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MESOLITHIC SETTLEMENT IN NORTHERNMOST SWEDEN: ECONOMY, TECHNOLOGY, CHRONOLOGY

Abstract
In this paper the chronology of early Stone Age sites in Norrbotten (the northernmost part of Sweden) is studied, with the purpose of understanding human and faunal migration into Norrbotten and adaptation to the new environment during the Mesolithic after the latest glaciation. The results from radiocarbon dates acquired of burnt bones from both old and new data from selected sites in Norrbotten, and a reanalysis of the lithic material for the purpose of identifying the technological traditions, form a foundation for further studies about faunal history and economy on archaeological sites in northern Sweden. The results also connect the introduction of flora and fauna into the newly ice-free area in Sweden with the movement of animals and people in Finland. Especially the late introduction of hunting seals in northern Sweden strengthens the argument for connections to Finland rather than to southern Sweden.

Keywords: Mesolithic, fauna, radiocarbon dates, stone technology

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INTRODUCTION

This paper is a pilot study that deals with human and faunal migration into Norrbotten, the northernmost county in Sweden, during the period of the melting of the Weichsel ice sheet, and the changes in settlements and economy of the area during the Middle and Late Mesolithic period, c 9000–4000 calBC. The study is a pre-study to a larger study involving a larger geographical area.

One of the major problems of dating prehistoric sites not only in Norrbotten, but the entire Norrland (the northern half of Sweden), is how to argue for an association between radiocarbon dates and artefacts. Due to thin vegetation, the artefacts from prehistoric sites are often found right beneath the top soil, which complicates the interpretation due to the lack of stratigraphy. The assemblages often represent palimpsests of material from several periods, making the relation of dates, features and artefacts difficult. Furthermore, due to the decomposition of organic materials in the acid soil, artefacts made of wood and unburnt bones are rarely found in sunken features (Borg et al. 1994: 97–8; Björdal 1999: 120–1; Christensson 1999: 172–3). Burnt bones, however, do survive, which gives one option to dating the sites (Lanting & Brindley 1998: 7). Most sites are thus chronologically mixed, and so even at sites that do bear a stratigraphy in this area, such as Rappasundet, Döudden/Varghalsen or Garaselet (Knutsson 1993: 25; Bergman 1995), it is often difficult to distinguish which feature belongs to which period. At all of these inland sites it is therefore important to do a careful contextual analysis of the provenance of artefacts and samples for radiocarbon analyses.

Bones from animals that live in the sea or feed on animals from marine habitats may yield dates exceeding their actual age, due to the so-called reservoir effect. It is therefore important

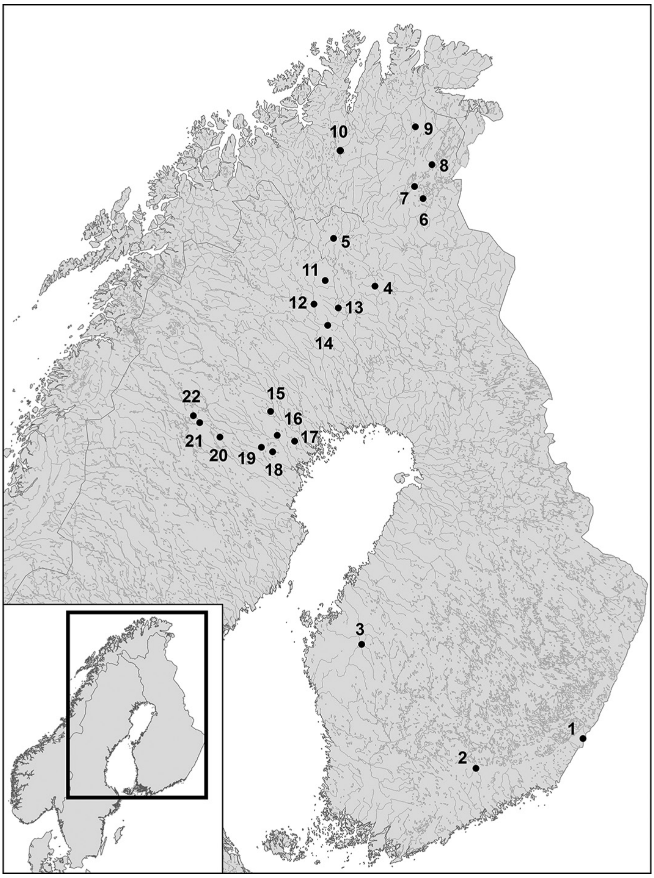

Fig. 1. Map of sites with radiocarbon-dated bone samples from Norway, Sweden and Finland mentioned in the paper: 1 – Saarenoja 2; 2 – Ristola; 3 – Nurmo; 4 – Kittilä; 5 – Museotontti; 6 – Kaunisniemi 3; 7 – Vuopaja; 8 – Lahdenperä 1; 9 – Sujala; 10 – Buolžajávri Nord-3; 11 – Kitkiöjärvi; 12 – Kangos; 13 – Aareavaara; 14 – Pajala 238; 15 – Bodträskfors; 16 – Stockberg; 17 – Alträsket; 18 – Petbergsliden; 19 – Kantaberget; 20 – Skiljesmyren; 21 – Dumpokjauratj; 22 – Ipmatisjauratj. Map: T. Ekholm.

to choose bones from terrestrial over marine animals for analysis, as well as animals with a terrestrial diet over those feeding on marine sources (Lanting & van der Plicht 1998: 151; Lanting et al. 2001: 249–50; Hedman 2009: 5). This does not, however, affect burnt bones as much as it does unburnt bones. Structural carbonate, which is used when dating burnt bones, originates from the whole diet rather than just animal protein. Bone samples from predators feeding on marine sources only are still affected, though (Lanting & Brindley 1998: 6). Since fish bones usually are too small for ^{14}C dating, fish do not present a problem in this case. Seal bones, on the other hand, are larger and therefore more suitable for ^{14}C dating.

Subfossil remains prove that the ringed seal (*Phoca hispida*) was present already in the Ancylus Lake. A seal bone found at a historical-period site situated by the coast of the Ancylus Lake in the area of present day Nurmo, central Finland (Fig. 1), was dated to 9505±85 BP (Hela-440) (Ukkonen 2002: 192). There are, however, no finds of seal bones from the earliest settlements on the Finnish coast (Takala 2004: 61–2; Jussila et al. 2007; Pesonen 2010; K. Mannermaa, pers. comm.). Since there are osteological remains of forest animals on the sites and there are seal bones found at other sites along the Baltic Sea coast (e.g. Knutsson et al. 2011), the reason must be related to a cultural difference. This could be a difference in handling the bones, i.e. the bones were not burnt but instead decomposed, or perhaps they did not even hunt seals. Some of the first groups of known settlers in Finland were Butovo groups from north-west Russia, which had no hunting strategy for sea mammals. The fauna on the Butovo sites is the typical taiga fauna with European elk and beaver. When these people reached the coast they may have continued to feed on their usual diet instead of changing the diet (Sulgostowska 2003: Fig. 7.2; Veski et al. 2005; Zhilin 2005; Kriiska & Tvauri 2007: 21, 24–6; Hartz et al. 2010).

