waters (Maristo 1941). The appearance of *Myriophyllum* species is an indication of nutrient-rich water in Lake Soldatskoye; especially *M. verticillatum* grows in relatively eutrophic lakes (Hämet-Ahti et al. 1998). The synchroneity of the maximum occurrences of opaque Fe-Mn microspherules with the maxima of *Myriophyllum* could also be connected with the colour changes of the water and with higher productivity, connected with occasional oxygen deficiency in the lake (e.g. Cronan 1980; Virtanen 1994). Halbach (1976) emphasized the importance of climatic fluctuation as a cause of the alternating manganese- and iron-rich phases observed in the ore concretions of Finnish lakes. Their pattern of distribution in certain periods is, however, difficult to explain on a purely climatic basis. The occurrence of micronodules can be thought to reflect ecological changes in the lake basin or its surroundings. As such, they correspond to the pollen data.

According to Rothwell (1989), in marine sediments Fe-Mn microspherules are frequently associated with fish debris. They probably could act as indicators of periods with abundant fish population in Lake Soldatskoye, alternating with settled periods when the fish content in the lake decreased significantly. In the present material the frequencies of Fe-Mn nodules or nodule groups in pollen slides (10–1200% of AP) show peaks in concentration at particular levels (270–280 cm, 350–390 cm and 520–530 cm) in zones Sol 2, Sol 4 and Sol 6.

It is tempting to interpret the fluctuations in the trophy of the water in Lake Soldatskoye partly as a reflection of the intensity of human occupation. In connection with the earliest *Isoëtes* maximum, herb pollen frequencies and pollen taxa increase, and also the diatom data show increasingly eutrophic conditions (Grönlund & Kauppila 2002). Sporadic *Plantago* sp. and *Urtica* pollen occurs, i.e., the same pollen types which indicate Stone Age settlement in the Boreal coniferous forests (cf. Vuorela 1995). The second and third periods are characterized by pollen types such as *Rumex, Urtica, Melampyrum* and *Artemisia*. Even though these plants grow naturally in the area, the uneven occurrence of their pollen records and their synchronism with the local settled periods should be pointed out.

This interpretation is further supported by comparing the results with a pollen diagram from Lake Yarnyshnoe-3, north-western Kola Peninsula (Snyder et al. 2000), which does not show any fluctuations comparable with the Lake Soldatskoye record. The site is from an area where no prehistoric human occupation is known. Similarly, the diatom stratigraphy of Lake Yarnyshnoe-3 does not show the fluctuations between oligotrophy and eutrophy observed in Lake Soldatskoye.

In near tundra conditions, however, the erosion risk is also great in the absence of humans and therefore the role of *Isoëtes*, as well as the probable terrestrial pollen indicators should be treated with caution. Microscopic charcoal was mainly found in periods with low microspherule frequencies and high *Isoëtes* frequencies, especially in the uppermost part of the profile, corresponding to the last four to five centuries.

Erosion of the surface soil of the lake shores which, simultaneously, improves the oxic conditions in the lake, should also be taken into consideration. The thin vegetation cover in the lake surroundings is easily destroyed even by weak human activity, as is the present situation (Figure A1.4), and allochthonous input into the lake is intensified. It is quite obvious that the settlements of the hunter-gatherers and perhaps the movements of reindeer caused breakage of the vegetational cover and erosion of the thin mineral soil.

This interpretation, based on NAP and aquatics, does not require any climatic fluctuation whereas the pollen influx values of major tree species (birch, pine spruce and alder) reflect, in addition to the successional immigration, also climate, especially the cooling trend as shown by the declining influx values. The peak of the birch pollen influx 7000 BP (7800 cal. BP) coincides with the Holocene climatic optimum. The first anthropogenic influence recorded in the pollen stratigraphy at 6000 BP (6850 cal. BP or 4900 BC) starts at the end of the climatic optimum, followed by cooling trends towards the present. Birch has been present in the Drozdovka Bay area during all prehistoric settlement periods, but the correlation of the birch pollen influx values with the intensity of the human activity is too ambitious.

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Appendix 2

Bayesian Chronology Models for the House 5 Sequence and the Ust-Drozdovka IУ/III Locality as a Whole

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Introduction

Over the past three decades there have been considerable developments in the Bayesian statistical analysis of radiocarbon dates that are perhaps only in recent years beginning to have more widespread impact on how archaeologists engage with time and chronologies. Although programs for these analyses have long been available, perhaps many archaeologists have been intimidated by the mathematical formulas and language used in the presentation of the methods, and therefore have avoided exploring them. This appendix is an effort to engage the Drozdovka House 5 radiocarbon data with a simple Bayesian approach to see how this might affect our interpretation of the house chronology.

We normally make visual evaluations of radiocarbon calibration multiplots – as we have done in Chapter 5 – but these assessments may be prone to cognitive bias. According to Bayliss et al. (2011: 18): "Using this method of informally estimating chronology by visual inspection of calibrated radiocarbon dates, past activity will nearly always be interpreted as starting earlier, ending later, and enduring longer than was actually the case." A basic point to consider is that radiocarbon dating dates samples, but the chronologies that are based on these dated samples also incorporate contextual information that is used when interpreting the dating results. Thus, although chronologies are based partly on "hard" radiocarbon results, they are not, strictly speaking, objective. Dated samples do not speak for themselves but acquire meaning when they are interpreted in relation to the foreknowledge we possess regarding their contextual relationships. In general, Bayesian statistical methods invoke "prior knowledge" of phenomena to assess their probabilities. Applied to archaeological dating, that means using our foreknowledge of contextual relations to construct chronological models against which the dated samples can be compared. By testing chronological models based on different assumptions we can determine which of them fit best with the dated material (Bayliss et al. 2011: 18–20; see also Buck et al. 1991; Bronk Ramsay 1995).

