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TRANSITION AND ORDER: A STUDY OF SÁMI RECTANGULAR HEARTHES IN PASVIK, ARCTIC NORWAY

Abstract

Sámi hearths have never featured prominently on the agenda of Nordic archaeology and their inclusion into the archaeological discourses has been a long and hesitant process. Focusing on the peculiar row-organized, rectangular hearths that became wide-spread during the late Viking Age and Early Medieval Period, this paper summarizes their archaeological reception history and presents new data for their interpretation. The starting point is the recently excavated Brodtkorbneset site in Pasvik, Arctic Norway, which has provided a surprisingly rich archaeological and faunal material. The material is interpreted as representing a mixed economy comprising both hunting and herding. In addition to domesticated reindeer also sheep may have been kept at the site. It is further argued that the order and symmetry implied by the row-organized hearth sites related to both the role they played in internal social dynamics and in negotiating inter-regional processes of change

Key words: Sámi hearths, spatial organization, reindeer economies, sheep, bone depositions, settlement pattern, social transition, material formalization

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INTRODUCTION

Hearths are the most common surviving element of Sámi habitation sites from the Late Iron Age up until modern times. Pertinently so, given the central role the hearth played in the lives of Sámi hunter-gatherers and herders. In the dwelling, the hearth was the focal point of social life and subsistence activities, the place around which one gathered to prepare and consume food, to tell stories, to be warmed and to sleep and rest. Carrying strong religious significance, the hearth also provided an essential spatial node for the socio-religious division of domestic space (Ränk 1949).

Although Sámi hearths today have also become an object of concern to the northern

archaeologists, their inclusion into the Nordic archaeological discourse has been a long and reluctant process. The reasons for this hesitant reception are probably varied and complex. For one thing their mundane appearance hardly appealed to Scandinavian archaeologists inclined to study *monuments* of the past. In addition, the common sense assumption that hearths were traces of Sámi reindeer herding sites from recent centuries more or less automatically disqualified them from becoming an object of serious archaeological concern. Against the backdrop of national discourses and disciplinary research agendas, Sámi hearths came to be considered at best an ethnographic object of only marginal interest to mainstream Nordic archaeology.

This effective historical framework of research also came to condition the interpretation of the particular type of hearths discussed in this paper. The focus here is on the large, rectangular hearths that started to emerge in the Late Iron Age and which became especially numerous and widespread during the late Viking and Early Medieval Period (Bergman 1988; Mulk 1994; Hamari 1996; Hedman 2003: 133). A conspicuous feature of these hearths is their linear, spatial organization, as reflected in the term “row-organized hearths” that is sometimes applied to designate them (see Storli 1994). Row-organized hearth sites are found over the vast interior of the Sápmi region which includes northern Finland, northern Sweden and Norway.¹ A recent find from Aursjøen, Lesja suggests that their distribution may have even included the mountain areas of southern Norway (Bergstøl 2008: 141–2). In this paper, we shall discuss how the hearth row sites relate to Sámi subsistence, settlement and society during the Late Iron Age and Early Medieval Period, a period that brought numerous changes to both Sámi and neighbouring societies.

Our point of departure is the 2008 excavation conducted at the Brodtkorbneset site in Pasvik, Finnmark, situated right on the Norwegian side of the Norwegian-Russian border. The site is the northeasternmost hearth row locality of this type heretofore known; however, since there is no plausible reason to believe that the distribution of rectangular hearth sites stops precisely at a modern state border, it is likely that their northeastern distribution also includes the Kola Peninsula. The Brodtkorbneset site is rather unique due to its well preserved remains, including a surprisingly rich faunal material, and in this paper, we shall use these new data to discuss seasonality, economy and social features.

ARCHAEOLOGICAL CONCEPTIONS OF RECTANGULAR HEARTHES

On a par with Sámi settlement sites more generally, hearths were hardly considered a topic worthy of further study in early Nordic archaeology. To the extent that Sámi prehistory was a matter of concern at all, it was burials and sacrificial sites which attracted the archaeologist’s attention (cf. Hallström 1932; Serning 1956; Manker 1957; Zachrisson 1984). It was not until

the 1980s that the hearths emerged as an object of specific concern in relation to contextual studies of Sámi settlement patterns and economy. Prior to that, the hearths were normally only rather rudimentarily treated in surveys and excavation reports. This archive, however, reveals important information about how they were conceptualized and interpreted by the researchers.

The earliest investigations of hearth localities in northern Sweden were conducted in the 1950s in connection with the extensive development of hydro-electrical dams. Here, the identification of Sámi material became essentially a chronological feature. In an investigation along the Ume River in 1954–1955, for example, the surface visibility of the hearths seems to have been crucial for interpreting them as remains of Sámi habitation (Hvarfner 1956). In other words, surface visibility became indicative of a young age and thus of their interpretation as belonging to Sámi dwellings (Hvarfner 1957). Through these early investigations, the concept of “Sámi hearths” also emerged as a specific typological category confined to containing certain attributes. Sámi hearths were circular or oval in shape, subdivided into an “early” type (although not older than the 17th century) characterized by an oval assemblage of packed stones and a “late” type (emerging in the mid-18th century), containing large frame stones (Meschke 1979: 95).

These restrictive and stereotypical conceptions of Sámi hearths were circulated in publications and reports, and by also being transmitted and internalized through lectures, fieldwork and heritage management, they established a persistent conceptual and interpretative norm that was not challenged until the 1980s. Sámi hearths were typologically and chronologically distinct, as witnessed in classifications such as “oval hearth of late Saami type” (Forsberg 1985: 244). Hearths yielding post-medieval dates were easily subsumed as Sámi hearths, while hearths dating back to the Iron Age were more or less automatically disassociated with Sámi settlements (Meschke 1979: 95; Holm 1983: 82).

In the late 1960s and early 1970s, the Universities of Uppsala and Stockholm carried out the large *Nordarkeologi* (Northern Archaeology) research project in the northern parts of Norrland, Sweden. During surveys conducted along the Byske River, a number of

hearth sites were found, and while the *oval* and *circular* hearths were recorded as hearths of “Lappish² type” (Sundqvist 1973), a third type of hearth was found at the Nedre Kvarntjärn site which came to puzzle the investigators. This site consisted of 13 *rectangular* hearths which apparently did not comply with what was expected of a “Lappish type”:

Through their shape and size, the hearths set themselves apart from the hearths of the Lappish type that occur within this area. Their arrangement along an almost perfectly linear row is also peculiar with regard to Lappish hearths, which normally lack any orderly organization (Sundqvist 1973: 56, our translation).