The first settlers in northern Norway, on the other hand, lived by the coast and the ice sheet covered the inland at that time. There are no bones left on those sites, but one must assume that the people fed on a marine diet since there were no forests (Glørstad 2013: 58–9). They were most probably descendants from the late glacial Ahrensburgian groups (the Komsa culture) and came from the south-west, along the coast of Norway. Soon after their arrival, different groups entered northern Norway from the south-east (Finland) (Sørensen et al. 2013: 46) and the two groups met not far from Norrbotten. The question is where the first settlers of Norrbotten came from, as this is of some importance for the analysis of the economy of these groups.

A preceding research project titled *Mellan is och hav* (En. Between the Ice and the Sea) was instituted by Norrbotten's Museum in 2006. This idea was to find and define the earliest settlements in Norrbotten. Since this is an area where shoreline displacement is pronounced, it began with a survey along the highest coastline to find the oldest coast-bound settlements. During that project, the site designated as Pajala 238 in this study was found, and later on also the site Aareavaara, the oldest archaeological site in Norrbotten (Östlund 2006: 3; 2011: 5). The findings, which may shed some light on the question of origin of the first populace, will be discussed later on, when an attempt to define the cultural background of the first settlers is done.

PURPOSE

The aim of this paper is to date different Mesolithic contexts with burnt animal bones from sites claimed to belong to the early Stone Age in northernmost Sweden. In that way, I explore the movement of humans into the new ice-free area and, also, if their ecology changed as they adapted to the changing environment. The results from this study, together with similar data from middle and southern Norrland, will later be used in a larger study to discuss the introduction of and use of different animal species throughout the Mesolithic in Norrland. The purpose of this study is thus to:

- Identify potentially old sites with zoological assemblages
- Radiocarbon-date selected faunal species
- Radiocarbon-date certain feature types
- Date the stone technology connected to the radiocarbon-dated contexts

When the economy, the stone technology and different feature types are connected to the chronology, similarities and differences can perhaps become visible, helping to address the question of the origin of the first settlers and the process of adaption. Since the ice sheet melted rapidly the water level and the quaternary geology must have played an important role in the settlement process. The quaternary geology and the climate steered the introduction of plants, which in turn were essential for the establishment of fauna. One aim of this study is thus also to contextualize the sites in the natural environment.

METHOD

The first step in finding information about possible Mesolithic sites in Norrbotten was to search the *ADIN 1950–1995* (Ramqvist 2000), a database of all archaeological sites excavated between 1950 and 1995 in the region of Norrland. Also *Fornminnesinformationssystemet* (FMIS, see www.fmis.raa.se), a national database of archaeological sites maintained by the Swedish National Heritage Board, was used to complement the information, as data on more recent excavations can be found there. The second step was to identify good contexts with samples of burnt bone for radiocarbon measurements from the sites chosen for the study: Stockberg, Alträsket, Bodträskfors, Pajala 238, Petbergsliden and Kantaberget (Fig. 1). This was accomplished by:

- Searching for zooarchaeological assemblages from closed contexts at the site
- Surveying and clarifying the lithic assemblages connected to the site

All of the zooarchaeological assemblages derived from these sites were already dated to the Mesolithic with charcoal, other bone samples or artefact typology. The zooarchaeological assemblages were also already analysed, but the spe-

Sample	Site	Raä	Context	Species	Bone Element
Stockberg 1	Stockberg	Älvsby 912:1	Cooking pit A1	Elk	Phalanx I
Stockberg 2	Stockberg	Älvsby 912:1	Cooking pit A1	Reindeer	Phalanx II
Alträsket 1	Alträsket	Överluleå 184:1	Hearth A1	Ringed seal	Phalanx
Alträsket 2	Alträsket	Överluleå 184:1	Hearth A4	Ringed seal	Talus
Bodträskfors 1	Bodträskfors	Edefors 405:1	Whole site	Elk	Sesamoideum
Bodträskfors 2	Bodträskfors	Edefors 405:1	Whole site	Ringed seal	Metatarsus III
Pajala 238	Pajala 238	Pajala 238:1	Survey finds	Reindeer	Talus
Petbergsliden	Petbergsliden	Älvsby 282:1	Survey finds	Elk	Phalanx I
Kantaberget	Kantaberget	Älvsby 461:1	Survey finds	Beaver	Talus

Table 1. The samples chosen for the study, listed according to the reliability of the context.

cies determination was confirmed by the author, using T. Ekholm's private osteological reference collection and the osteological reference collection at the Evolutionary Museum in Uppsala, before the samples were sent to the Ångström Laboratory in Uppsala, Sweden, for AMS radiocarbon dating. The calibrations of the dates were done with the OxCal v4.2.4 program (Bronk Ramsey & Lee 2013) using IntCal13 (Reimer et al. 2013). The dates mentioned in the text are uncalibrated and calibrated data, given a 2-sigma confidence level, is to be found in Table 3. Calibrated data from previously published sources is presented in Appendix 1.

As part of the investigation, the lithic artefacts from the assemblages of the sites were reanalysed by archaeologist Olof Östlund at the regional museum of Norrbotten (see Appendix 2) to see if there was any chronological trend in the material and to be able to compare the finds to contemporaneous lithic industries in the region.

MATERIAL

The selected contexts and samples for the study are:

1. A cooking pit (A1) with charcoal, fire-cracked stones, burnt bones and reddish sand at the site Stockberg 4:1 in Älvsby Parish. In the excavation report it is interpreted to be situated underneath a semi-subterranean house, at 100 m a.s.l. on a former cape in a bay which today is a part of the Stockfors River (Färjare 1996). A previous date, 4290±60 BP (Ua-3711) (Färjare 1996: Appendix 18), from a charcoal sample taken from the cooking pit, with no species or own age determination, gave 5552–5261 calBC (Färjare 1996: 7, 26), but turned out to have been miscalculated in the report. When recalibrated, it resulted in 3093–2851 calBC. Other undetermined charcoal samples from the site have also been dated. Two samples were collected from a layer of fire-cracked stones, soot and charcoal. The radiocarbon dates were 5545±75 BP (St-13729) and 5320±65 BP (St-13727) (Färjare 1996: 14). In the bottom of the semi-subterranean house, a layer, paler than the surrounding layer, was dated to 6495±65 BP (Ua-3712) (Färjare 1996: 7, 26). Two toe bones (*phalanx I* and *phalanx II*), the first one of elk (*Alces alces*) and the second one of reindeer (*Rangifer tarandus*), were used to date the cooking pit (Table 1).

2. At the Alträsket site, in Överluleå Parish, two contexts were of interest. The first one was a hearth (A1) with fire-cracked stones and burnt bones, and from which a toe bone of ringed seal (*Phoca hispida*) was chosen as a sample. In the report the hearth was interpreted to be situated underneath a semi-subterranean house (Structure A). The house structure was situated at 93.66–103.26 m a.s.l. (Halén 1994).

3. The second context at Alträsket was a hearth (A4) with soot, charcoal, fire-cracked stones and burnt bones, also interpreted to be situated underneath the same semi-subterranean house as hearth A1 (Halén 1994). A4 has been

previously dated to 6285±110 BP (Ua-1590), and other undetermined charcoal samples from the site include 6045±105 BP (Ua-1587) and 5920±120 BP (Ua-1588) from a cooking pit, and 5725±115 BP (Ua-1589) from a hearth (Halén 1994: 52). For this study, an ankle bone (*talus*), also of ringed seal, was selected from hearth A4 (Table 1).