The central problem to be investigated here is what our radiocarbon dates from the Ust-Drozdoka III House 5 locality can tell us about the sequence of activities that produced two physically identifiable houses that occur in a clear stratigraphic succession. In Chapter 5 an initial pairwise statistical analysis of the AMS dates from the earlier House 5A suggested that at least two chronologically distinct events can be identified for this dwelling phase. Thus, when these are seen in relation to the stratigraphically later House 5B, at least three phases of dwelling activity are implied for the House 5 locality. This appendix will further explore the dates and phasing of the two houses using Bayesian analyses to determine whether additional insights can be gleaned beyond the three-phase distinction identified in the basic statistical analysis. Thereafter, the House 5A and 5B dates will be combined with other dates from the House 5 locality and from other houses at Ust-Drozdovka IУ and III to generate a total site model.

Radiocarbon Dating Sample Selection and Methods

As outlined in Chapter 5, the Drozdovka House 5 radiocarbon dates (Table 5.1) present us with various challenges. A few of the conventional dates have such large standard deviations that they were excluded from the basic site analysis, and the rest of the conventional assays deemed acceptable still have fairly large standard deviations (±60 to ±160). Given the relatively short time span separating the two houses, these conventional dates are not very helpful for establishing a finer chronology. Consequently, the Bayesian analysis of the house sequence uses only the nine AMS dates from Houses 5A and 5B, which have standard deviations ranging from ±25 to ±40, as well as a single conventional date from House 5B with a standard deviation of ±80 (Table A2.1). The conventional date was included due to the lack of other dates that can reliably be associated with House 5B. In this connection, an AMS date on ceramic residue associated with House 5B was excluded given uncertainties regarding marine reservoir correction. This relatively small sample should be kept in mind when evaluating the results. For the total site model, 28 dates from Ust-Drozdovka IУ and III were used: all the AMS dates except for the ceramic residue result, and all the conventional dates with a standard deviation of ±130 or less.

The Bayesian analyses were conducted with OxCal 4.4 (Bronk Ramsay 2009). First up was a test of the three-phase model established through pairwise statistical testing using the "R-Combine" and "Combine" functions in OxCal: 1) House 5A earlier episode (five dates), 2) House 5A later episode (three dates), and 3) House 5B (two dates) (Table A2.1). The initial OxCal modelling results suggested that the oldest and youngest dates from the early phase of House 5A did not fit as well as expected with the three-phase model, as they showed somewhat lower agreement indices. Consequently, another run was performed

Table A2.1. The nine AMS dates and one conventional date used in the Bayesian analyses, organized in accordance with the three- and four-phase models.

Three-Phase Model		**Four Phase Model**	
Sample	**Uncal. BP**	**Sample**	**Uncal. BP**
Phase 1		*Phase 1*	
Wk-35066 - House 5A	3671±25	Wk-35066 - House 5A	3671±25
Wk-25736 - House 5A	3662±30	Wk-25736 - House 5A	3662±30
Wk-25738 - House 5A	3635±30	*Phase 2*	
Wk-35062 - House 5A	3630±25	Wk-25738 - House 5A	3635±30
Wk-35064 - House 5A	3594±25	Wk-35062 - House 5A	3630±25
Phase 2		Wk-35064 - House 5A	3594±25
Wk-35065 - House 5A	3547±25	*Phase 3*	
Wk-25737 - House 5A	3545±30	Wk-35065 - House 5A	3547±25
Wk-35063 - House 5A	3531±25	Wk-25737 - House 5A	3545±30
Phase 3		Wk-35063 - House 5A	3531±25
TUa-3537 - House 5B	3395±45	*Phase 4*	
T-15741 - House 5B (conv.)	3385±80	TUa-3537 - House 5B	3395±45
		T-15741 - House 5B (conv.)	3385±80

using a four-phase model (Table A2.1) in which the two oldest 5A samples were used form a new Phase 1, while the remaining three dates from the original Phase 1 now constituted Phase 2. In other words, House 5A was now modelled in relation to three rather than two occupation episodes. The four-phase modelling result showed an improved agreement for these individual samples and a modest improvement in the overall agreement between the model and the unmodelled data. Each phase model also included: 1) the duration of each phase (using the "Span" command), 2) the duration of the *intervals* between phases (using the "Interval" command), and 3) the duration of the total sequence (using the "Span" command).

The total site model was constructed with four phases: an early phase followed by the three phases already established for Houses 5A and B. The additional dates from features not used previously in the House 5A/5B sequence analysis were simply slotted into the phase containing dates close to their uncalibrated age determination. Phase 1 was comprised of two dates that were clearly earlier than all the others: one from the western cooking pit north of House 5B and the other from the cultural layer outside of Ust-Drozdovka IУ House 1. Phase 2 was comprised of nine dates, which included those from the earliest phase at House 5A as well as other contexts within that span (layer cross-cut by the House 5B entrance passage, basal midden samples, resin from a Sunderøy ground slate point). Phase 3 was comprised of 15 dates: three directly associated with the later phase of House 5A, four probably related to this phase, two from the circular chamber, one from the later cooking pit north of House 5B, one sample adjacent to the hearth from House 5B, three from midden contexts, and one from House 7. Phase 4 included the two charcoal samples associated with House 5B.