In a subsequent publication from the project, Christiansson and Wigenstam further confirmed that the appearance of large, linearly organized hearths “seem to indicate an element of foreign culture, possibly during the Viking Age” (Christiansson & Wigenstam 1980: 167, our translation). Other archaeologists pointed to the similarity between the rectangular hearths and hearths found on the house grounds of the so-called “Stalo” type in the mountain region (Meschke 1979: 95). These dwelling sites were also organized according to a linear pattern and this feature, as well as the size of the dwellings, was decisive in the early interpretation of them as belonging to a *Norse* population (Kjellström 1983: 231). Rectangularity and linearity thus appeared as obvious and diagnostic non-Sámi features.

Due to their conspicuous size, form and spatial organization, the rectangular hearths also attracted other interpretations. The fact that some of them were more than 2 m long triggered the assumption that they might possibly be graves. As early as 1973, an investigation of nine rectangular hearths located in the Mattaure area of Arjeplog, Sweden was actually conducted to test the hypothesis of whether these structures were burials sites or not. The investigation refuted this hypothesis, and Wallerström concluded in his unpublished report that they were hearths associated with Sámi settlement sites (Wallerström 1973). He was thus the first in Swedish archaeology to challenge the dominant opinion of these sites as being non-Sámi. Later, however, Wallerström adopted a far more traditional and sceptical attitude, claiming that

“the only archaeological source material which can definitively be associated with the Sámi... are the Sámi sacrificial sites (Wallerström 1995: 188, our translation. For an even more sceptical view, see Wallerström 2006).

In Norway, however, the burial hypothesis became more or less accepted largely due to the work of Povl Simonsen. Based on his investigations in the late 1960s of similarly shaped and organized structures at Juntavadda and Assebakte in interior Finnmark, he interpreted the rectangular hearths to be cremation burials (Simonsen 1979: 42–9). Simonsen’s work and interpretation were instrumental in canonizing the term Assebakte *graves* as the most common classificatory designation for the rectangular hearths in Norway. Still today, when the burial interpretation is refuted, this misleading term lives on in Norwegian heritage registers and survey reports.

The confusing naming and interpretation of these structures clearly reflects how national borders and research traditions often hamper and confuse research on what is actually the same archaeological phenomenon. As such, the fate of the rectangular hearth accentuates one of the most crucial challenges facing the study of the Sámi past, which has unfolded on the territory of four modern day nation states. Despite the convincing interpretation of these stone structures as hearths in Swedish archaeology and their inclusion into numerous studies of Sámi settlement during the 1980s, there was little objection raised to the interpretation of them as burials sites in Norway. It was not until the 1990s that Simonsen’s burial interpretation was challenged and the results from the Swedish investigations made relevant to the interpretation of the “Assebakte” sites in Norway (Mulk 1994: 234; Storli 1994: 55–60). As late as 1997, however, Simonsen defended his interpretation even though he states that he does not “totally discard the fireplace theory, but in that case they would have been outdoor fireplaces, presumably of a ritual character” (Simonsen 1997: 63).

In Finland, the rectangular hearths were already noticed by Ilmari Itkonen in 1909, but were since disregarded by archaeologists until the 1960s. The first excavations were undertaken in the 1980s, most notably at the large Siuttavaara site in Angeli, Inari (Hamari 1996: 127). The cautious way these objects are conceptualized in

Finnish archaeology must be judged against the backdrop of diverging interpretations launched in Sweden and Norway. In what may appear to be an attempt to avoid any interpretive associations, the “neutral” term “rectangular stone settings” became the preferred option in Finnish archaeology. In her first overview paper, Pirjo Hamari convincingly argues against the burial interpretation and concludes that “[a] majority of the rectangular stone settings in Finland must [thus] be interpreted as hearths” (Hamari 1996: 131).

Interestingly, during the 1980s a new research agenda had developed in Sweden under the auspices of the Department of Archaeology at Umeå University. While previous interpretations concentrated on cultural identity and function, several projects were launched that studied the hearth sites in the context of prehistoric Sami economy and settlement (Baudou 1981:149–50, 1988a: 20–6, 1988b; Bergman 1988; Hedman 1989: 137–8). One important issue was the relationship between the hearth sites and the large sacrificial sites known from northern Sweden (Hedman 2003), and another on how the spatial restructuring of the settlement sites may be related to economic transformation and an emerging reindeer pastoralism (Storli 1993; 1994; Mulk 1994, Hedman 2003).

During the latter half of the 20th century, the study of rectangular hearths changed from being narrowly concerned with ethnic affiliation to embracing the social and economic transformation of Sámi societies. Well into the new millennium there are also clear signs of increased cooperation across national borders that enable an adequate regional scope to be applied in the study of these phenomena. The research which forms the basis of this paper is hopefully setting a new agenda by bringing together Swedish, Norwegian and Finnish scholars in the study of the rectangular hearths.

SURVEYS: RECTANGULAR HEARTHES AND LANDSCAPE

Sites with row organized rectangular hearths are found in most environmental zones within the interior of Sápmi, apart from the treeless alpine zone. They appear within the mountain birch forests as well as in the lower woodland. Their main distribution, however, is within the

coniferous woodland zone where they most often appear in pine forests with rich sources of reindeer lichen. For millennia, such lichen woodland has formed important winter pastures for wild, as well as domesticated populations of reindeer.

The location of the sites differs from that considered typical for earlier prehistoric settlements in the interior and studies from northern Sweden have suggested that a change in location preference took place during the Late Iron Age. This included a shift from river banks and lake shores to what may seem more marginal forest areas. The beach areas of the major rivers and lakes were still utilized, but an increasing number of sites, in particular the rectangular hearth sites, are often located within new niches and in new types of terrain, away from the major watersheds (Hedman 2003). The hearth rows are located on dry moraine outcrops in marsh areas, on forested terraces on the edge to marshland, or next to small creeks and tarns surrounded by heathlands rich in lichen. Such areas are well suited for winter habitation, but also provide good conditions for storing food in cold caches during summer. Access to water is still important for site location (Hamari 1996: 129), but the immediate vicinity to river bank areas seem less imperative.

