# Settlement and subsistence in the forest area of Northern Sweden

## An environmental archaeological study of dwelling sites with hearths

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## Abstract

*This article presents the results of environmental archaeological surveys carried out in northernmost Sweden in 2006. These surveys consist of soil chemical analysis and pollen analysis of dwelling sites with hearths located in the inland forest areas (Karlsson 2006).*

*The results show that the activities carried out at the dwelling sites have not caused substantial changes in the soil and vegetation in the area. Nevertheless, there are enrichments of phosphate and organic matter, which can be used for interpretation.*

*These modest changes indicate that the dwelling sites have probably been used only by a limited number of people and during some seasons of the year. On the other hand, the pollen analyses show that the dwelling areas have been used for settlement during a long period of time (from around 600 AD to ca. 1800–1900 AD). There are great similarities between the changes in vegetation and soil at the dwelling sites from the Iron Age and the changes that can be seen at dwelling sites of Forest Sami reindeer herders from historical times.*

### *Keywords:*

dwelling sites, hearths, environmental archaeology, soil chemical analysis, pollen analysis, Forest Sami settlement.

## Introduction

During the first millennium AD, several changes took place in the northern parts of Sweden. One of the most substantial changes that occurred during this period was a reorganisation of the settlement patterns. New areas were used for settlement and at the same time new types of dwellings came into use.

Along the coast of the Gulf of Bothnia, there are still *tomtningar* – remains of a dwelling type that became common in this area during this time. These coastal dwelling sites were probably used in connection with seal hunting during shorter periods of the year (Nilsson 1989: 17–28; Kvist 1990: 33; Rathje 2001: 197–198).

New types of dwellings also became common in the mountain area. Remains of these so-called *stalo* sites (Sw. *stalotomter*) can be seen as circular floor surfaces with a centered hearth surrounded by a low bank (Storli 1994: 44–47; Mulk 1995: 142–144).

Changes also took place in the settlement of the forest area between the coast and the mountain areas. Here dwelling sites with a charateristic type of hearth became a common feature. The hearths at these sites were built with a round or oval lining of stones (see Fig. 4 below). Some of these hearths were also filled with a layer of stones, while others were built without such a layer. Today the remains of these dwelling sites

show variations in terms of location in the landscape and organisation of the hearths, as well as in the number of hearths on the site. During the first millennium AD, dwelling sites with hearths were also built in areas close to mires and tarns, in other words in areas that had not been used for dwelling during earlier periods (Hedman 2003: 143).

Previous researchers have emphasized that the changes in the settlement patterns during this period were caused by changes in economy. According to some researchers, the economy became more focused on the hunting of wild reindeer (Bergman 1990: 279–282; Mulk 1995: 229–239). They state that the reorganisation of the settlement pattern was a prerequisite for the intensification of reindeer hunting. Hence dwelling sites were located at places that were strategic for reindeer hunting. In the vicinity of many dwelling sites with hearths there are also hunting pits, which could have been used for this hunt. The researchers who connect these dwelling sites with reindeer hunting also think that the inhabitants were hunters and gatherers who used different dwelling sites during different seasons of the year. During the winter they lived in larger groups at gathering sites similar to the Eastern Sami winter villages documented in the Kemi and Petsamo areas during historical times (Tanner 1929 and 2000; Tegengren 1952). The dwelling sites at which a greater number of hearths have been arranged in distinct rows have often been interpreted as winter villages of the Eastern Sami type. During other seasons, the population was spread over the resource area in smaller groups. The sites with only one or a few hearths might represent the dwellings of these groups (Bergman 1990: 281–282; Mulk 1995: 229–234).

In contrast to this theory, there are other researchers who argue that reindeer herding started to develop in the first millennium AD (Aronsson 1991; Hedman 2003). According to their opinion, the changed location of the dwelling sites was caused by the need for pasture for the reindeer. The areas that came into use for settlement during this period have also been used for pasture by Sami reindeer herders during later times. On some of the excavated dwelling sites, there are datings, finds, and remains of huts and other wooden constructions that show that the sites may have been in use both in the Iron Age / early medieval time and later on in historical times[1]. Pollen analyses have also indicated that reindeer herding by the Forest Sami in historical times has caused changes in the local vegetation similar to other types of livestock grazing. They occur on sites where small reindeer herds were gathered at so-called reindeer pens (Sw. *mjölkningsvallar*) (Aronsson 1991: 98–99). Similar changes have also been seen at dwelling sites with hearths with older dates. The advocates of an early development of reindeer herding also think that on dwelling sites with hearths, the subsistence and settlement pattern were to a great extent similar to that of the Forest Sami in historical times (Aronsson 1991: 101; Hedman 2003: 214–217).