In this case, the resulting modelled phase dates are not robust because they are not as tightly constrained by context and stratigraphic relationships as was the case for the House 5 models. Some of the dates were only included in a phase because of their corresponding uncalibrated age, not a stratigraphic relationship. Furthermore, there are few dates from some of the individual features and the other houses. Consequently, the primary purpose of the model is to estimate the longevity of settlement at Ust-Drozdovka IУ and III; otherwise, it provides only a loose summary of the activity sequence.

The specific OxCal 4.4 programming language used for these models is given at the end of this appendix.

Results

Three-Phase Model for Houses 5A and 5B

Table A2.2 provides a summary of the results of the three-phase model, run with individual phase spans, the duration of the intervals between the phases, and the total time span for the dated activities at both houses. All results are given for the 95.4% level of probability. The span of House 5A Phase 1 is given as 0–94 years, while the interval between phases 1 and 2 is given as 0–145 years. The span of House 5A Phase 2 is determined as 0–95 years, and the interval between phases 2 and 3 as 0–209 years. Phase 3 (House 5B) has a duration of 0–96 years. The overall span of activities related to Houses 5A and 5B is 103–540 years. Figure A2.1 shows the probability distribution multiplot for this model. The generalized agreement indices suggest the results are acceptable, with an agreement between the modelled and unmodelled data of Amodel= 117.1%, and an overall agreement based on the individual date indices of Aoverall= 114%.

However, there are two individual agreement indices that are somewhat lower, the oldest and youngest dates for Phase 1: 3671±25 BP (A= 76.5%) and 3594±25 BP (85%). The oldest date is from the base of the midden on the floor of House 5A, while the youngest is from the House 5A ventilation channel (see Table 5.1). These lower agreements are not critical problems for the model – the OxCal standard is that they should be over 60% – but their weakness prompted a desire to see if a four-phase model might provide greater agreement.

Table A2.2. Results of the three-phase Bayesian model for House 5A and 5B. In the upper captions “A” denotes the individual agreement indices (how well the date fits with the model) while “C” denotes the “convergence interval” (a measure of the effectiveness of the algorithm in finding a solution). At the bottom of the table “Amodel” is the agreement index between the model and the unmodelled data, while “Aoverall” is the agreement of the model as a whole, based on the individual dates (see Bronk Ramsay 1995; 2009). Red lettering indicates the data of primary interest in the model.

	Uncal. BP	**Unmodelled (BC/AD)**			**Modelled (BC/AD)**				
Name		**from**	**to**	**%**	**from**	**to**	**%**	**A**	**C**
Sequence									
Boundary Start 1					-2091	-1954	95.4		97.9
Phase 1									
R_Date Wk-35066-5A	3671±25	-2139	-1961	95.4	-2047	-1950	95.4	76.5	99.3
R_Date Wk-25736-5A	3662±30	-2138	-1950	95.4	-2045	-1947	95.4	100.7	99.3
R_Date Wk-25738-5A	3635±30	-2132	-1900	95.4	-2036	-1946	95.4	125.5	99.3
R_Date Wk-35062-5A	3630±25	-2127	-1900	95.4	-2032	-1950	95.4	119.9	99.3
R_Date Wk-35064-5A	3594±25	-2027	-1886	95.4	-2030	-1941	95.4	85	99.3
Span Phase 1					0	94	95.4		99.4
Boundary End 1					-2023	-1916	95.4		99.7
Interval Phase 1 to 2					0	145	95.4		99.9
Boundary Start 2					-1981	-1791	95.4		99.9
Phase 2									
R_Date Wk-35065-5A	3547±25	-2007	-1772	95.4	-1944	-1778	95.4	117.4	99.9
R_Date Wk-25737-5A	3545±30	-2010	-1769	95.4	-1944	-1778	95.4	120.4	99.9
R_Date Wk-35063-5A	3531±25	-1945	-1766	95.4	-1940	-1778	95.4	104.2	99.7
Span Phase 2					0	95	95.4		99.9
Boundary End 2					-1926	-1751	95.4		99.5
Interval Phase 2 to 3					0	209	95.4		99.6
Boundary Start 3					-1891	-1641	95.4		98.9
Phase 3									
R_Date TUa-3537-5B	3395±45	-1873	-1541	95.4	-1879	-1609	95.4	95.1	98.7
R_Date T-15741-5B	3385±80	-1887	-1503	95.4	-1881	-1597	95.4	109.5	98.7
Span Phase 3					0	96	95.4		99.9
Boundary End 3					-1874	-1511	95.4		96.6
Span All					103	540	95.4		97.7
Indices: Amodel= 117.1 Aoverall= 114									