The awareness of such possible divergent locational preferences is important when searching for rectangular hearth sites. As the research from northern Sweden suggests, such sites may represent ways of using and relating to the landscape other than those motivating previous settlement patterns and economies. In September 2007, we tried to implement research-based criteria from the northern Swedish woodland to a relatively similar pine woodland environment located in the upper Pasvik River area of Norway, 500 km to the northeast (Fig. 1). The small-scale survey concentrated on the neck and central parts of the Kjerringneset promontory, approximately 60 km inland from the coast. Extensive archaeological investigations were conducted here from 1957–1961 in connection with the hydro-electric development of the Pasvik River (Simonsen 1963). Further surveys were conducted in the 1970s as part of the national economic mapping program, and additional fieldwork undertaken as part of several projects

in the late 1990s and early 2000s (Olsen 1999; Berg 2000; Skandfer 2003).

These previous surveys and excavations were mostly concentrated on the banks of the Pasvik River/Vaggetem Lake area along the east and southern shore of the Kjerringneset promontory. This preference was understandable due to the hydro-electrical development of the river and the attention thus directed towards sites affected and exposed by flooding and erosion. The large number of sites, predominantly from the Stone Age and Early Metal Period, found along the river and lake beaches also confirmed a strong affinity between the river and settlement sites. However, at least to some extent, the affinity between settlement and river also probably reflect expectations about where to find sites and the continued focus on the river/lake zone runs the risk of becoming self-confirming, resulting in a bias in relation to sites located elsewhere. The objects previously recorded in the interior parts of the Kjerringneset promontory were mostly hunting pits, which were possibly considered as one of the few pertinent monuments to be found beyond the shore area and thus consciously looked for.

The survey at Kjerringneset in the autumn of 2007 was very limited. It was conducted over a period of only one week by two archaeologists³ covering a survey area of ca. 5 km² (Hedman 2007). Still, a total of 26 new hearths were recorded, including two sites each containing seven row-organized hearths, and smaller sites with two or three hearths were also found. Nearly all the recorded hearths are large, rectangular hearths with an average size of 2 x 1 m. It should be mentioned that another hearth row site had actually been previously recorded in the survey area, but designated as a “burial field” containing four “cairns”. Another three hearths were also found at this site, thus constituting a third site with seven row organized hearths within the small survey area.

None of these sites are located along the bank or the immediate vicinity of the Pasvik River. One of the three row organized hearth sites was found at the central part of the promontory, next to a small forest tarn. In those cases, in which the hearths are located closer to the river, they are all located on elevated terraces 10–20 m above the water surface at a distance of 100–200 m from the

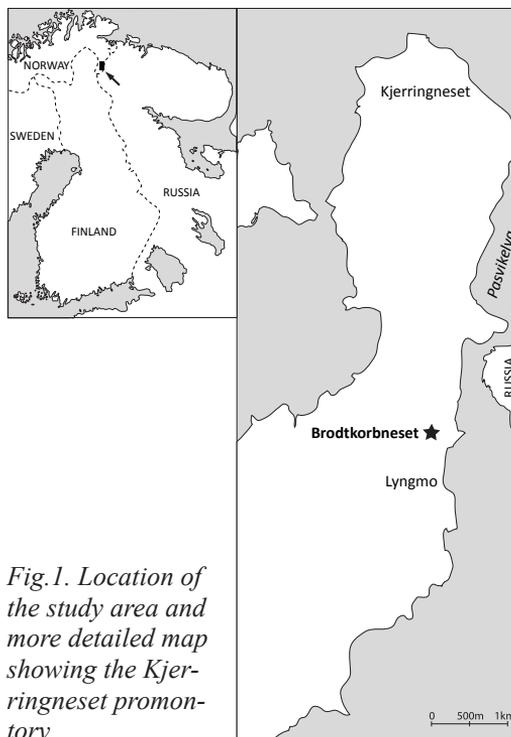


Fig. 1. Location of the study area and more detailed map showing the Kjerringneset promontory.

riverbank. Their location thus markedly differs from previously recorded settlement sites in the area. It is also interesting to note that these hearth rows are oriented perpendicularly in relation to the river, not parallel to it, which seems to have constituted the spatial rule of earlier settlements (cf. Simonsen 1963).

All hearths were found in pine or mixed pine birch forests. Most hearths were overgrown by a thick cover of moss and heather and were hardly possible to spot on the surface, especially since this vegetation caused a very uneven surface sprinkled with tufts and tussocks. To identify hearths in terrain conditions such as this, the use of a metal soil probe is indispensable. When applied, the probe has a diameter of 1 cm and causes minimal destruction. The hearths usually exhibit a common stratigraphy, distinct from the natural podzol layers and often identifiable in the probe sample (see Hedman 2003: 53, and below). Therefore, experienced-based knowledge about the composition of the hearth and its associated stratigraphy is crucial in order to distinguish them from natural formations.

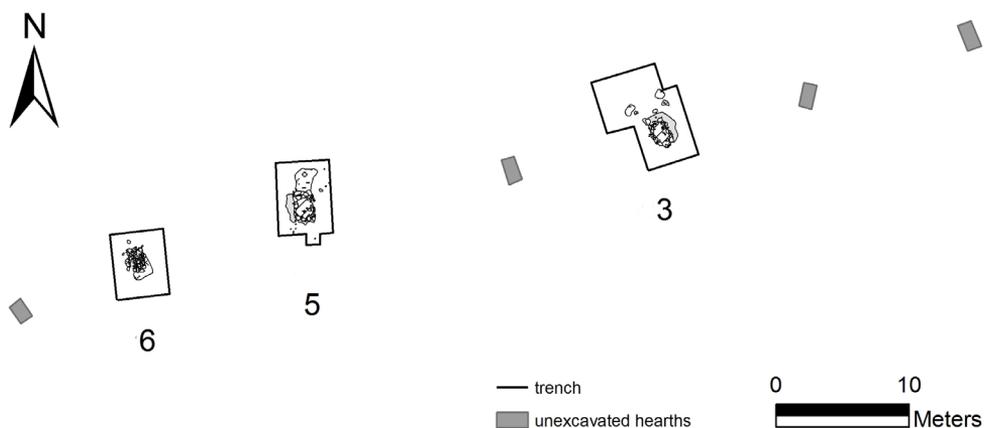


Fig. 2. The Brodtkorbneset site, Pasvik. Notice the linear organization of the seven hearths.

THE BRODTKORBNESET SITE, LYNNGMO

The Brodtkorbneset site (R 116714) is located ca. 500 m north of the farmhouses at the deserted Lyngmo farm. The site consists of seven linearly organized hearths interspaced by intervals of 8 to 15 m (Fig. 2). The hearth row is oriented approximately east-west on a sandy terrace interspaced between the Brodtkorbneset promontory in the east and moraine slopes in the west. The terrace is covered with lichen, moss, heather and pine forest (Fig. 3).