## Methods for studies of dwelling sites with hearths

The interpretation of dwelling sites with hearths is problematic in many ways. An archaeological excavation of this type of dwelling site usually reveals few finds. The finds that do occur are usually concentrated around the hearth, and thus they can seldom be used for interpreting the function or seasonality of the dwelling site as a whole. However, analyses of the osteologi-

1 One example of this is the site R1371 Kårtejaur in the county of Nottbotten (Hedman 2003: 128).

cal material from excavated hearths indicate that an increase occurred in the amount of reindeer bones after 800 AD, and after 1300 AD, reindeer became the dominant animal (Hedman 2003: 198–199). This can only be interpreted in the way that reindeer obtained a more dominant position in the economy during this period. On the basis of this material, however, it cannot be determined whether the reindeer bones originated from wild or domesticated reindeer.

The radiocarbon dating of dwelling sites with hearths has also presented some difficulties. The results of the dating of charcoal from different hearths at one dwelling site are usually not precise enough for separating the hearths chronologically (Hedman 2003: 101–140; Karlsson 2006: 24–25).

The problems that arise when studying dwelling sites with hearths are most probably caused by the way in which these sites were used. They were probably used in a settlement system where each of the sites was in use during short seasons of each year and during several shorter periods of settlement. It follows that in most cases only the hearth is preserved for us to observe today. This may be the consequence of the use of easily decaying organic material, such as wood, bone and reindeer horn, for the rest of the buildings as well as for tools and other implements that were used at the sites. This can explain the lack of finds at many of the excavated sites. It is also likely that most of the tools and household equipment were brought along when people moved between different dwelling sites. Similar to the mobile Sami tenthuts (Sw. *tältkåtor*) that were used in historical times, the constructions may have been dismantled and moved in older times, too.

Excavations of dwelling sites with hearths have mainly been focused on the hearths and limited areas adjacent to the hearths. Studies of larger areas around the hearths or in other parts of the dwelling areas have also been performed, but much less frequently[2]. With the exception of the pollen analysis performed by Kjell-Åke Aronsson (1991), any extensive environmental archaeological studies had not been carried out at dwelling sites with hearths before the surveys presented in this article.

In environmental archaeological studies, different types of scientific methods are used for studying the relationship between prehistoric societies and their environment. Soil chemical analysis and pollen analysis are examples of methods that are often used in this kind of studies.

Soil chemical analysis can be used to trace prehistoric and historical human activities. Different activities affect the soil in different ways, which means that changes in the soil can indicate specific activities that were once performed at a given site (Linderholm 2007: 417–436).

At dwelling sites there is often an accumulation of phosphorus and organic matter, due to dwelling activities such as waste disposal and food preparation. All organic matter, such as animals and plants, contains phosphorus (Linderholm 2007: 417–436). This means that the decaying and accumulation of organic matter in the soil also causes phosphorus to be released and to accumulate in the soil. Phosphorus bound to particles in the soil, in the form of phosphate (phosphorus ions), can be preserved in the soil for a very long time. Furthermore, in connection with different decaying processes, parts of the organic matter may escape decay and be preserved in the soil in forms that are more resistant to decay. The amount of phosphate and organic

2 Examples of archaeological and environmental archaeological studies of spatial organisation connected to hearths and Sami huts that have been performed prior to my study are Carpelan & Lavento (1996) and Mulk (1995). In addition, studies of the inner organisation of Sami huts in Finnish Lapland and the Kola Peninsula have also been carried out by Halinen et al in the field season 2008 (to be published later).

matter in the soil can therefore be used as indications of previous dwelling site activities.

Fire can also affect the magnetic properties of the soil by causing an oxidation of iron particles in the soil. The oxidization of iron enhances the soil's ability to become magnetic, which means that the magnetic susceptibility of the soil (MS) increases. Measurement of the soil's magnetic susceptibility can therefore be a useful method for tracing earlier dwelling activities (Limbrey 1975: 325; Thompson & Oldfield 1986: 25–26; Linderholm 1998: 24). The soil at the sites surveyed in this study, however, could be shown to contain high amounts of iron. This limited the possibilities for discerning which deviations in the MS might be due to dwelling activities.