4. The site of Bodträskfors in Edefors Parish, situated by a former bay and at 90 m a.s.l., was damaged due to construction work by digging machines and the bone assemblage was spread over an area of c 26 m^2. The sampled material thus represents the whole site and the burnt bones were found together with a concentration of quartz flakes (Lindgren 2010: 15, 17). In connection to excavations, a charcoal sample of alder (*Alnus* sp.) was dated to 6146±41 BP (Ua-38318), a charcoal sample of pine (*Pinus sylvestris*) to 6743±45 BP (Ua-38319) and a bone of indeterminate species to 6777±180 BP (Ua-38320) (Lindgren 2010: 18). According to the isostatic uplift curve for this area (Lindén 2006), the shoreline at 90 m a.s.l. corresponds to a date around 5300 calBC. The samples chosen for this study consist of a hoof bone (*sesamoideum*) of elk and a paw bone (*metatarsal III*) of ringed seal (Table 1).

5. The site Pajala 238 in Pajala Parish has not been excavated but bones and lithics were found together in the course of a survey in the area. The bones in this analysis were collected under the turf next to an open surface where the ground was eroded. Pajala 238 was situated at 165 m a.s.l. by what is probably an old riverbed by the highest sea level (Östlund 2006: 8). A previous radiocarbon measurement, made of a bone sample without species determination, gave a date 7555±80 BP (Ua-33469) (Östlund 2006: 8). The osteological assemblage from the site consisted of reindeer bones, of which one talus was picked up for dating (Table 1).

6. The site Petbergsliden, in Älvsby Parish, is only partly studied with seven test pits, each having the size of 1 m^2. The bone assemblage was partly collected from three connected test pits (4, 6 and 8), partly from test pit 2 (Burman 1994: 3). The sample used in this analysis, a toe bone of elk (Table 1), came from test pit 2. The site has not been radiocarbon-dated before, but it was estimated to be from the Stone Age due to the character of the lithics, and more specifically from the Mesolithic as it is located by the former sea shore at 155 m a.s.l. (Burman 1994).

7. The site Kantaberget in Älvsby Parish has not been excavated but bones together with lithic artefacts were found in the course of a survey in the area. No archaeological report or osteological analysis of the surveyed material exists, only a description in FMIS (2016). As there were no obvious traces of later periods, the site was assumed to be Mesolithic. Of the six bones found at the site, a talus of beaver (*Castor fiber*) was taken for radiocarbon dating (Table 1).

THE SETTING

The quaternary geology of Norrbotten

The environment has changed a great deal since the first humans entered the newly ice-free area that constitutes Norrbotten today. At first the change was rapid, especially the geological change, and the people must have been aware of it from one generation to another (Lindén 2006: 13). As a backdrop to the cultural processes investigated in the study, a description of the landscape during the Mesolithic period is presented in the following.

In order to understand the situation for settlement and the first migration of humans, animals and plants to Norrbotten, the deglaciation processes and the eustatic process need to be discussed. There are several aspects that must have conditioned the possibility to settle the land rising out of the sea, not least how these groups of hunter-gatherers related to the terrestrial and aquatic fauna that was slowly establishing in the area.

The deglaciation of the Fennoscandian Ice Sheet was rapid during its last phases, and northward of Lake Vänern in Sweden and the southern coast of Finland the ice melted with the speed of approximately 600 metres per year. When the ice margin reached Norrbotten from the east, this eastern margin was subaquatic, which resulted in a more rapid melting of the ice (Fig. 2). The isostatic uplift rate was also very high, with over 90 mm per year in Norrbotten at 8500 calBC, just about the time when the first humans settled in the area. At that time there were almost no ice left, and the isostatic uplift

Fig. 2. Fennoscandia with the Fennoscandian Ice Sheet c 8000 calBC, during the time when the first signs of hunter-gatherer groups are found in Norrbotten. Map: T. Ekholm.

rate began to slow down, beginning c 1500 years after deglaciation (Lindén 2006: 11–3).

Today the isostatic uplift in the region is 8 mm per year and has been so for the last 5000 years. The drainage of the Ancylus Lake at the Great Belt, which took place 8000 calBC, caused a lowering of sea levels even in Norrbotten. The isostatic uplift remained constant, but the drainage of Ancylus Lake caused the land rise faster out of the sea (Lindén 2006: 13). The isostatic uplift was fastest in the coastal area of Norrbotten, because the ice sheet was at its maximum in this part of Scandinavia. The zone of highest ice accumulation and the maximum thickness of the ice sheet coincide with the present coastal area (Gembert 1996: 55–6; Bergman et al. 2004: 163). At the same time, water from the melting ice came rushing down the mountains, but the isostatic uplift was more rapid than the transgression (Lindén et al. 2006: 1). This means that the sea shore moved rapidly and the environment changed very fast from a coastal environment to an inland environment. When the Ancylus Lake drainage occurred, it must have represented an even more dramatic change.

The climate during the Mesolithic in Norrbotten

The first settlers most likely arrived to Norrbotten during the Preboreal period (9000–8000 calBC), when temperature was rising fast, the ice had retreated to the highest shoreline and the land had risen above water limit and had become accessible to humans. Due to the rapid isostatic rise of the land, the earliest known sites are found far away from the present shoreline (Möller et al. 2013: 104). During the Boreal period (8000–7000 calBC), or the second stage of the Early Mesolithic, the ice sheet was gone and the climate became dry and warm and the water limit in the lakes decreased (Robertsson 2009: 137). During this period the vegetation cover and faunal life changed from Arctic to Boreal forest type.

The natural environment

The first plants, established Norrbotten soon after the ice sheet had retreated, were light loving herbs, shrubs and bushes forming a tundra landscape. After a few centuries, the earliest trees such as birch (*Betula* sp.) aspen (*Populus tremula*) and pine (*Pinus sylverstris*) entered. Spruce (*Picea* sp.) and larch (*Larix decidua*) entered Norrland from the north and the east and reached Norrbotten soon after the ice melted (Robertsson 2009: 136). A study on macrofossils from lake cores from the Lakes Lunkkujärvi, Vähä-Aareajärvi and Aareajärvi söder (Möller et al. 2011: 3; 2013: 107) gives indication of the timing of the process. All of the studied lakes are situated close to the archaeological site of Aareavaara by the eastern border of Norrbotten. The oldest species among the samples within the study was the horsetail (*Equisetum arvense*), dated 8900±65 BP (LuS-9265) in Lake Lunkkujärvi and 10130±65 BP (LuS-9271) in Lake Vähä-Aareajärvi, which is contemporary with the results from the radiocarbon measurements performed on burnt bone from the archaeological site (10291±565 BP; Ua-38699 and 9637±128 BP; Ua-41267 at Raä 1276 and 9384±488 BP; Ua-38698 and 9192±237 BP; Ua-41266 at Raä 1277). Other species with old dates found in the lakes were sedge (*Cyperaceae* sp.) (8775±60 BP; LuS-9513), moor birch (*Betula pubescens*) and willow (*Salix* sp.) (8475±65 BP; LuS-9267), pondweed (*Potamogeton*) (8430±60 BP; LuS-9511) and marsh violet (*Viola palustris*) (8295±80 BP; LuS-9512). The oldest date of pine from the lakes was 7405±70 BP (LuS-9508) (Möller et al. 2011: 3; 2013: 107). It therefore seems that there were no trees when the first humans settled in the eastern part of the research area. According to these dates, the first trees (moor birch and willow) took root almost 2000 years after the first trace of human settlement, and the first pines grew almost 3000 years after the arrival of humans.