All the hearths are rectangular and oriented perpendicularly in relation to the overall linear outline of the site. The length of the hearths lay within the range of 1.5–2.4 m, their width varies between 1–1.6 m, and they reach a maximum height of 0.4 m above the surface. Three hearths, numbered H3, H5 and H6, were selected for

excavation in 2008. A substantial area around each hearth was excavated in order to identify areas of activity and possible traces of dwellings. The stratigraphy of the area around the hearth was mostly compiled of podzol layers separated into three main layers. Layer 1 consisted of organic top soil which was cleaned to the top of the leached, grey-white subsoil constituting Layer 2. The second layer varied 4–6 cm in thickness, and was excavated down to the red brown, iron rich soil of Layer 3. Most of the finds occurred in the upper part of Layer 2, or in the interface between Layers 1 and 2. The hearths were treated as separate stratigraphic units and contained layers not observed outside of them. The two largest hearths (H3 and H5) contained an upper layer of very compact, sintered soil rich in fragments of burned bones. Below this “hearth concrete” was a dark brown layer of fatty soil (also present in hearth 6), sometimes reaching a thickness of nearly 0.3 m. At the bottom of the hearths was a marked reddish layer formed by the release of iron oxide due to intensive firing.

Table 1. Identified fragments in the bonematerial from the Brodtkorbneset site (R 116714).

Species	Hearth			Total
	3	5	6	
Reindeer	1243	504	85	1832
Sheep/Goat	17	1	-	18
Arctic fox	-	7	-	7
Wolf	-	1	-	1
Wild duck	-	1	-	1
Grouse	1	-	-	1
Common whitefish	95	83	2	180
Grayling	4	6	-	10
Pike	13	32	-	45
Cod	-	2	-	2
Fish unknown	7	41	2	50

Hearth 3

A total of 36 m² was excavated in connection with this hearth. Before the excavation, this object appeared only as a vague moss and heather covered elevation. The excavation exposed a well-preserved rectangular hearth composed of packed and partly layered stones surrounded by larger

frame stones, measuring 2 x 1.2 m. In the northern part of the hearth the frame stones created an elevated platform ca. 0.4 m high. A substantial part of the base of this platform was made up by a large flat stone occupying most of the northern section of the hearth. The compact layer of concrete-like, sintered soil covered the entire area inside the frame stones (excluding the northern “platform”). This layer rested on the layer of dark brown soil which was intermixed with the stone packing inside the hearth. As with the compact, sintered layer, this one also contained numerous bones. The bone material recovered from the hearth is mostly burned and consists of reindeer bones (*Rangifer tarandus*) and freshwater fish: pike (*Esox lucius*) and common whitefish (*Coregonus sp*) (Vretemark 2009; see Table 1).

The largest amounts of bones however were found outside the hearth. Most of them were uncharred and occurred in a number of small clusters north of the hearth (Fig. 4). This faunal

material is almost completely dominated by reindeer, but also contains a small but significant component of sheep and/or goat bones (*Ovis/Capra*) (Vretemark 2009, see Table 1). A total of 17 bones/bone fragments of sheep and goat were found in a deposit (cluster 318), measuring 0.6 x 0.5 m also containing reindeer bones. Even an iron axe and several trapezoid pendants of copper alloy were found in this deposit. The bones of sheep and goat were also found together with reindeer in another deposit north of the hearth (cluster 319) (Fig. 5). A total of 7.6 kg (5240 fragments) of bones were found in the trench excavated in connection with hearth 3 (Table 2).

A total of 34 artefacts were recovered from the trench, of which the majority consists of pieces of copper alloy (32 %) and flint (26 %). Most of the finds were concentrated in the hearth area, but some finds were even made in connection with bone deposits found north of the hearth. The flint are either simple flakes or



Fig. 3. The Brodtkorbneset site during the excavation in 2008. In front the excavated hearth 6 with the remaining frame stones; behind is hearth 5, and in the distance one can glimpse hearth 3 being excavated.

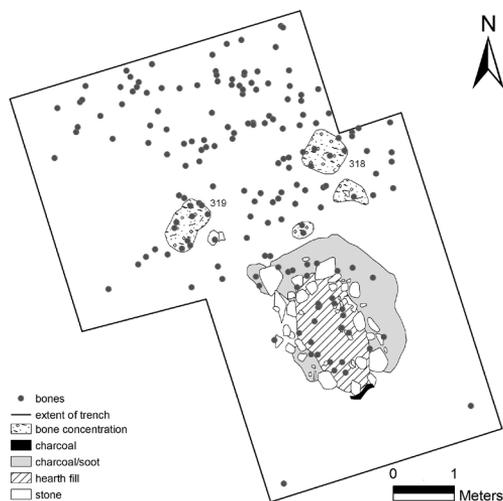


Fig. 4. Distribution of unburned and burned bones in the hearth 3 area.

Table 2. The distribution of bones from the hearth areas of the Brodtkorbneset site (R 116714).

Hearth	Frgs	Wgt (g)	Avg. wgt (g)
3	5240	7604	1,45
5	3447	2742	0,8
6	546	311	0,6

Frgs= fragments, wgt= weight

Table 3. AMS radiocarbon dates from the Brodtkorbneset site (R 116714).

Ua-37594	3	Pine. 4–5 years outer growth rings.	790±35	1180–1280
Ua-37595	3	Pine. Branch.	905±35	1030–1210
Ua-37598	3	Unburned bone. Reindeer. Cluster 318.	705±30	1250–1390
Ua-37599	3	Unburned bone. Reindeer. Cluster 318.	690±35	1260–1400
Ua-37600	3	Unburned bone. Reindeer. Cluster 319.	820±30	1160–1270
Ua-37601	3	Unburned bone. Reindeer. Cluster 319.	775±35	1185–1285
Ua-37602	3	Burned bone. Reindeer.	800±30	1180–1275
Ua-37603	5	Pine. 10 years outer growth rings.	825±35	1150–1280
Ua-37604	5	Pine. 2 years outer growth rings.	950±35	1010–1170
Ua-37605	5	Burned bone. Reindeer.	910±35	1030–1210
Ua-37606	6	Pine. 7 years outer growth rings.	895±30	1030–1220
Ua-37607	6	Pine. 10 years outer growth rings.	945±35	1020–1170
Ua-37608	6	Burned bone. Reindeer.	830±35	1050–1280