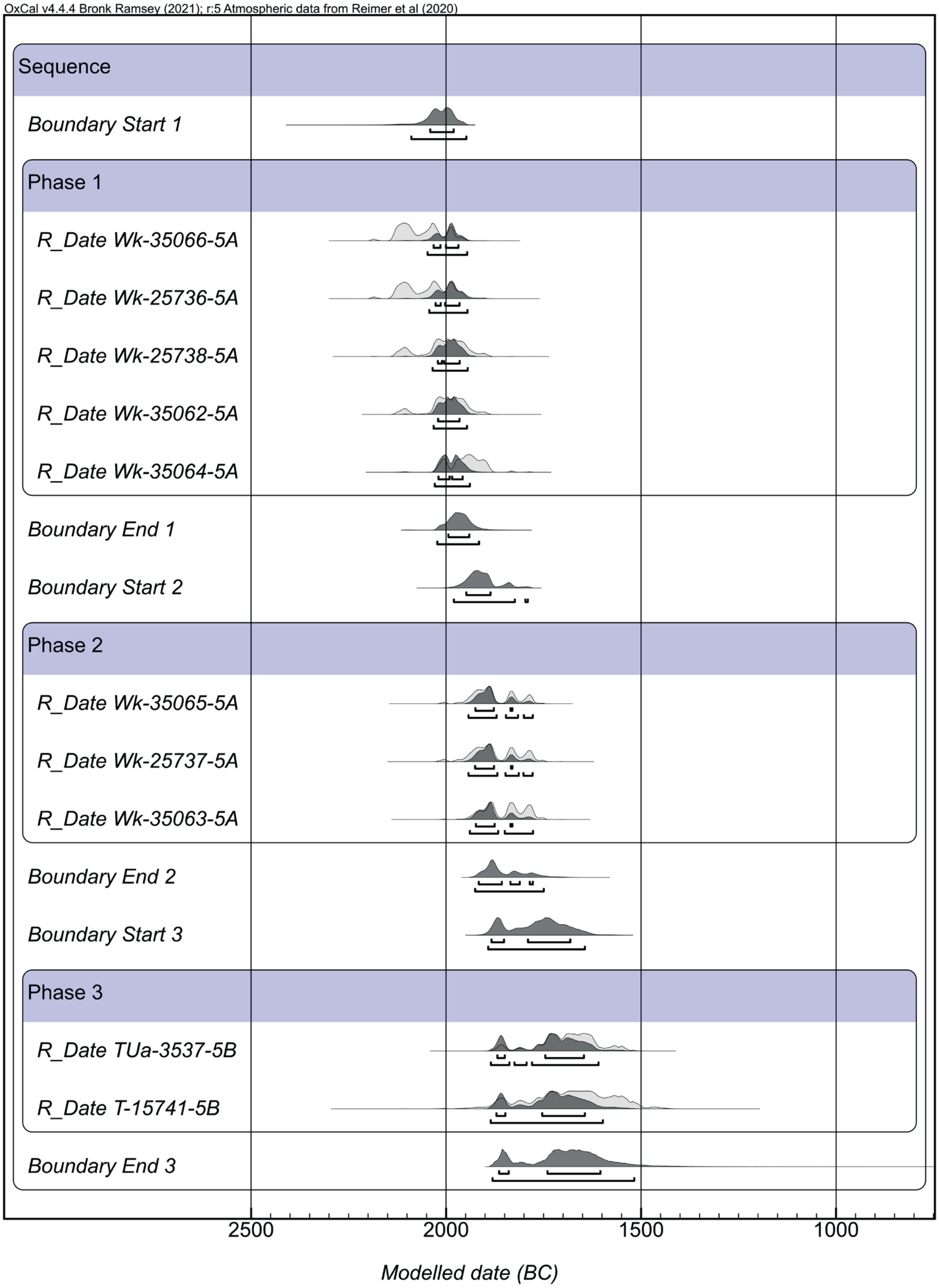

Figure A2.1. Probability diagram for the three-phase Bayesian model run in OxCal 4.4.

Four-Phase Model for Houses 5A and 5B

A four-phase model was constructed by re-assigning the two oldest dates for House 5A – which included one of the lower-agreement dates – to a new Phase 1 (Table A2.1). Table A2.3 summarizes the results of this model, run with individual phase spans, the duration of the intervals between the phases, and the total time span for the dated activities at both houses. Again, all results are given at the 95.4% level of probability. Figure A2.2 shows the probability distribution multiplot for this model. In this case there was an improvement in the individual agreement indices of the two weaker samples in the three-phase models. Date 3671±25 BP went from 76.5% to 103.9%, while date 3594±25 BP went from 85% to 102.8%. However, one of the samples from House 5B (3395±45 BP) dropped from 95.1% in the three-phase model to 85.8%, and one from House 5A (3635±30 BP) from 125.5% to 115%, so there are both up and down adjustments. The generalized agreement indices, however, both show slight improvements over the three-phase model: Amodel= 132.8% Aoverall= 126%. Nevertheless, one cannot conclude that the four-phase model is "better" than the three-phase result, it is just a different statistical outcome. Furthermore, the three-phase model is closely related to the archaeological context, while the four-phase model is a more arbitrary "what if" exercise.

In the four-phase model Phase 1 has a span of 0–55 years and the interval between phases 1 and 2 is 0–111 years. Phase 2 has a span of 0–61 years and the interval between phases 2 and 3 is 0–127 years. Phase 3 has a span of 0–86 years and the interval between phases 3 and 4 is 0–197 years. Phase 4 has a span of 0–82 years. Finally, the overall span of the dwelling activities associated with houses 5A and 5B is 83–579 years.