In the inland, near the Mesolithic sites of Dumpokjauratj and Ipmatisjauratj, Hörnberg et al. (2006) carried out a similar analysis in the nearby lake. The sediment was sampled every 0.5 –1 cm (Hörnberg et al. 2006: 15) and showed that birch and willow already was established in the area of Dumpokjauratj around 6400 calBC. It also seems that the ice first melted in the mountains and only then in the lower parts of the landscape. The tundra vegetation, with buckthorn (*Hippophaë* sp.) willow, wormwood (*Artemisia* sp.) sedge (*Cyperaceae* sp.) and hemp (*Humulus lupulus*), followed the ice margin. Climate change was fast and a semi-open birch forest with birch, aspen and pine was established rapidly. Wormwood, sedge and hemp were still present but herbs as ranunculus (*Ranunculus* sp.) and sorrel (*Rumex* sp.) were also present (Hörnberg et al. 2006: 20).

By the time of 6400 calBC, the birch-buckthorn-willow dominated forest began to change to mixed forest with more species, but later on to a forest dominated by pine (Hörnberg et al. 2006: 21). At Ipmatisjauratj the landscape saw similar vegetation changes, but with a delay of 300–400 years. When the mixed forest near Dumpokjauratj changed into a pine forest at around 6900 calBC, the vegetation near Ipmatisjauratj turned into a mixed forest. A pine dominated forest (with elements of spruce) was established at Ipmatisjauratj only at around 6100 calBC (Hörnberg et al. 2006: 22–3). Humans settled the area of Dumpokjauratj and Ipmatisjauratj when a forest environment was already established.

Around 6250 calBC (8200 calBP) a global climatological/geological cold event occurred (the so-called ‘8.2 ka event’). At this occasion, the cold water from the melting ice sheets around the northern part of the globe, together with the burst of the proglacial Lakes Agassiz and Ojibway in North America, cooled the water from the Gulf Stream and the climate became colder for several centuries (Ellison et al. 2006; Manninen 2014: 7). This cooling is seen in both Dumpokjauratj and Ipmatisjauratj, represented by the return of cold-adapted species such as buckthorn (Hörnberg et al. 2006: 22). In northern Fennoscandia in general, the 8.2 ka event did not affect the summer temperature, but the winters became colder (Manninen 2014: 13). At that time, both pine and elk were established in the ecosystem.

As the ice sheet continued to melt after the cool period of the 8.2 ka event, the pressure on land disappeared and caused several earthquakes and other seismic activities. One of those earthquakes may have caused a tilt of the landscape westwards and changed the direction of the water flow at the Dumpokjauratj site, resulting in an influx of water on the site. This is shown in the stratigraphic record as a sand layer on top of the gyttja layer to the south of the site.

On top of this there was probably an occurrence of a tsunami wave that backwashed the Norwegian Barents Sea coast (Bergman et al. 2004: 163; Hörnberg et al. 2006: 22; Carcaillet et al. 2012: 546; Manninen 2014: 15), which must have caused problems for the groups living there and perhaps also had effects, at least secondary, for the groups that now settled Norrbotten.

After the 8.2 ka event, the birch became more common in Dumpokjauratj and pine decreased again. When the climate became more stable, pine came to dominate forest vegetation (Hörnberg et al. 2006: 23). Carcaillet et al. (2012) confirm the results with a similar study of the area around Dumpokjauratj and underline that the tundra expanded in patches or existed for a short period of time. Vegetation spread to the region c 9000 calBC (Carcaillet et al. 2012). However, based on the charcoal present at the archaeological sites, Hörnberg et al. (2006) claim that the vegetation around the Mesolithic sites was transformed on purpose by humans burning the vegetation. Obviously, the first occupants would have needed plants as well to acquire nutrition and plant tissues.

The surrounding area

In northern Finland, especially in the inland, the introduction of vegetation showed a similar process as in northern Sweden, with rapid changes from tundra to mountain birch forests and later on to mixed forests with birch and pine. The reindeer is thought to have entered Finland from the Barents Sea coast while the landscape was still covered by tundra. Meanwhile, the elk is thought to have entered northern Finland from the south/south-east together with the expansion of forests (Manninen 2014: 13). The earliest date for reindeer in Finland lies at 8940±80 BP (Hela-1103) and derives from the site Sujala in the northern part of Finnish Lapland (Manninen 2014: Appendix 1). The earliest date of elk in northern Finland is 8915±60 BP from the Municipality of Kittilä (Sarala & Ojala 2011: 36). Tallavaara et al. (2014), among others, suggest that Finland was colonized by humans from the east and south-east, based on the provenience of imported raw material for stone tools. The possible routes would have been between the Gulf of Finland, Lake Ladoga, Lake Onega and the White Sea (Tallavaara et al. 2014: 164, 168; see also Takala 2004; Jussila et al. 2007).

Since the studies of the prehistoric environment in northern Norway are somewhat sparse, there is not much information about the pioneer flora and fauna in that area. In western Norway, the birch entered 600–700 years after the ice sheet was gone, and since the average temperature in northern Norway is lower than in the south, it takes more effort for the vegetation to grow (Tallavaara et al. 2014: 168). Even though the Norwegian coast (from Varanger Fjord to Oslo Fjord) was ice-free 14000–11000 calBC, there were no human settlements before 8000 calBC (Bang-Andersen 2012: 106). In Sweden the first sign of humans has been found in Aareavaara dated to 9384±488 BP (Ua-38698) but the dated burnt bone was from an unknown species and the probability range was almost 500 years. The earliest settlement with known species (reindeer) is Kangos, which is slightly later than both northern Norway and northern Finland.

RESULTS

New radiocarbon dates from Mesolithic sites in Norrbotten

In the following, the results from the radiocarbon measurements are presented site by site (see also Table 2).

The elk bone found in a cooking pit underneath a semi-subterranean house at Stockberg gave the result of 5622–5486 calBC, and a reindeer bone from the same site was dated to 5520–5326 calBC (Table 2). The previous date

Sample	Lab-index	BP	±	δ13C	Dated species	Other species at the site	Context
Stockberg 1	Ua-50777	6614	45	-29	Elk	Hare, fish	Cooking Pit
Stockberg 2	Ua-50778	6473	52	-27	Reindeer	Hare, fish	Cooking Pit
Alträsket 1	Ua-50771	6146	44	-28.5	Ringed seal	Elk	Hearth A1
Alträsket 2	Ua-50772	5827	42	-9.1	Ringed seal	Elk	Hearth A4
Bodträskfors 1	Ua-50773	6174	44	-28	Elk	Elk, marten, pike, burbot, whitefish	Whole site
Bodträskfors 2	Ua-50774	6077	48	-27.7	Ringed seal	Elk, marten, pike, burbot, whitefish	Whole site
Pajala 238	Ua-50779	7427	48	-16.7	Reindeer		Survey finds
Petbergsliden	Ua-50776	5790	45	-27.7	Elk	Fish	Survey finds
Kantaberget	Ua-50775	4739	42	-24.9	Beaver		Survey finds

Table 2. Radiocarbon datings obtained for this study.

from the cooking pit was 3093–2851 calBC and might indicate that it has been reused much later. There is a previous dating from a charcoal sample, 5565–5549/5523–5280 calBC, from a hearth underneath the house that corresponds to the new results.

The radiocarbon measurements from Alträsket were performed on two ringed seal bones from two different hearths. A toe bone from hearth A1 was dated to 5218–4979 calBC and a talus from hearth A4 was dated to 4788–4579 calBC (Table 2). The latter hearth had previously been dated to 5223 calBC using a charcoal sample, and other charcoal samples from the site have been dated to 4998 calBC, 4835 calBC and 4603 calBC. They thus correspond to the new dates.