The analyses were performed at the Ångström Laboratory, Uppsala, Sweden.

pieces fractured by crushing, a characteristic of flint struck by strike-a-lights in order to produce sparks and fire. Thin pieces of cut copper alloy are very common in the material found in Sámi sacrificial sites in Sweden, as well as in Sami dwelling sites in northern Scandinavia, Finland and Russia (Serning 1956; Carpelan 1975; 2003; Zachrisson 1984; Odner 1992; Hedman 2003). These artefacts have a wide chronological distribution from the Late Iron Age to early modern times (cf. Zachrisson 1976: 47, 62; Odner 1992: 132; Hedman 2003: 161, 181). As raw cut pieces, their function remains uncertain, although they are often worked into ornaments such as the aforementioned trapezoid forms. These pendants are common at Sámi sacrificial sites and also found in late medieval habitation sites (Serning 1956; Zachrisson 1984; Odner 1992; Carpelan 2003).

The iron axe found in the deposit north of the hearth is difficult to give a more exact typological dating to. However, the two parallel grooves near the neck of the blade are peculiar, and only known from a few specimens found in northern Sweden and Finland dating to the late Viking Age/Early Medieval Period (Kivikoski 1973: 145, pl. 1194; Hedman 2006: 173). A fragmented mid-piece of composite bone comb with copper rivets was found next to the southeast edge of the hearth. The find is unusual on sites like this and the specimen seems to comply with Nordic combs from the late Viking Age and medieval period, and is probably indicative of trade or

exchange. From the lower part of layer 2 some fragments of what is most probably Kjelmøy ceramics⁴ were found, thus suggesting Early Metal Period activity at the site.

Three samples from the hearth were radiocarbon dated (Table 3). Two charcoal samples⁵ yielded dates to $905 \pm 35\text{BP}$ (ca. 1030–1210 AD⁶) and $790 \pm 35\text{BP}$ (ca. 1180–1280 AD), while one burnt fragment of reindeer bone was dated to $800 \pm 30\text{BP}$ (ca. 1180–1275 AD). The two latter dates correspond well and suggest that the hearth was in use during the late 12th or early 13th century. Four additional samples from two of the largest concentrations of unburned bones north of the hearth were also radiocarbon dated. All samples consisted of reindeer bones. Two samples from cluster 318 yielded dates to $705 \pm 30\text{BP}$ (ca. 1250–1390 AD) and $690 \pm 35\text{BP}$ (ca. 1270–1400 AD), while the two samples from cluster 319 were dated to $820 \pm 30\text{BP}$ (ca. 1160–1270 AD) and $775 \pm 35\text{BP}$ (ca. 1185–1285 AD). The dates from cluster 319 comply nicely with those from the hearth, while the dates from the first cluster are slightly younger.

Although it cannot be ruled out that they are contemporaneous it may indicate prolonged or later reuse of the hearth area.

Hearth 5

An area of 23 m² was excavated in relation to hearth 5. The conditions prior to excavation were similar to that observed for H3. The hearth was completely covered by moss and heather, and hardly visible among the tussocks. The excavation exposed a nicely proportioned hearth composed of packed stone inside a rectangular frame of edge stones. The exposed hearth measured 2.35 x 1.6 m and had an elevated northern section raised ca. 0.4 m above the original surface. The stratigraphy of the hearth was almost identical to that identified in H3, and contained three separate layers. The concrete-like sintered soil deposit contained large amounts of burned bones, as did the underlying dark brown hearth fill (Fig. 6). A curious detail of the hearth was that the southwest corner was made up by a sandstone that contained two parallel grooves,



Fig. 5. The hearth 3 area under excavation. Note the concentrations of bones (the two largest being clusters 318 and 319).



Fig. 6. Hearth 5 excavated to the top of the “hearth concrete”.

each 9 cm long and 0.3 cm wide. The grooves most probably indicate that the stone was used for some type of tool polishing or grinding, and since the geological qualities differ from the other hearth stones, it may indicate that it was purposefully selected for this task.

Bones were found inside the hearth and in a confined area immediately to the north of it. Here, a marked concentration of burned as well as unburned bones extended 1.6 x 1.3 m to the north of the northern edge of the hearth (Fig. 7). Nearly all the bones from this area stem from reindeer, apart from one of sheep or goat and one of wolf (*Canis lupus*). All the bones from the hearth were of course burned, and displayed greater species variation than those recovered from the outside deposit. Most were reindeer and fish, but even 8 fragments of arctic fox (*Alopex lagopus*) and one fragment of an undetermined duck species were identified (Vretemark 2009, see Table 1). The fish bones are dominated by the freshwater species pike, common whitefish and grayling (*Thymallus thymallus*), but even ocean fish are represented by two bones of cod (*Gadus morhua*) (Vretemark 2009; Table 1). A total of 2.74 kg (3447 fragments) of bones were found in the H5 trench, which despite the smaller

excavation area is considerably less than what was found in the H3 trench.

In terms of finds, however, the H5 area was richer. A total of 70 artefacts were found in this trench, for the most part consisting of flint for firemaking (41 %), unidentified iron fragments (20 %), and pieces of cut copper alloy (18 %). Among the identifiable artefacts was one complete arrowhead of iron and fragments of two other arrowheads. The complete specimen belongs to Wegreus type B, which almost exclusively is known from the Sámi settlement area of northern Sweden, Norway and Finland. Of the close to 100 specimens found in northern Sweden, ca. 90 % are found at sacrificial sites. This type dates back to the Viking Age and Early Medieval Period (Wegreus 1973; Hedman 2003). Among the cut copper alloy sheets were two ornaments, one axe-formed pendant and one trapezoid specimen similar to those found in the H3 area. The ornaments are in concordance with the types found at the Viking Age/Early Medieval sacrificial sites in northern Sweden, and they also appear commonly on Sámi settlement sites (Odner 1992; Carpelan 2003).

Other finds included one iron fish hook, two hones/whetstones and two strike-a-lights (one of

the open, lyre-shaped type and the other of the closed oval type). Both types of strike-a-lights are known from Viking Age graves at Birka and the eastern Ladoga area (Hårdh 1984: 155; Кочкуркина & Линьский 1985: 140). Strike-a-lights are commonly found at medieval settlement sites in the north, including coastal sites in Finnmark and at inland sites such as Nukkumajoki in northern Finland (Carpelan 2003). They also appear at hearth sites in northern Sweden dating from the Late Iron Age to modern times (Carpelan 2003; Hedman 2003: 184). The finds were mostly located next to the hearth. Adjacent to the eastern side of the hearth was a concentration of fire flint, indicating an area for lighting fire though curiously, the strike-a-lights were found at the opposite side of the hearth. Inside the hearth, one knife fragment with partially preserved bone/antler shaft was found, as well as one fragment of an iron hide scraper.