Different types of human activities can also affect the vegetation. To study how the vegetation has looked and changed during older periods, pollen analysis can be used (Moore et al. 1991: 181–191). Samples of peat or lake and tarn sediments collected close to the dwelling sites can provide information on how the dwelling activities have affected the vegetation in the area. On the basis of the changes in the vegetation that have occurred at a site, conclusions can be drawn regarding the type and extent of the human activities.

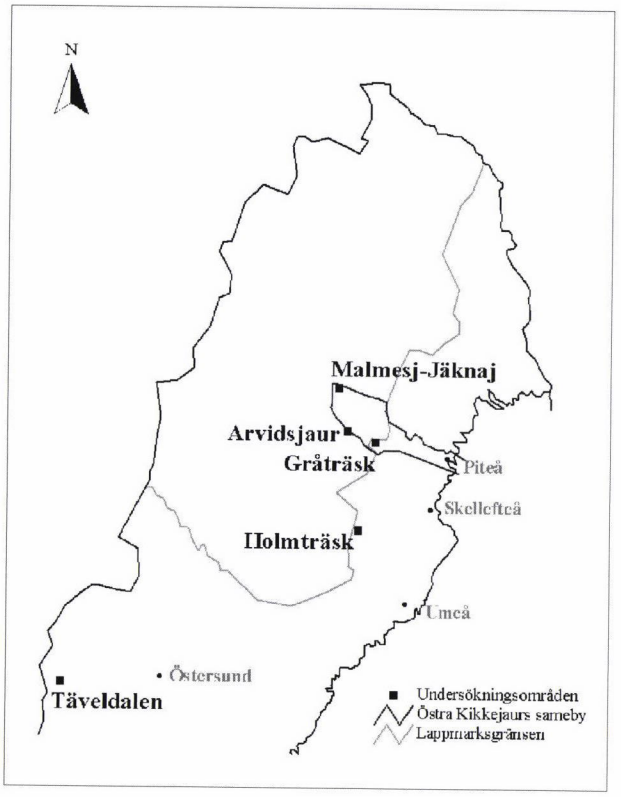


Fig. 1. Map of northern Sweden showing the borders of the Sami village of Östra Kikkejaur (Sw. *Östra Kikkejaurs sameby*) and the areas where environmental archaeological studies were performed (*Undersökningsområden*).

## Environmental archaeological studies of dwelling sites with hearths

In an attempt to try to avoid the problems that have been observed during earlier studies of dwelling sites with hearths, and to obtain more knowledge about how these sites were used, I have applied soil chemical analysis and pollen analysis at sites located in the coniferous forest area of northern Sweden (Karlsson 2006). Soil chemical analysis, as well as pollen analysis, can provide information on activities that have occurred at a dwelling site, but have left no observable traces above the soil surface.

The study in question consists of soil chemical surveys of thirteen dwelling sites with hearths which date from 1000/1100 AD to 1900 AD (Fig. 1). For the soil chemical analyses, soil samples have been collected by soil probe over a wide area around each site (approximately 0.5–1 ha). The distance between individual samples varied between 5 and 20 metres.

Samples for pollen analysis have been collected from mires and tarns within a radius of 100 metres from the dwelling sites. Pollen analyses have been conducted on samples from four different dwelling sites.

The studied sites are mainly located within the area defined today as the Sami village of Östra Kikkejaur in the county of Norrbotten. In addition, environmental archaeological studies have been performed in two areas, one located in the vicinity of the village of Holmträsk in the county of Västerbotten and the other in Täveldalen in the county of Jämtland (Fig. 1).

The results from the soil chemical surveys show that in general the soil at the dwelling sites has relatively low enrichments of phosphate and organic matter. However, considerably higher phosphate enrichments do occur in smaller areas within the dwelling sites (Karlsson 2006: 95–109). It would be expected that the dwelling sites used more permanently or by a greater number of people should have a greater effect on the soil chemical conditions at the site. These kinds of sites would most likely show extensive enrichments of phosphate and organic matter, as well as a high magnetic susceptibility, due to more widespread and extensive dwelling activities. Accordingly, the relatively low enrichments of phosphorous and organic matter that occur at the studied sites correspond rather to what might be expected from a dwelling site used by a smaller number of people, during a shorter period of the year.