Previous radiocarbon measurements from Bodträskfors were acquired from two charcoal samples: one of alder dated to 5220–4980 calBC and one of pine dated to 5730–5560 calBC. There was also an indeterminate piece of bone dated to 6050–5350 calBC. The two samples dated for this study yielded a date of 5230–4997 calBC for the elk bone and 5081–4844 calBC for the seal bone. These two datings are in line with each other and with the date acquired from alder charcoal, but deviate from the one acquired from the bone sample.

The result of the radiocarbon measurement from the reindeer bone sample taken from Pajala 238 gave a result of 6413–6223 calBC, which corresponds to the previous sample from the site (6570–6330 calBC).

Petbergsliden has not been radiocarbon-dated before the present study, but according to the report and based on the analysis of the stone assemblage from the survey test pits the site might be Mesolithic. The radiocarbon measurement done on the bone sample for this study shows that the site is dated to 4730–4529 calBC. This means that the site was used in the Late Mesolithic.

There is no report available for the Kantaberget site, and the lithic material could not be found, but according to the FMIS (2016) database the site is dated to the Stone Age site and there was a talus from beaver big enough to be dated. The bone, however, gave a Neolithic date (4739±42 BP; Ua-50775).

Overall, the dating project shows that most of the studied contexts are from Late Mesolithic. Only Pajala 238 is Middle Mesolithic and Kantaberget turned out to be Neolithic.

Species

The earliest species found on the sites of the area of Norrbotten were reindeer followed by elk. Both species are found in inland contexts and on the former coast. In the osteological assemblages from the Mesolithic sites of Norrbotten in general there are mainly reindeer, elk and ringed seal. From this study it seems the species entered the region in the following order: 1) reindeer; 2) elk; 3) seal; 4) beaver. Table 2 shows other species found at the same site. They are associated with the dated species, but can also date to a different period of time.

Contexts

In this study the number of contexts in general is low, and the number of different contexts is very low. There are samples from one cooking pit, one hearth, samples connected to one site and samples from three surveys. It is impossible to draw any conclusions of differences in species from the different contexts.

DISCUSSION

According to the results of this study, the first humans to establish themselves in the newly ice-free region of Norrbotten came to a tundra landscape, free from trees, around 9000–8000 calBC. They had probably followed their prey feeding on the tundra vegetation that followed the retreating ice westward. The climate, the vegetation and the prey animals were not new to them, but the landscape changed as they moved. Fig. 3 shows how certain key events in Norrbotten during the pioneer phase relate to each other.

The earliest date from a determined species in Norrbotten, according to this study, comes from a reindeer bone from the site of Kangos. It derives from the time of tundra vegetation which reindeers feed on. Not until a thousand years later, when taiga vegetation was established in Norrbotten, does the elk show up in the archaeological record. But question is still open concerning the animal species from the oldest known site in Norrbotten. Because of the fragmented bone material at Aareavaara, it was not possible to find a bone defined to species for the dating program (Östlund 2011: Appendix 3:2; 3:4). A bone from an unknown species has been previously dated, indicating that the site is the oldest in Norrbotten and even older than Sujala, the earliest known site in northern Finland. What makes it even more interesting is that the stone technology on the site seems to differ from what is found at the Sujala site. The people that came to Aareavaara were seemingly not used to work with quartz and the site may also be too early to be a Butovo site (M. Guinard, pers. comm.; K. Knutsson & O. Östlund, pers. comm.). Sørensen et al. (2013) suggest that there might have been people already established in northern

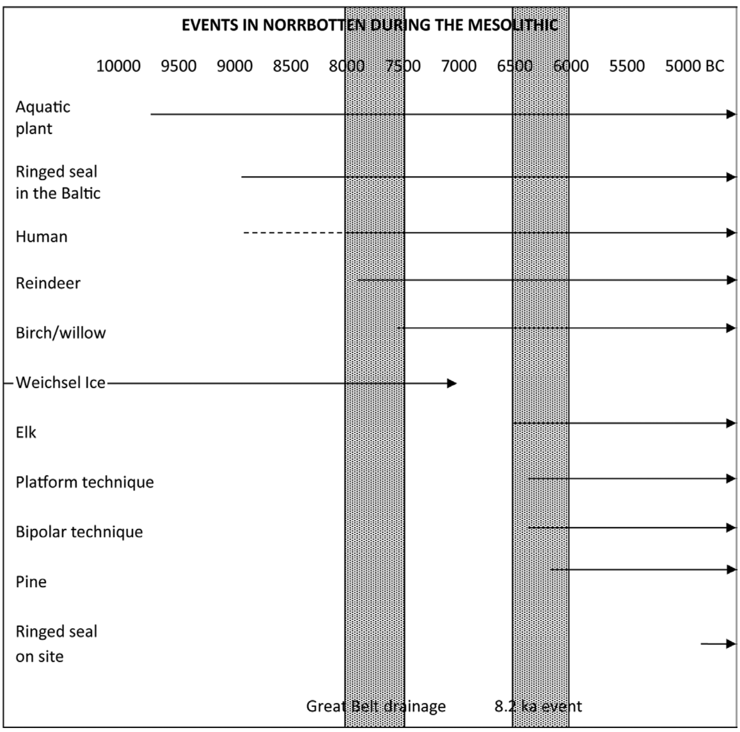

Fig. 3. Rough outlines of Mesolithic events in Norrbotten; time scale in calBC, the Great Belt drainage and the 8.2 ka event shown in grey. The Great Belt drainage started about 8000 calBC and continued for 500 years, the 8.2 ka event started 6500 calBC, peaked at 6200 calBC and ended 6000 calBC. Illustration: T. Ekholm.

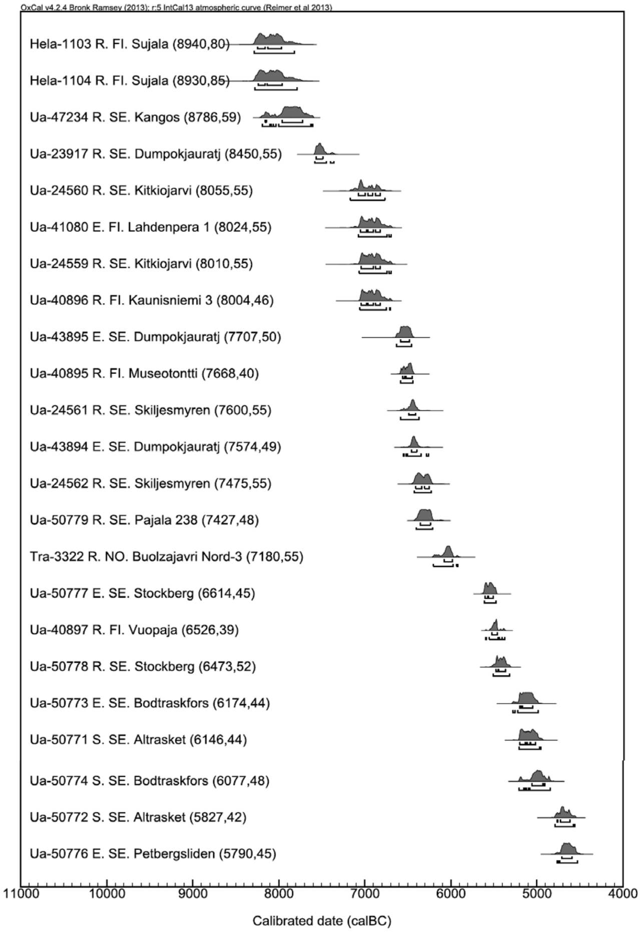

Fig. 4. Mesolithic radiocarbon dates obtained on burnt bones from the northernmost Fennoscandia. The information given of each dating includes the lab-index, dated species, country, site, and the uncalibrated date (BP). Species: R – reindeer; E –elk; S – ringed seal; countries: SE – Sweden; FI – Finland; NO – Norway.