Three samples from the hearth were radiocarbon dated (Table 3). Two charcoal samples yielded the results 950 ± 35 BP (ca. 1010-1170 AD) and 825 ± 35 BP (ca. 1150-1280 AD), and another sample of burned reindeer bone was dated to 910 ± 35 BP (ca. 1030-1210 AD). These dates are relatively concordant with those obtained from the first hearth, and suggest that H5 either is contemporary or slightly older than H3.

Hearth 6

The third hearth excavated at this site was H6 where an area of 20 m² was investigated. Apart from one exposed framestone, even this hearth was completely overgrown by vegetation. The exposed hearth measured 1.9 x 1.2 m and was raised 0.1–0.2 m above the original surface. Thus, it is considerably smaller and appears to be less solidly built than the two other hearths, and also lacks the marked and elevated northern section. It was made up by a rectangular frame of larger edge stones with smaller, fire-cracked stones inside. Contrary to the previously described hearths, it lacked the cover layer of sintered, compact soil which may indicate less intense firing. The main layer inside the hearth was the dark brown layer also observed in the other hearths.

This hearth also contained bone material, although the amount of 0.31 kg (546 fragments) was far lower than from the previous two hearths.

Relatively few bones were found outside the hearth, but the bones found here were also clustered at the north side of the hearth. Inside the hearth, the recovered bones were all burned and found in the dark brown "hearth-fill" layer. Bones from reindeer dominated, with the only exception being four fish fragments consisting of two common whitefish and two undetermined fish species (Table 1). Another contrast to the two previous hearths was the amount of finds, as only nine artefacts were recovered from the trench. Despite the fact that the material was sparse its composition is still comparable, containing fire flint, bronze/copper alloy pieces and a hone/whetstone. One of the copper alloy artefacts was a trapezoid pendant perforated in its centre.

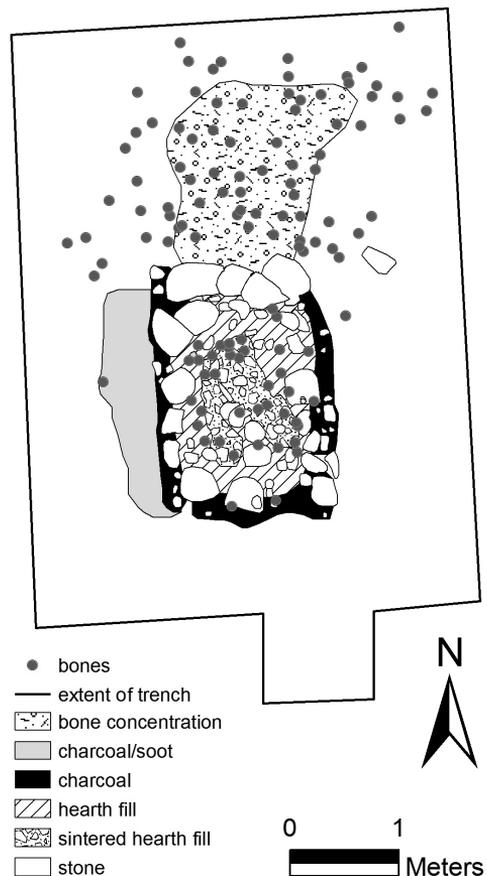


Fig. 7. Spatial distribution of burned and unburned bones in the hearth 5 area.

Three samples from H6 were radiocarbon dated (Table 3). Two samples of charcoal yielded the results 895 ± 30 BP (ca. 1030–1220 AD) and 945 ± 35 BP (ca. 1020–1170 AD), while a sample of burned reindeer was dated to 830 ± 35 BP (ca. 1150–1280 AD). These dates show a similar age distribution to the bones observed in H3 and H5.

DISCUSSION

Hearths and superstructure

No traces of construction related to possible dwelling superstructures, e.g. postholes, were found at the Brodtkorbneset site. This complies well with the negative results from other investigations of rectangular hearth sites in northern Fennoscandia and triggers the question of whether the hearths had been situated inside a dwelling or not. The latter option seems rather unlikely for several reasons. The hearths were very solidly built, and the amount of stones that was used clearly served as a heat storing device. Used in an outdoor context, most of the heat would escape into the air and large amounts of fuel would be needed to maintain the heat. Moreover, the clustering of artefacts around



Fig. 8. Moving from the winter village: sheep on the sledge in Suenjel. After K. Nickul 1948: plate XLVII.

the hearth, as well as the systematic pattern of bone disposal, suggests activity patterns and distributions more in compliance with a dwelling than an open-air site (cf. Olsen 1998: 116–). Although the artefact distribution may also seem in compliance with Binford’s “drop and toss zones” for outdoor hearths (Binford 1978: 339), the artefacts recovered were less likely to be subjected to such principles of disposal. In addition, the systematic distribution of bone refuse (see below) clearly suggests spatial patterns in accordance with dwelling and entrance structures.

The most likely interpretation is that the hearths have been part of a lightweight and moveable dwelling leaving few or no visible traces of construction (Hamari 1996: 131). The pivotal candidate for such a dwelling is, of course, a tent (*lávvu/goahti*) with its highly transportable superstructure of light poles and hides or rugs. This is a dwelling that has traditionally been used by the Sámi during both summer and winter. However, there is a significant difference between the light, conical *lávvu* used during summer and seasonal migrations and the more solid winter tent (*goahti*). The latter was constructed using a framework of paired curved poles (*baeljek*) and was covered by woven wool rugs. The *baeljek* construction also gave the winter tent a more oval floor outline that would even fit large hearths. Thus it seems more likely that the rectangular hearths were used as part of a *goahti* than inside a conical tent of the *lávvu* type. Moreover, when considering their possible fit inside a lived tent space, one should notice that the actual fired area of the hearths was considerably smaller than the hearth itself, thus reducing the risk of close contact with the fire.