Discussion: Houses 5A and 5B

The simple pairwise statistical comparison of dates described in Chapter 5 resulted in the inference of a three-phase sequence. The results of the three-phase Bayesian model do not contradict this, and the four-phase model does not provide additional insight. Bayesian modelling also provides us with estimates of the chronological dimensions of the phases. In the three-phase model, phase spans vary between 0–96 years, with the shortest span of 94 years. The intervals between the phases are from 0–209 years. In the four-phase model, phase spans vary between 0–86 years, with the shortest span of 55 years (Phase 1). The intervals between the phases are from 0–197 years. Considered from a human perspective, for both models the maximum phase spans are equivalent to three to four generations[4], while the maximum between-phase interval durations could be six or seven generations, although all these estimates could be considerably shorter, statistically speaking. Both models produce broadly similar results for the overall time span of activities related to houses 5A and 5B: 103–540 years (three-phase model) and 83–579 years (four-phase model). In human terms this is roughly 3 to 20 generations.

For clarity, the modelled boundaries of the phases at 95.4% probability are summarized in Table A2.4; there is considerable overlapping between the phase boundaries under both models. A graphical example of the overlap is shown more clearly in Figure A2.3, a modified version of the OxCal probability distribution plot for the three-phase model. This plot shows only the modelled probabilities for the start and end of each phase. A visual assessment suggests there is so much overlap it is difficult to define the phase boundaries in practice; this is especially the case for Phase 3 (House 5B), where the probability distributions are very broad. In part this is due to the use of a conventional radiocarbon date with a higher standard deviation (±80), but also because this part of the calibration curve is somewhat flat.

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[4] Fenner (2005) estimates the average hunter-gatherer generation length as being 28.6 years.

Table A2.3. Results of the four-phase Bayesian model for House 5A and 5B. Red lettering indicates the data of primary interest in the model.

	Uncal. BP	**Unmodelled (BC/AD)**			**Modelled (BC/AD)**				
Name		**from**	**to**	**%**	**from**	**to**	**%**	**A**	**C**
Sequence									
Boundary Start 1					-2183	-1975	95.4		98.8
Phase 1									
R_Date Wk-35066-5A	3671±25	-2139	-1961	95.4	-2133	-1976	95.4	103.9	99.5
R_Date Wk-25736-5A	3662±30	-2138	-1950	95.4	-2132	-1975	95.4	110	99.6
Span Span P1					0	55	95.4		100
Boundary End 1					-2116	-1961	95.4		99.6
Interval Int1to2					0	111	95.4		99.8
Boundary Start 2					-2053	-1939	95.4		99.9
Phase 2									
R_Date Wk-25738-5A	3635±30	-2132	-1900	95.4	-2027	-1931	95.4	115	99.9
R_Date Wk-35062-5A	3630±25	-2127	-1900	95.4	-2026	-1932	95.4	112	100
R_Date Wk-35064-5A	3594±25	-2027	-1886	95.4	-2023	-1926	95.4	102.8	99.9
Span Span P2					0	61	95.4		100
Boundary End 2					-2014	-1898	95.4		99.9
Interval Int2to3					0	127	95.4		99.9
Boundary Start 3					-1969	-1791	95.4		99.9
Phase 3									
R_Date Wk-35065-5A	3547±25	-2007	-1772	95.4	-1941	-1778	95.4	119.3	99.9
R_Date Wk-25737-5A	3545±30	-2010	-1769	95.4	-1941	-1778	95.4	122.5	100
R_Date Wk-35063-5A	3531±25	-1945	-1766	95.4	-1937	-1778	95.4	105.8	99.9
Span Span P3					0	86	95.4		100
Boundary End 3					-1926	-1754	95.4		99.9
Interval Int3to4					0	197	95.4		99.9
Boundary Start 4					-1895	-1652	95.4		99.7
Phase 4									
R_Date TUa-3537-5B	3395±45	-1873	-1541	95.4	-1882	-1616	95.4	85.8	99.3
R_Date T-15741-5B	3385±80	-1887	-1503	95.4	-1884	-1615	95.4	103.5	99.3
Span Span P4					0	82	95.4		100
Boundary End 4					-1879	-1556	95.4		98.2
Span All					83	579	95.4		97.6
Indices: Amodel= 132.8% Aoverall= 126%									