Fennoscandia when the Butovo groups arrived – either groups from the east (Finland) or from the Komsa group in the north-west (Norwegian coast). According to present knowledge, the earliest sites in the area of Norrbotten predate the arrival of Butovo groups in northern Finland (Sørensen et al. 2013). That speaks for a movement from the Norwegian coastline southward along the ice margin towards the Ancylus coastline. What speaks against it is that the groups with a marine adoption, living by the coast for generations, suddenly would leave the sea to move straight into the inland instead of moving along the coast eastwards.

As Fig. 4 shows, the oldest radiocarbon samples acquired of burnt bones with determined species from an archaeological site in northern Finland derive from the site Sujala, which shows evidence of eastern migration by groups of the Butovo tradition from the region of Moscow (Rankama & Kankaanpää 2008: 896; Sørensen et al. 2013: 24). On the Butovo sites the elk usually dominates the osteological record. This is also the case with sites from southern Finland with Butovo type materials, such as Saarenoja 2 and Ristola (Fig. 1). On the Sujala site the most common species is the reindeer. The cultural tradition in Sujala, based on an analysis of their lithic technology, is the same as on the south Finnish and west Russian sites, but the prey species are different. The difference in faunal remains at the sites probably depended more on the different environments than on cultural preferences (Sørensen et al. 2013: 35).

Fig. 4 shows, in chronological order, radiocarbon dates of analysed Mesolithic burnt bones in northern Fennoscandia. According to the figure, reindeer and elk seem to be the

A Site	Species	Lab-index	BP	±	Max (2σ)	Min (2σ)	Context	Setting	Reference
Kangos	Reindeer	Ua-47234	8786	59	8006	7635	Hearth pit	Inland	1
Dumpokjauratj	Reindeer	Ua-23917	8450	55	7591	7450	Charcoal concentration	Inland	2
Kaunisniemi 3	Reindeer	Ua-40896	8004	46	7063	6755	Hearth	Inland	3
Dumpokjauratj	Elk	Ua-43895	7707	50	6637	6463	Hearth pit	Inland	1
Museotontti	Reindeer	Ua-40895	7668	40	6594	6449	Refuse pit	Inland	3
Dumpokjauratj	Elk	Ua-43894	7574	49	6510	6354	Hearth pit	Inland	1
Buolžajávri Nord-3	Reindeer	Tra-3322	7180	55	6211	5981	Hearth	Inland	3
Stockberg	Elk	Ua-50777	6614	45	5622	5486	Cooking pit	Coast	4
Vuopaja	Reindeer	Ua-40897	6526	39	5561	5463	Hearth/pit	Inland	3
Stockberg	Reindeer	Ua-50778	6473	52	5520	5326	Cooking pit	Coast	4
Alträsket	Ringed seal	Ua-50771	6146	44	5218	4979	Hearth	Coast	4
Alträsket	Ringed seal	Ua-50772	5827	42	4788	4579	Hearth	Coast	4

B Site	Species	Lab-index	BP	±	Max (2σ)	Min (2σ)	Context	Setting	Reference
Sujala	Reindeer	Hela-1103	8940	80	8288	7827	Whole site	Inland	5
Sujala	Reindeer	Hela-1104	8930	85	8287	7795	Whole site	Inland	5
Kitkiöjärvi	Reindeer	Ua-24560	8055	55	7175	6776	Survey finds	Inland	6
Lahdenperä 1	Elk	Ua-41080	8024	55	7081	6747	-	Inland	3
Kitkiöjärvi	Reindeer	Ua-24559	8010	55	7072	6747	Survey finds	Inland	6
Skiljesmyren	Reindeer	Ua-24561	7600	55	6590	6380	Survey finds	Inland	6
Skiljesmyren	Reindeer	Ua-24562	7475	55	6436	6236	Survey finds	Inland	6
Pajala 238	Reindeer	Ua-50779	7427	48	6413	6223	Survey finds	Coast	4
Bodträskfors	Elk	Ua-50773	6174	44	5230	4997	Whole site	Inland	4
Bodträskfors	Ringed Seal	Ua-50774	6077	48	5081	4844	Whole site	Inland	4
Petbergsliden	Elk	Ua-50776	5790	45	4730	4529	Survey finds	Coast	4

Table 3. Mesolithic radiocarbon dates obtained on burnt bones from archaeological sites in northern Fennoscandia. Each table is set in chronological order: a – radiocarbon dates of burnt bones from sealed contexts; b – radiocarbon dates of burnt bones from sealed contexts but not connected to certain features. References: 1 – Ekholm 2015; 2 – Silver Museum; 3 – Manninen 2014: Appendix 1; 4 – this publication; 5 – Rankama & Kankaanpää 2008; 6 – Hedman 2009.

first prey species, and not until Late Mesolithic do seal bones show up in the archaeological record. Mikael Manninen (2014: 14) also states in his dissertation that reindeer and elk seem to be the earliest and most important prey in Norwegian Finnmark and northern Finnish Lapland.

The first settlers seem to have preferred the inland rather than the coast, which is seen both in Norrbotten and in northern Finland. One argument against this pattern is Aareavaara, which is not discussed much in this study because of the lack of identified animal species at the site. It is situated on the former coastline and is much earlier than the others. Fig. 4 is based on Table 3 with the same information. Table 3 is divided into two groups; 3a representing samples taken from closed contexts, and 3b representing samples collected during a survey or from a site where there were no identified structures.

On the earliest sites in the region of present day Finland and Sweden, the pioneer population seems to have fed on forest mammals and fish, even if they also could have exploited marine mammals as well. Not until the Late Mesolithic did people in Sweden and Finland begin to use more marine resources. Perhaps a new group from a different culture entered the area, or the Boreal groups may have learned how to hunt marine mammals and/or developed a technology to do so (Sørensen et al. 2013: 34). For example, on the Bodträskfors site, two different periods of use are seen in the archaeological record: one with indeterminate animal species associated with a pine forest and dated approximately 6000–5400 calBC, and another one with the presence of alder, elk and ringed seal dated approximately 5200–4900 calBC, with the seal bone yielding the youngest date. All the identified fish bones found at the site were from freshwater fishes, but it is difficult to say which phase they derive from.

All dated bones of ringed seals in Norrbotten are from around 4900 calBC, all of them deriving from a Late Mesolithic hunter-gatherer context. The ringed seal probably entered the Baltic at the time of Yoldia Sea (Storå 2001: 2; Ukkonen 2001: 17), but no seal bones are found in the archaeological record until much later. Since the seal lives in water and feeds on a marine diet, the reservoir effect in seal bones is high, but in the present study the seal bones produced the youngest dates. Since the bone samples from terrestrial animals are earlier than the seal bones, the result does not challenge current ideas about the first entry of humans to Norrbotten. It might, however, mislead the interpretation of the first hunt of seal in Norrbotten which, given the reservoir effect, could have taken place later than the results of the radiocarbon measurements indicate.