Seasonality, economy and settlement pattern

All the investigated hearths contained an assemblage of packed stones inside larger frame stones. This packing of stones creates better heat radiation and a far more effective heat reserve than a regular frame hearth, strongly suggesting that the site was used during the colder part of the year. If so, this fits nicely with the seasonal pattern of the Skolt Sámi who used this territory as their Báhcevej/Pasvik siida. The winter village (*Tahv-sijd*) used from December to April

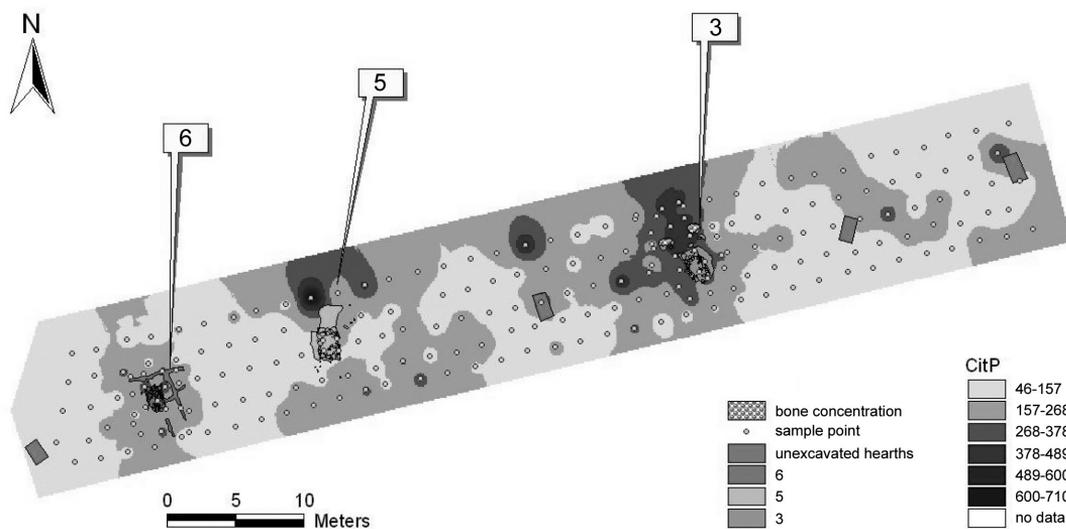


Fig. 9. Phosphate distribution on the Brodtkorbneset site.

was the aggregate site for the entire community which dispersed into family based units during other seasons, of which spring and summer were spent in the coastal region. The winter village was always located in the interior of the Pasvik River Valley, but always at various distances away from the river (Keilhau 1831: 43; Tanner 1929: 105–39). The community mostly lived on stored resources, and access to reindeer pasture and firewood were the main factors that determined the location of the winter site. These very same factors caused the winter village to be moved by intervals of 5–30 years (Tanner 1929: 104–6; cf. Nickul 1948: 54–6).

The settlement system of the Báhceveaj siida thus seems to provide a plausible model for interpreting the seasonality and settlement pattern of the Brodtkorbneset site. The fact that there are two recorded additional sites with seven row organized hearths in the survey area is well in accordance with the pattern of “moving” winter villages. Furthermore, the presence of ocean fish among the organic fossil material, as well as finds of pumice stones (summer 2009), seems to indicate a coast-inland settlement pattern similar to that documented historically for the Báhceveaj siida (Tanner 1929; Olsen 1984: 142–57). More generally, the new environmental preferences indicated by the location of the hearth row sites may suggest that access to reindeer pastures, and thus the importance of domesticated reindeer,

had become imperative to the selection of winter sites (Hedman 2003).

Upon closer scrutiny, however, the archaeological material from the Brodtkorbneset site is less conclusive. The amount and variety of finds fit well with a communal site occupied throughout the winter months, while other features of the material object to a too harmonious fusion with the ethnographic record. The fish hook, for example, does not comply well with fishing during winter, which if conducted normally was done with nets under the ice. Generally speaking, lake and river fishing were predominantly carried out during spring and fall (Tanner 1929: 125, 134–7; Nickul 1948: 21–53). Several features indicate a settlement involved in subsistence activities rather than living on stored resources. The cut marks on pike jaw bones indicate possible procurement for drying;⁷ moreover, the recovered vertebrae were all from the part near the tail of the spin, suggesting that the fish rich (and dried?) parts were produced for consumption elsewhere (Vretemark 2009: 10). The reindeer bones show an even spread of body parts including meat rich limb bones, as well as less meat rich bones such as crania, ribs and vertebrae (Vretemark 2009: 5–6). This suggests that the reindeers had been slaughtered on or near the site, either by killing domestic ones or by hunting from the site. Hunting and slaughtering would most likely take place during autumn,

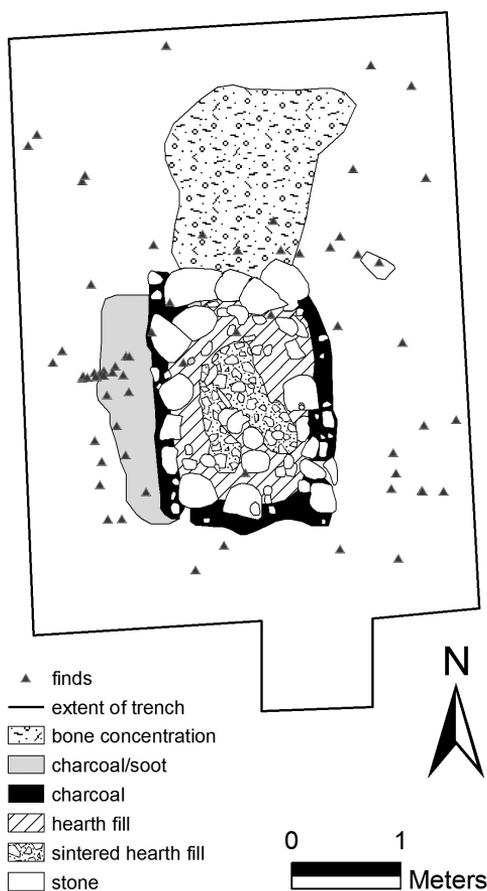


Fig. 10. Artifact distribution in the hearth 5 area (see also fig. 4).

although less extensive late winter hunting is also known historically among the Skolt Sámi (Tanner 1929: 116; cf. Tegengren 1952: 105). Taking these mixed material suggestions into consideration, it cannot be ruled out that the site was used during late fall or early spring/late winter, or that it was used twice during different seasons. Returning to the same site during other seasons was not uncommon among the late Skolt Sámi (Tanner 1929: 127–9, 216–20), although such intra annual returns do not seem to have included the winter village.