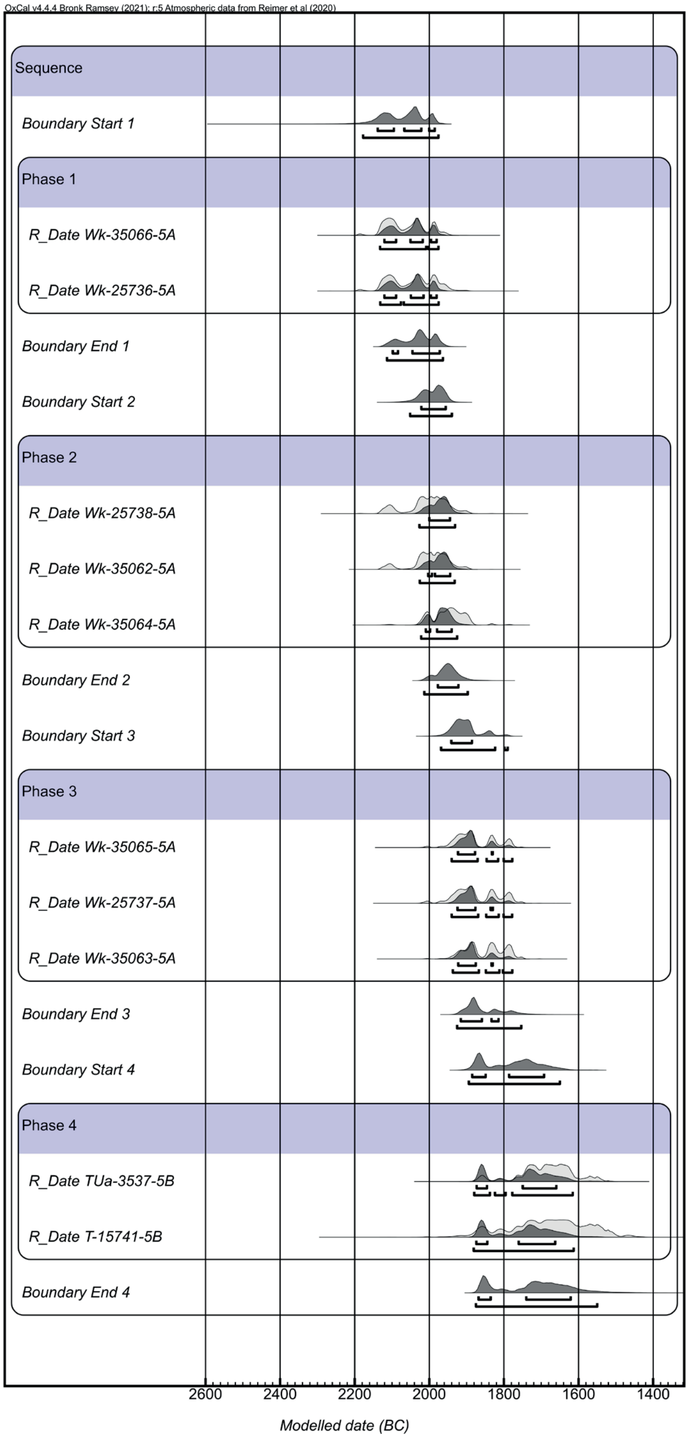

Figure A2.2. Probability diagram for the four-phase Bayesian model run in OxCal 4.4.

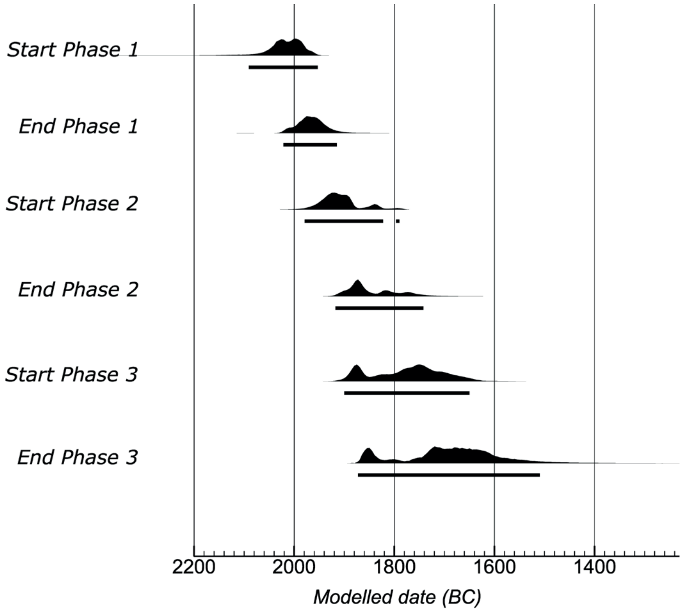

Figure A2.3. OxCal 4.4 plot of the probabilities for the start and end of each phase in the three-phase model.

Table A2.4. Summary of the modelled phase boundaries, given the 95.4% probability level.

Three Phase Model			**Four Phase Model**		
	Start	**End**		**Start**	**End**
Phase 1	2091–1954 BC	2023–1916 BC	**Phase 1**	2183–1975 BC	2116–1961 BC
			Phase 2	2053–1939 BC	2014–1898 BC
Phase 2	1981–1791 BC	1926–1751 BC	**Phase 3**	1969–1791 BC	1926–1754 BC
Phase 3	1891–1641 BC	1874–1511 BC	**Phase 4**	1895–1652 BC	1879–1556 BC

The Total Site Model

Table A2.5 provides results from the four-phase modelling of the 28 dates from Ust-Drozdovka IУ and III. As noted above, because of the loose contextual constraints on many of the dates included in the analysis, the modelled phase dates should be regarded as only providing a general summary of the activity sequence. Instead, the focus here is on estimating the overall site occupation span, which was calculated as ranging from 187 to 698 years (95.4% prob.). These numbers may not seem that useful, but they at least provide an estimate of site longevity based on the statistical properties of the calibrated radiocarbon dates, rather than a rough intuitive interpretation. On the other hand, future excavation of additional houses at Ust-Drozdovka might change the picture considerably.

Conclusion

Do these results provide us with additional insight into the sequence of activities at the House 5 locality and at Ust-Drozdovka as a whole? On the

Table A2.5. Total site model: Results of a four-phase Bayesian model for all appropriate dates from Ust-Drozdovka IУ and III. Red lettering indicates the data of primary interest in the model.