When it comes to the species related to the dated contexts, there is too little data to draw any conclusions. Since the inland sites are usually more mixed and contain more species than the coastal sites, there is a bigger chance that each species belongs to a different period. The dates for elk and reindeer from the cooking pit at the Stockberg site corresponded with each other, and we may assume that both reindeer and elk meat was prepared in the cooking pit, although probably on two different (temporally close) occasions because the two animals are too large to fit in the cooking pit at the same time. The site is probably characterized by contextual contemporaneity, meaning that it has been reused the same way, or by people from the same tradition, several times (Ahlbeck 1995: 42; Ekholm 2015). An earlier sample that yielded a later date indicates that the cooking pit has been reused even much later.

CONCLUSION

Due to the sparse data from Norrbotten, it is difficult to work out a pattern through time and space. Since the results of the re-analysis of the lithic material did not lead to any conclusions as to the cultural affiliation of the sites, the traces of the lithic production do not support any hypotheses so far. The Butovo groups moved from the east and south-east into Finland and continued northward into Norwegian Finnmark, but they never seem to have entered Norrbotten. Instead, some other groups (before and after the Butovo groups), with a different type of stone technology but with the same diet, entered Norrbotten. First, right after the Weichsel ice sheet was gone the reindeer was introduced together with the tundra vegetation, and a pioneer population hunting reindeer. Later on, the taiga landscape and the elk entered, and people started hunting elk.

It seems, though, that hunting of ringed seal in this area began only during the Late Mesolithic. It is difficult to tell if this represents a new group of people with a different type of cultural behaviour or hunting strategies, or if the original populace developed new hunting strategies. The same pattern is seen in Finland, where more data has been collected: even if there were seals in the Baltic Sea at the time of the earliest Mesolithic, there are no seal bones on the archaeological sites.

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Appendix 1.

Site	Lab-index	BP	±	Max (2σ)	Min (2σ)	Reference
Nurmo	Hela-440	9505	85	9181	8625	1
Stockberg	Ua-3711	4290	60	3093	2851	2
Stockberg	St-13729	5545	75	4528	4244	2
Stockberg	St-13727	5320	65	4331	3981	2
Stockberg	Ua-3712	6495	65	5565	5549	2
Alträsket	Ua-1587	6045	105	5281	4710	3
Alträsket	Ua-1588	5920	120	5205	4498	3
Alträsket	Ua-1589	5725	115	4829	4348	3
Alträsket	Ua-1590	6285	110	5477	4995	3
Bodträskfors	Ua-38318	6146	41	5220	4980	4
Bodträskfors	Ua-38319	6743	45	5730	5560	4
Bodträskfors	Ua-38320	6777	180	6050	5350	4
Pajala 238	Ua-33469	7555	80	6570	6230	5
Lunkkujärvi	LuS-9265	8900	65	8257	7817	6, 7
Väha-Aareajärvi	LuS-9271	10130	65	10078	9641	6, 7
Aareavaara	Ua-38699	10291	565	11352	8542	6, 7
Aareavaara	Ua-41267	9637	128	9305	8641	6, 7
Aareavaara	Ua-38698	9384	488	10239	7567	6, 7
Aareavaara	Ua-41266	9192	237	9159	7756	6, 7
Aareajärvi söder	LuS-9513	8775	60	8002	7607	6, 7
Vähä-Aareajärvi	LuS-9267	8475	65	7601	7448	6, 7
Aareajärvi söder	LuS-9511	8430	60	7585	7421	6, 7
Aareajärvi söder	LuS-9512	8295	80	7524	7134	6, 7
Lunkkujärvi	LuS-9508	7405	70	6423	6000	6, 7
Kittilä	-	8915	60	8272	7839	8

Radiocarbon data from previous published sources. References: 1 – Ukkonen 2002; 2 – Färjare 1996; 3 – Pettersson 2015; 4 – Lindgren 2010; 5 – Östlund; 6 – Möller et al. 2011; 7 – Möller et al. 2013; 8 – Sarala & Ojala 2011.

Appendix 2.
THE LITHIC TECHNOLOGY AND RAW MATERIAL USE

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To be able to connect the chronology of the artefacts with the radiocarbon dates, a reanalysis of the lithics was done. The analysis was done by identifying reduction strategies and related core types. The length and width of the blades was measured according to Arnold (1987) and Crabtree (1972). Table I summaries the analyzed lithic material.

PAJALA

Lithic material

In the lithic material collected from the site in 1992, during the nation-wide archaeological survey, there were a total of 11 pieces of quartz. The material contains one bipolar core and a possible bipolar flake. The core has clear crush marks both on the hammer side and on the anvil side and exhibits flake scars on the sides. There are also two platform flakes. Otherwise, the material consists of quartz flake fragments. Quartz material is common in the Norrbotten County and the raw material is therefore most likely of local origin. Another archaeological survey was conducted by the Museum of Norrbotten in 2006, but no lithic materials were collected then at the site, only burnt bones for the purpose of ^{14}C dating.

Age assessment

Only one type of lithics (quartz) suggests that people were comfortable with the properties of the material; these humans were thus probably not pioneers still looking for suitable types of stones to use for tool manufacture (but see Knutsson et al. in press).

BODTRÄSKFORS

Lithic material

The material collected from the excavations in 2010 contained finds of quartz, quartzite, slate

Site	Raä	Platform technique		Bipolar technique		Nr of indeterminate flakes	Other artefacts	Comment
		Cores	Flakes	Cores	Flakes			
Stockberg 4:1	Älvsby 912:1	12	23	2	1	202	15 scrapers	All platform cores,6 platform flakes 'on anvil'.
Alträsket	Överluleå 184:1	4	40	1	37	541 (5 slate)	1 scraper	3 platform cores, 23 platform flakes 'on anvil'
Bodträskfors	Edefors 405:1	4	64 (5 quartzite and 4 slate)	-	4	376 (14 quartzite, 4 helleflint and 27 slate)	5 quartz scrapers, 1 quartzite scraper, 1 ground slate adze	4 platform cores (one partial), 35 platform flakes 'on anvil'
Pajala	Pajala 238:1	-	2	1	1	7	-	-
Petbergsliden	Älvsby 282	-	6	-	15	94	2 scrapers	Platform flakes 'on anvil'
Kantaberget	Älvsby 461	-	-	-	-	-	-	Artefacts are missing

Table I. An overview of the lithic assemblages included in this study.

and silicified tuff (Sw. hälleflinta), a total of 455 artefacts. The shares of different lithic materials, based on frequency, are: quartz 88.1%, slate 7.0%, quartzite 4.1%, and silicified tuff 0.9%.

The quartz in the assemblage is greyish white and milky white, but some of the pieces are discoloured yellowish-brown, which may indicate that they have been lying in water (Lindgren 2010: 20). Still, the edges of these lithics are not rounded as one would expect had they been surging sometime at the shore. Nevertheless, the discoloured lithics were mostly gathered in one place (the low-lying trench 1, today at c 90.5 m a.s.l.), that could propose that they have been in water near the shore. Of the 19 pieces of discoloured quartz only three were not located in or adjacent to the trench 1, but were found lying close to the sea shore and thus may have ended up in a secondary position when a fire road was dug at the location during a forest fire in 2006.