The results show that enrichments of phosphate and organic matter at dwelling sites with a greater number of hearths (10 or more) are no different from those at sites with few (1–5) hearths. This indicates that the number of hearths that are observable at the dwelling sites today does not reflect the number of people that lived at the site at one time or the number of hearths that were in use simultaneously. This corresponds well with previous studies in the course of which more than one of the hearths of one dwelling site has been dated. These results show that probably not all the hearths have been in use at the same time (Hedman 2003: 214–217; Karlsson 2006: 25).

The results from the pollen analyses (Fig. 3) show that human activity has had only a limited effect on the surrounding vegetation (Karlsson 2006: 117–120). A reduced amount of pollen from pine in combination with enhanced amounts of pollen from herbs, juniper, and grasses indicates that an area around the dwelling site was cleared of trees and the soil was enriched by nutrients as a result of the dwelling activities. The limited influence of the presence of man on the vegetation as it is reflected in the pollen analyses corresponds well with the results from the soil chemical surveys: these sites have been used

| Study Area | Site | Number of hearths at the dwelling site | $P^0$mean | $P^0$max |
|---|---|---|---|---|
| Holmträsk | RAÄ 174 | 1 | 94 | 185 |
| Gråträsk | Arvträsket | 1 | 144 | 339 |
| Jäknajaure-Malmesjaure | Åssiejaurgedd | 1 | 86 | 130 |
| Jäknajaure-Malmesjaure | Nilasvallen | 1 (+ 1 hut) | 78 | 195 |
| Jäknajaure-Malmesjaure | Nykåtan | 2 (+ 1 hut) | 89 | 190 |
| Jäknajaure-Malmesjaure | Östra härdomr | 2 | 103 | 169 |
| Täveldalen | RAÄ 204 | 2 | 47 | 144 |
| Gråträsk | RAÄ 300 | 3 | 91 | 217 |
| Holmträsk | RAÄ 47 | 4 | 59 | 138 |
| Holmträsk | RAÄ 173 | 5 | 152 | 520 |
| Jäknajaure-Malmesjaure | RAÄ 567 | 10 | 93 | 173 |
| Jäknajaure-Malmesjaure | RAÄ 633 | 11 | 56 | 124 |
| Arvidsjaur | RAÄ 471 | A large number of hearths and house foundations | 61 | 289 |