	Uncal. BP	**Unmodelled (BC/AD)**			**Modelled (BC/AD)**				
Name		**from**	**to**	**%**	**from**	**to**	**%**	**A**	**C**
Sequence									
Boundary Start 1					-2298	-2033	95.4		99.1
Phase 1									
R_Date TUa-3536 CP	3755±60	-2434	-1975	95.4	-2227	-2024	95.4	111.6	99.7
R_Date TUa-4403 H1	3730±40	-2283	-1983	95.4	-2204	-2029	95.4	109.5	99.7
Span					0	84	95.4		100
Boundary End 1					-2186	-1999	95.4		99.8
Boundary Start 2					-2068	-1961	95.4		99.8
Phase 2									
R_Date Wk-35066-5A	3671±25	-2139	-1961	95.4	-2042	-1953	95.4	76.1	99.9
R_Date Wk-25736-5A	3662±30	-2138	-1950	95.4	-2039	-1951	95.4	100.7	99.9
R_Date Wk-25738-5A	3635±30	-2132	-1900	95.4	-2034	-1948	95.4	126.1	99.9
R_Date Wk-35062-5A	3630±25	-2127	-1900	95.4	-2031	-1950	95.4	120.6	99.9
R_Date T-15743	3605±115	-2292	-1632	95.4	-2041	-1936	95.4	139.4	99.9
R_Date T-11917	3630±120	-2402	-1642	95.4	-2042	-1937	95.4	141.9	99.9
R_Date Su-2841	3680±70	-2286	-1886	95.4	-2044	-1942	95.4	107.7	99.9
R_Date Wk-35070	3609±33	-2121	-1884	95.4	-2032	-1942	95.4	114.2	99.9
R_Date Wk-35064-5A	3594±25	-2027	-1886	95.4	-2028	-1939	95.4	87	99.9
Span					0	104	95.4		99.9
Boundary End 2					-2021	-1911	95.4		99.8
Boundary Start 3					-1952	-1783	95.4		99.6
Phase 3									
R_Date Wk-35065-5A	3547±25	-2007	-1772	95.4	-1922	-1777	95.4	113	99.9
R_Date Wk-35063-5A	3531±25	-1945	-1766	95.4	-1917	-1777	95.4	127	99.8
R_Date Wk-25737-5A	3545±30	-2010	-1769	95.4	-1921	-1777	95.4	120.2	99.8
R_Date Wk-25735 Cham	3509±30	-1922	-1745	95.4	-1905	-1777	95.4	108.8	99.8
R_Date Tua-4402 H7	3515±45	-2008	-1694	95.4	-1912	-1777	95.4	122.4	99.9
R_Date Wk-35067 CP	3500±25	-1894	-1744	95.4	-1899	-1777	95.4	95.2	99.9
R_Date Wk-25739	3566±30	-2022	-1776	95.4	-1927	-1777	95.4	82.6	99.8
R_Date Su-2839	3560±60	-2125	-1700	95.4	-1921	-1777	95.4	119.8	99.8
R_Date T-15742	3550±90	-2139	-1633	95.4	-1917	-1777	95.4	133.1	99.8
R_Date LE-5973	3560±130	-2284	-1542	95.4	-1915	-1778	95.4	134.6	99.8
R_Date Wk-35068	3521±25	-1929	-1751	95.4	-1911	-1777	95.4	119.1	99.9
R_Date LE-5969	3460±120	-2132	-1500	95.4	-1910	-1778	95.4	120.1	99.8
R_Date T-11918	3460±110	-2115	-1506	95.4	-1910	-1778	95.4	117.4	99.8
R_Date Su-2840	3520±80	-2119	-1624	95.4	-1913	-1778	95.4	134.7	99.8
R_Date T-15744 Cham	3465±105	-2111	-1510	95.4	-1910	-1778	95.4	118.7	99.8

Span					0	128	95.4		99.8
Boundary End 3					-1892	-1760	95.4		99.7
Boundary Start 4					-1881	-1644	95.4		99.7
Phase 4									
R_Date TUa-3537-5B	3395±45	-1873	-1541	95.4	-1876	-1611	95.4	99.6	99.6
R_Date T-15741-5B	3385±80	-1887	-1503	95.4	-1876	-1599	95.4	112.8	99.6
Span					0	89	95.4		100
Boundary End 4					-1871	-1529	95.4		98.7
Span Allspan					**187**	**698**	95.4		98.8
Indices: Amodel 197.7 **Aoverall 196**									

one hand, the inference of three phases from the simple bivariate tests is supported by the modelling results. This is not surprising given that the bivariate results formed the basis for the Bayesian phasing, but the modelling did reveal that two dates have a weaker fit with the three-phase model, which raises questions concerning how the phases were defined. On the other hand, the number of dates is low, and we cannot claim to have dated all the contexts possibly relevant to capturing the full history of house activities. This could have a significant impact on how we recognize phases and on the estimation of phase and interval duration. The Bayesian analyses do not provide that much help in defining the spans of the dwelling/activity phases or the length of the intervals between them. The spans and intervals could be relatively short – a few years – or relatively long – several human generations. Even the overall time span of houses 5A and 5B remains unclear: from as little as three generations up to 20. Seen critically, it seems this does not take us much further than the more intuitive analysis and simple statistical evaluation that we started with. Finally, the estimation of total settlement longevity does provide us with a useful probabilistic estimate based on the current data, but it is limited by the lack of investigation of the other houses at the site.