In addition to the discoloured quartz flakes, there are also other indications that the site was shore-bound when shoreline was at 90 m a.s.l. The proportion of medium-sized flakes (from 4.00 to 9.99 grams) is remarkably large in the close proximity to trench 1. Quartz flakes with a weight of over 10 grams were found in the higher-lying parts of the site and quartz flakes less than 10 grams were evenly distributed all over the site. Thus, the larger flakes were collected and saved for further processing and the smaller – useless – ones were left at the site. It may be that the mid-sized pieces were collected as debris and then deposited at the shoreline.

Five distinct quartz cores were found (F159, F213, F281, F283). F213 is processed with platform-on-anvil method, but also shows traits of freehand reduction. F159, F281 and F283 are platform-on-anvil cores with percussion marks on the platform and crush marks on the anvil side. F281 and F283 were found in a concentration of burnt bones, and F159 a few meters further down the slope. F159 and F283 are slightly conical in shape, small in size and show flake scars of very small-sized flakes (the flakes' maximum length would have been less than 15 mm). The sizes of the cores imply some kind of microlith technology.

The quartzite in the assemblage varies in colour from white to pale lilac-white. It is sometimes very fine-grained, but some pieces are coarser and closer to quartz in structure. The flakes are thin and, with a few exceptions, short. The intention of knappers may have been to create microlithis, small thin flakes with sharp edges to be glued in the sockets/slots in tools/weapons made of bone or wood. However, there are only one or two quartzites (F 264, 278) that actually fill the definition of microblades (length:width ratio of 2:1) (Crabtree 1972) and are shorter than 50 mm (Arnold 1987).

Slate resembles the chlorite phyllite found in the Aareavaara (Östlund 2011) and Kangos (Östlund 2004) sites. It has been reduced by percussion: some pieces show percussion marks on the platform and three pieces have crush marks that imply the use of anvils during the work. Two slate pieces are grinded, and the item F337 can be interpreted as a fragment of an adze with a clearly visible polished edge. This artefact was found on disturbed surface adjacent to the area with burnt bones sampled for this investigation. According to Wastenson & Fredén (1994), basic igneous rocks of this kind may be prevalent in many parts of Norrbotten County and also not too far away from Bodträskfors. However, the map does not show where the deposits of chlorite phyllite are particularly situated.

There are four pieces of helleflint, light grey igneous rock (acidic volcanic rock), from the site. The way of reduction is not clearly visible in these pieces. The fine-grained rock is reminiscent to the stone material found in the Early Mesolithic Dumpokjauratj site (Raä 1568 Arjeplog parish). According to the National Atlas bedrock map this kind of acidic volcanic rock is found mainly in the mountains near Arjeplog and near the border to Norway (Wastenson & Fredén 1994) – if the raw material is the same, it is most likely transported to the site from some distance.

The reduction strategy was determined for 77 of the 455 lithics. Of these, 29 flakes originate from freehand platform reduction, 35 from platform-on-anvil reduction, and four from bipolar reduction. Four anvil cores and one freehand platform core are present, no clear bipolar cores were found. This implies that large part of the material was processed with freehand platform reduction strategies and, further, that the quartz quarry was close – maybe at the hillside next to the site – although the material contained just a few pieces with remaining cortex. Callahan (1987) proposes that freehand reduction is something primarily done close to the stone material source. It is probable that the people at the site started working the lithics by freehand reduction and then, when the core became smaller and smaller, started using an anvil, first platform-on-anvil reduction and then bipolar reduction until the cores became exhausted. In the Bodträskfors site five quartz scrapers (F150, F164, F168, F245, F280), one quartzite scraper (F265), and one small polished slate adze (F337) were also found.

Age assessment

Nothing in the lithic assemblage of Bodträskfors contradicts a Mesolithic date.

ALTRÄSKET (STRUCTURE A)

Structure A is the semi-subterranean house from which the bone samples were taken.

Lithic material

The quartz material from Alträsket is relatively fine in its crystal structure and consists of both milky white or grey quartz, and clear quartz. Most of the 624 artefacts were knapped using platform-on-anvil technique. There are three clear cores of this type (F9, F13, and F23) with percussion marks on the platform and crush marks on the anvil side. There are also two cores made with bipolar strategies (F5 and F58). The majority of debitage is straight and thin. Very few flakes present the typical curvature which freehand platform strategies tend to generate. Several of the straight flakes also show crushing at both ends, although considerably more have only percussion crush marks at the platform remnant. A large proportion of the lithics consists of just thin and straight flakes without clear crush marks deriving from hammer stone or anvil. A few bipolar rejections (for example F14, F25, F57) are also visible among the lithics. Thus, the knappers seem to have used frequently anvil in the processing of lithics at the site. A few microblade-like flakes have also been found in the material and only one quartz scraper is present.

Age assessment

The amount of thin and straight flakes usable as microliths support a Mesolithic date. The overwhelming percentage of quartz implies that people had grown accustomed to the material and they knew where to find it; they were probably not the earliest pioneers in the area.

STOCKBERG

Lithic material

The material collected during the survey consists of a total of 255 quartz pieces. The quartz material is relatively fine in its crystal structure, and contains both milky white or grey quartz, as well as clear quartz.

An eye-striking feature in the Stockberg material is the remarkably large proportion of quartz scrapers: among the 255 pieces some 15 quartz scrapers were detected, representing 5.8% of all quartz material. Further, there are 11–12 cores or parts of cores. Notably, most cores are small ones with crush marks both on the platform and on the opposite side – these are cores processed on an anvil to create some kind of microliths. F53 is a conical microblade core (catalogued as flake/waste material in the report). In addition, there are several residual handle cores – e.g. F39 (catalogued as scraper in the report), and F52 (catalogued as flake/waste material in the report). Numerous microblade-like flakes are also present in the material, but in most of the cases it is hard to say with certainty if they were intentionally made.

Age assessment

The large amount of evidence on microlith/microblade-like techniques used in Stockberg propose that the site most definitively is a Mesolithic one.

PETBERGSLIDEN

Lithic material

The Petbergsliden lithic assemblage contains 117 pieces of quartz. The quartz raw material is coarse with irregular crystals, and probably was difficult to predict during knapping.

The few pieces, which allow the determination of processing technology, evidence mainly of bipolar reduction and several flakes show typical crush marks both on the anvil side and on the percussion side. Out of the 117 quartz pieces, in 21 cases the reduction strategy was determined: 15 pieces were interpreted as bipolar flakes, and six as platform-on-anvil flakes. Percussion marks were seen on the platform and the flakes were straight, but clear crush marks from the anvil were missing on the distal ends. The assemblage lacks typical flakes produceed by freehand technique.

Notably, the smallest quartz fragments (less than 3 mm in size) that can be observed at other Stone Age sites are almost entirely missing from Petbergsliden. This can also be the result of excavation methods and find recovery (coarse sieve mesh). Two scrapers but no cores were found in the material.

Age assessment

The lithics of Petbergsliden do not display distinct characteristics which would allow their more precise dating.

KANTABERGET

Lithic material

The lithic material from Kantaberget was lost during transportation to the museum and is now missing from the storage. FMIS mentions one quartz blade, 40 quartz flakes, one flake of dark quartzite and two pieces of helleflint, but no further analysis has been possible. The existence of quartz blade is doubtful. If the material is quartz, it is more reasonable to assume that the blade is a microblade or a microblade-looking flake: quartz is somewhat unpredictable in fragmentation and not really suitable for blade production.

Age assessment

The mixture of different types of stone material at the site is interesting and could imply that people were new in the area (Early Mesolithic?), experimenting with what materials to use when knapping stone, perhaps even carrying some stone material with them. However, the sparse information does not allow dating the site.