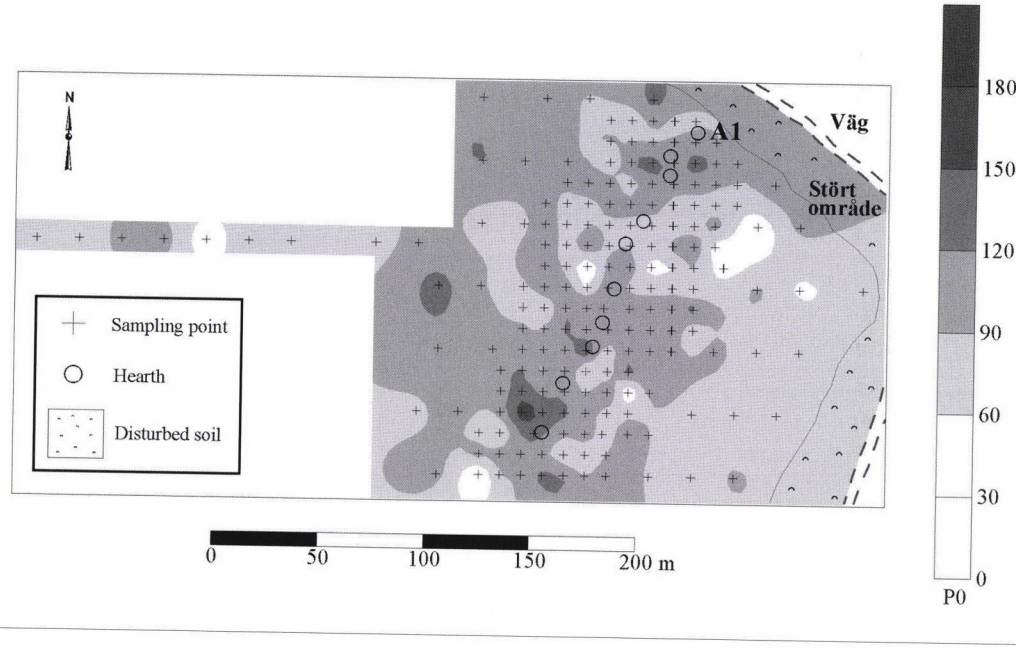


Fig. 2. Results from the soil chemical surveys. The table shows max and mean values for the phosphate enrichments ($P^0$) at all of the surveyed dwelling sites. The column *Number of hearths at the dwelling site* contains the number of recognized hearths at the sites. At two sites there were also remnants of Sami huts that have been in use during the late 19th and early 20th centuries. At the Arvidsjaure site there was a large number of hearths and remains of buildings.

The map shows spatial enrichments of phosphate at the site RAÄ 567 in Jäknajaure–Malmesjaure; for location see Fig. 1. (Surfer 7, kriging technique.)

*stört område* = disturbed area, *väg* = a modern road

RAÄ = Riksantikvarieämbetet

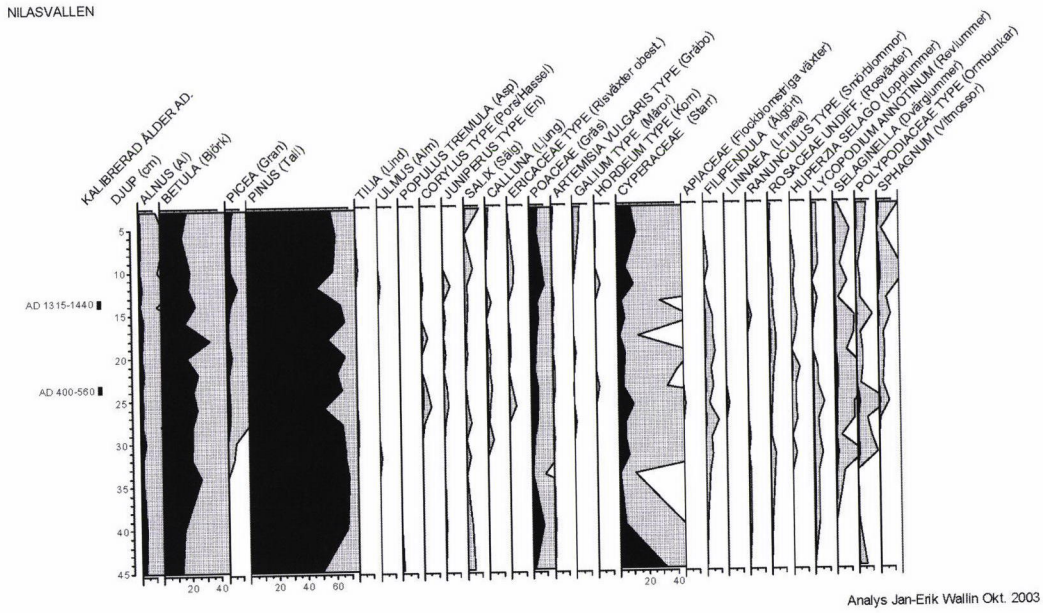


Fig. 3. Diagram showing the stratigraphic distribution of pollen from the analysis of the Nilasvallen dwelling site in the county of Norrbotten (Tilia v.2.0.b.4). The diagram also shows the radiocarbon datings (2 sigma values).

by a limited number of people, during relatively short periods.

My study included 13 dwelling sites with reindeer pens. In four cases pollen analyses were performed. My results do not show occurrence of herbs indicating reindeer pens to the same extent as the pollen analyses carried out by Kjell-Åke Aronsson (1991). This result is somewhat surprising, since many of the dwelling sites in my study are located in the same area as the sites studied by Aronsson. The differences between my study and Aronsson's study may indicate real differences in use between the different dwelling sites. The sites might have been used during different parts of the year, or the reindeer herding economy that was practiced there might have differed.

The differences in the results from the pollen analyses might also have been caused by a faster sedimentation rate in the sediments analysed by Aronsson. A slower sedimentation rate causes a low chronological dissolution of the accumulation of pollen in the sediment. This might result in difficulties in discerning pollen which occurs in lesser amounts, such as different types of herbs.