Despite these shortcomings, this analytical exercise shows what might be possible with a larger and more representative suite of radiocarbon dates from well-controlled contexts that could provide robust constraints for modelling. Rather than simply "eyeballing" possible overlaps between dates in multiplots – and in so doing perhaps confirming our prior biases – we have tools that can provide a better understanding of the probabilistic nature of dates and their calibrations, and thereby facilitate a more critical understanding of our chronologies.

Supplemental Information

OxCal Programming Language for the House 5A/5B Three-Phase Model

```
Plot()
 {
 Sequence()
 {
  Boundary("Start 1");
  Phase("1")
  {
   R_Date("Wk-35066-5A", 3671, 25);
   R_Date("Wk-25736-5A", 3662, 30);
   R_Date("Wk-25738-5A", 3635, 30);
   R_Date("Wk-35062-5A", 3630, 25);
   R_Date("Wk-35064-5A", 3594, 25);
   Span("span phase 1");
  };
  Boundary("End 1");
  Interval("Int1to2");
```

```
  Boundary("Start 2");
  Phase("2")
  {
   R_Date("Wk-35065-5A", 3547, 25);
   R_Date("Wk-25737-5A", 3545, 30);
   R_Date("Wk-35063-5A", 3531, 25);
   Span("span phase 2");
  };
  Boundary("End 2");
  Interval("Int2to3");
  Boundary("Start 3");
  Phase("3")
  {
   R_Date("TUa-3537-5B", 3395, 45);
   R_Date("T-15741-5B", 3385, 80);
   Span("span phase 3");
  };
  Boundary("End 3");
  Span("span all, Start 1-End 3");
 };
};
```

OxCal Programming Language for the House 5A/5B Four-Phase Model

```
Plot()
 {
 };
 Sequence()
 {
  Boundary("Start 1");
  Phase("1")
  {
   R_Date("Wk-35066-5A", 3671, 25);
   R_Date("Wk-25736-5A", 3662, 30);
   Span("Span P1");
  };
  Boundary("End 1");
  Interval("Int1to2");
  Boundary("Start 2");
  Phase("2")
  {
   R_Date("Wk-25738-5A", 3635, 30);
   R_Date("Wk-35062-5A", 3630, 25);
   R_Date("Wk-35064-5A", 3594, 25);
   Span("Span P2");
  };
  Boundary("End 2");
  Interval("Int2to3");
```

```
  Boundary("Start 3");
  Phase("3")
  {
   R_Date("Wk-35065-5A", 3547, 25);
   R_Date("Wk-25737-5A", 3545, 30);
   R_Date("Wk-35063-5A", 3531, 25);
   Span("Span P3");
  };
  Boundary("End 3");
  Interval("Int3to4");
  Boundary("Start 4");
  Phase("4")
  {
   R_Date("TUa-3537-5B", 3395, 45);
   R_Date("T-15741-5B", 3385, 80);
   Span("Span P4");
  };
  Boundary("End 4");
  Span("AllSpan Start 1-End 4");
   };
```

OxCal Programming Language for the Ust-Drozdovka II/ IУ Site Model

```
Plot()
 {
 };
 Sequence()
 {
  Boundary("Start 1");
  Phase("1")
  {
   R_Date("TUa-3536 CP", 3755, 60);
   R_Date("TUa-4403 H1", 3730, 40);
   Span();
  };
  Boundary("End 1");
  Boundary("Start 2");
  Phase("2")
  {
   R_Date("Wk-35066-5A", 3671, 25);
   R_Date("Wk-25736-5A", 3662, 30);
   R_Date("Wk-25738-5A", 3635, 30);
   R_Date("Wk-35062-5A", 3630, 25);
   R_Date("T-15743", 3605, 115);
   R_Date("T-11917", 3630, 120);
   R_Date("SU-2841", 3680, 70);
   R_Date("Wk-35070", 3609, 33);
```

```
  R_Date("Wk-35064-5A", 3594, 25);
  Span();
 };
 Boundary("End 2");
 Boundary("Start 3");
 Phase("3")
 {
  R_Date("Wk-35065-5A", 3547, 25);
  R_Date("Wk-35063-5A", 3531, 25);
  R_Date("Wk-25737-5A", 3545, 30);
  R_Date("Wk-25735 Cham", 3509, 30);
  R_Date("Tua-4402 H7", 3515, 45);
  R_Date("Wk-35067 CP", 3500, 25);
  R_Date("Wk-25739", 3566, 30);
  R_Date("Su-2839", 3560, 60);
  R_Date("T-15742", 3550, 90);
  R_Date("LE-5973", 3560, 130);
  R_Date("Wk-35068", 3521, 25);
  R_Date("LE-5969", 3460, 120);
  R_Date("T-11918", 3460, 110);
  R_Date("Su-2840", 3520, 80);
  R_Date("T-15744", 3465, 105);
  Span();
 };
 Boundary("End 3");
 Boundary("Start 4");
 Phase("4")
 {
  R_Date("TUa-3537-5B", 3395, 45);
  R_Date("T-15741-5B", 3385, 80);
  Span();
 };
 Boundary("End 4");
 Span("Allspan", Start 1-End 4);
};
```

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