Pollen analysis can provide chronological information concerning changes in the vegeta-

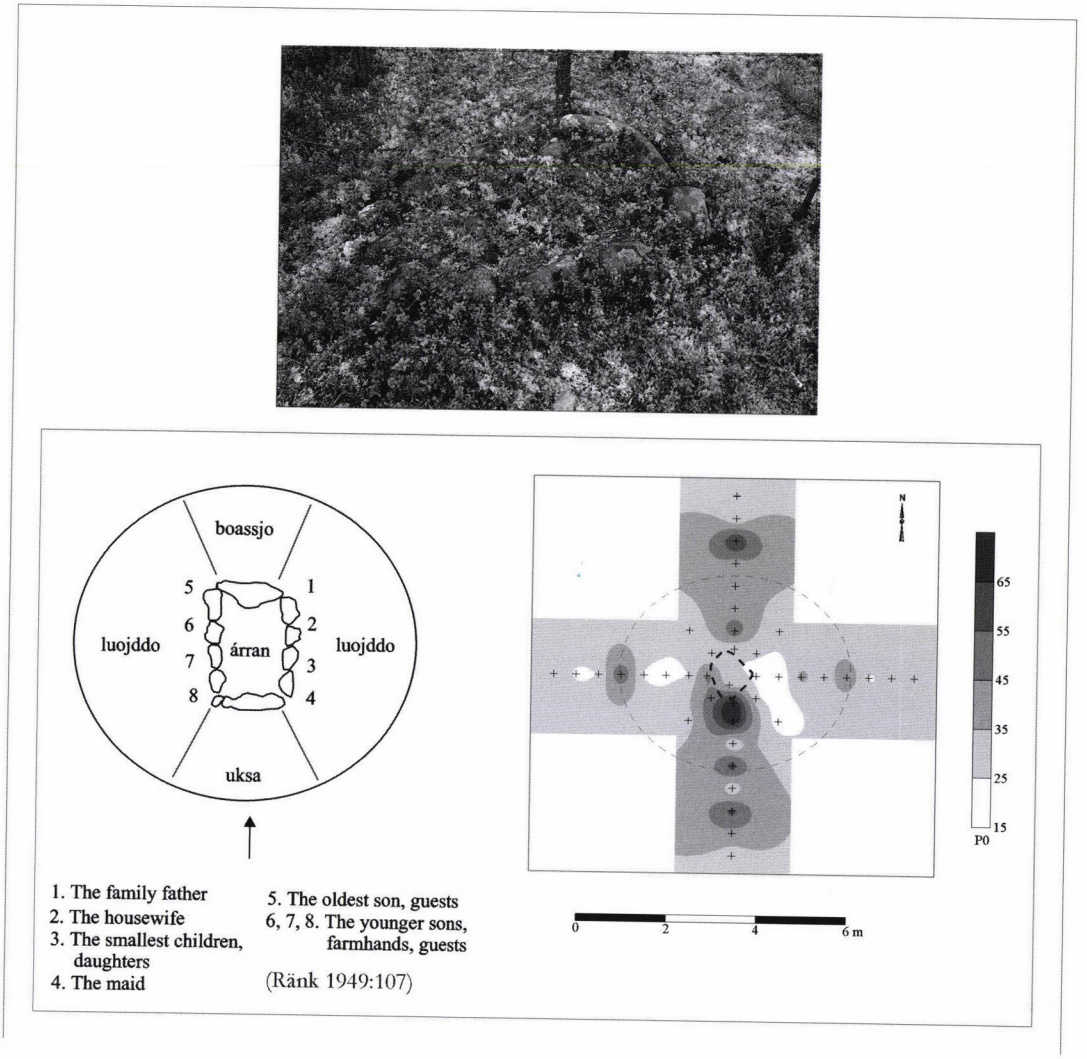


Fig. 4. Results from one of the surveyed hearths (the spatial distribution map on the right shows the results from the soil chemical surveying of hearth No. 4 at the RAÄ 633 dwelling site in Jäknajaure–Malmesjaure). The results can be compared to the drawing of Gustav Ränk (1949) of the inner organisation of the Sami hut (to the left). The crosses on the distribution map show the sampling points, the thick dotted line marks the outer lining of the hearth, and the narrow dotted line shows a possible wall line.
RAÄ = Riksantikvarieämbetet

tion at a given place. The analyses of the studied dwelling sites show that they have been used during a long period of time. The changes in the vegetation that can be seen at these sites show continuity from at least 600 AD and up to the late 19th and early 20th centuries. As far as dwelling sites with reindeer pens are concerned, the vegetation changes have been similar in the 19th to early 20th centuries and in older times respectively. The pollen analyses, however, show variations over time with respect to the settlement-indicating changes in the vegetation at the

studied sites. This indicates that these sites have not been used permanently and continuously, but instead during several, recurring shorter periods of settlement. A dwelling may have been in use during some generations, then abandoned, and later occupied again.

In an attempt to discern activity areas and to recognize exact locations of the vanished constructions in connection to the hearths at the dwelling sites, I conducted soil chemical surveys within areas adjacent to a number of hearths (Karlsson 2006: 110–116). The sampling for these analyses was carried out in the same way as the sampling of the whole dwelling site area, but in this case the intervals between the samples were considerably shorter (0.5–1.0 metres).

At several of the surveyed areas, characteristic enrichments of phosphate and organic matter can be discerned (Fig. 4). Enrichments occur in connection to one of the short ends of the hearths and within a narrow arch-shaped area, a couple of metres from the hearths, while the areas by the long side of the hearths lack enrichments.

These enrichments correspond spatially to descriptions of the use of the Sami hut (Sw. *kåta*) during historical times (Ränk 1949: 100–107). The extensive enrichments that can be seen at one of the short ends of the hearths correspond to the kitchen-area of the hut (Sa. *boassjo*) where cooking and preparation of meat and fish took place. The areas alongside the hearths which show no obvious enrichments may have been used as sleeping places (Sa. *luojddo*). In the Sami hut, the floor in the sleeping place areas was covered with twigs from birch or pine and furs. This means that various organic materials that fell on the floor mainly ended up in this floor covering and were removed from the hut during cleaning.

In other words, the floor cover probably restricted the areas where accumulation of organic matter and phosphate could occur in the soil under a Sami hut. Besides the kitchen-area and the entrance (Sa. *uksa*) of the hut, accumulation might possibly have occurred only within limited areas adjacent to the hearth, between the stone lining of the hearth and the floor cover, and at the outer edge of the hut, where the wall met the floor. This so called wall line can also be seen at some of the surveyed hearth areas as a narrow area with enrichments that are located a couple of metres from the hearth (Fig. 4).

## Conclusions

On the basis of the environmental archaeological surveys, I can conclude that the surveyed sites have been in use during shorter periods of the year and by a limited number of people. At each site only one or a couple of hearths may have been in use contemporaneously. This seems to be the case also at dwelling sites where a greater number of hearths can be seen today. Additionally, none of the studied sites show enrichments of phosphate and organic matter to an extent that would correspond to an Eastern Sami winter village, where a greater number of people lived during a longer period of the year.

The use of the dwelling sites also seems to have occurred in several different settlement phases within a longer continuous period that reaches from 600 AD and up to the late 19$^{th}$ and early 20$^{th}$ centuries. During the whole period, the settlements with hearths seem to have had a similar influence on the soil as well as the vegetation at the dwelling areas, which indicates that these dwelling sites have been used in a similar way ever since the end of the Iron Age.

At the dwelling sites, the hearths have been used inside constructions with a size and inner organisation that correspond well to the Sami huts in historical times. This indicates that these dwellings have been used by a similar number of people that also inhabited a typical Sami hut lat-

er. The similarities can also indicate that the conception of the inner organisation of the dwelling has remained the same during a long period of time in this area.

The results from the environmental archaeological study show several similarities between Sami settlements that are documented during late historical times and the studied dwelling sites with hearths. The land use and the dwelling site organisation connected to Forest Sami settlement in the coniferous forest area of northern Sweden during the late 19th and early 20th centuries seem to have their roots all the way back in the Iron Age.

The similarities also indicate that the people who inhabited dwelling sites with hearths practiced an economy that was similar to the historical Forest Sami economy. The Forest Sami economy can be described as a mixed economy: intense reindeer herding with milking of the female reindeer was only one of several resources that were used. It can also be characterized as dynamic: resources such as fish could totally replace reindeer herding during periods when there was a shortage in pasture for the reindeer or when diseases reduced the reindeer herds.

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