Reindeer is overwhelmingly dominant in the faunal material which triggers the question as to whether they were of domesticated or wild stock. The presence of arrowheads suggests that hunting took place. Pitfall system for trapping

of wild reindeer in the vicinity suggests that the area contained well suited hunting grounds. In fact, collective hunting of wild reindeer in the area is recorded as late as the early 19th century (Rathke 1907: 159). The determination of the age composition of the individuals represented in the faunal material shows that it was predominantly adult reindeer that were slaughtered, which may suggest the hunting of wild reindeer rather than the killing of a domesticated one (Vretemark 2009: 2). This, however, is inferred from current patterns of commercial reindeer production where calves are more commonly selected for slaughtering. In small pastoral herds, the slaughtering of old animals may be considered advantageous and age composition is hardly a reliable means to determine whether the reindeer were domesticated or not. Most probably, small herds of reindeer were at least kept for transport and decoy purposes while hunting was still important.

A curious indicator that domesticated reindeer were kept at the Brodtkorbneset site is actually the surprising presence of sheep (sheep/goat) bones, which is rather unique in such an early Sámi context. These bones stem from both meat rich and less meat rich part of the body, indicating that the animals were slaughtered at the site (Vretemark 2009: 7). In modern times the Skolt Sámi primarily kept sheep for their wool and since these animals are not well fit for moving long distances in snow, the animals were transported from the winter to spring sites in sleds pulled by reindeer (Nickul 1948: 67). Consequently, and given that this was not a sedentary site, the keeping of sheep and goats necessitated a draft technology that involved domesticated reindeer. The fact that only young individuals are represented (Vretemark 2009: 8) may indicate the wool producing importance of older animals not selected for consumption (Fig. 10).

Spatial organization

The most conspicuous feature of the spatial organization of the site is of course the linear organization of the hearths. As with other such sites, the hearths are oriented more or less perpendicular in relation to their linear arrangement, giving them an approximate N-S orientation. Another remarkable spatial feature

is the repeated pattern in bone refuse disposal. The spatial distribution of the bones shows a clear and systematic clustering to the north side of the hearths (Figs. 4 and 7). This is most evident for the two hearths rich in bone material, although it is also possible to detect in relation to H6. In addition, ongoing excavations of the four remaining hearths show that this is actually a systematic spatial pattern of bone disposal at the site. Only a few single fragments of bones are found in the area next to the opposite (southern) end of the hearths, and are also sparsely represented in the long side areas. The results of a phosphate analysis conducted at the site also largely confirm this spatial patterning of bone/organic refuse (Fig. 9). Although the grid for soil sampling is rather coarse (2 m intervals), the results are still in compliance with the overall distribution of bones.

An immediate interpretation of this spatial patterning of the bone material is that it reflects refuse clearance and butchering activities structured by the orientation of the entrance and thus the front and focal side area of the dwellings. Due to the general N-S orientation of the hearths, the entrances to the dwellings all faced in the same direction and probably affected the spatial patterning of activities and refuse disposal. This assumption is complicated by historical and ethnographic information regarding the Sámi organization of domestic space. As summarized by Ränk (1949), the hearth mediated a basic social and cosmological dualism between the front and back spaces in the dwelling, as also reflected by its two entrances. The inner part of the dwelling beyond the hearth (the *boassu* area) was the male area, leaving the front part as the female domain. The *boassu* was considered sacred, as was the attached back entrance. Sacred objects and hunting weapons were stored here, and together with the slaughtered wild animals, they could only enter the house (or tent) through the second doorway (cf. Yates 1989). Reindeer were killed and slaughtered at the back side of the dwelling. In more profane terms, the *boassu* area also served as the kitchen area of the dwelling, the place where meat and fish were cut and prepared for cooking. Thus, according to the ethnographic schemata, it may well be the *back* side of the dwelling that leaves the most visible imprints in the archaeological and soil chemical record.

It is interesting to note that the clear spatial patterning of bone refuse is not matched by the artefact distribution. Although also appearing in the north area of the hearths, artefacts are found evenly distributed around the hearth, with most of them next to the long side (Fig. 10). These divergent patterns of distribution could indicate that the bones were more likely to be deposited in accordance with the prevailing social and cosmological schemes. The proposed rules for how and where to handle meat and food within and next to the dwelling (cf. Ränk 1949; Mebius 1968; Edsman 1994; Grydland 2001) may have been imperative, and be the cause for the observed pattern. However, caution should be taken when trying to implement such recorded conceptions to the archaeological record. The generated pattern is actually also well in compliance with the imprints to be expected from a dwelling with one entrance and a major front door activity area. Additionally, according to the dualist interpretation domestic products such as milk, and also domesticated animals such as goats and sheep, should be kept separate from game and “wild” products, and should enter the house through the front entrance. The fact that the bones of goat and sheep are found in the same areas and deposits as reindeer and wild animals provides another cautionary tale to being too overenthusiastic in the reading of the ethnographic record. Nevertheless, it is still intriguing that the bones of these species were found in the same deposit (H3, cluster 318) with a rare iron axe and two trapezoid pendants.

Returning to the formalized linear organization of the site, this is a pattern of Sámi site organization that is commonly found over a vast area of northern Fennoscandia during the late Iron Age and Early Medieval Period. Below, we shall discuss its probable causes and implications on a larger regional level, but some comments also need to be added in relation to its internal social significance for the group in question. Although we cannot say for sure that all dwellings associated with the hearths were occupied at the same time (although most of them probably were), the site nonetheless constituted a unit that integrated both materials and people. Even if subsequently added, the hearths were constructed and arranged according to those previously built and thus indicate that the site was

considered a larger and more composite entity than the families or units of people associated with each hearth.

As with the principle of symmetry, a linear settlement pattern is often associated with egalitarianism (e.g. Levi-Strauss 1979: 133–9, 291–2). By arranging each hearth next to the other, one emphasized the commonality and equality among the people and families occupying the site. This however does not mean that we are dealing with a society that actually was egalitarian or without social differentiation beyond that associated with age and gender. As proposed by Friesen (2007) in his discussion of hearth rows and communal longhouses in the Late Dorset culture of northern Canada, “this evidence for overt signalling of equality may indicate the presence of the exact opposite: longhouses and hearth rows may have been constructed as acts of resistance to a growing tendency towards inequality or incipient hierarchies” (Friesen 2007: 207; see also Olsen 1984: 105–106, 1994). Studies of Sámi burials, sacrificial sites and settlements elsewhere in Sápmi have suggested emerging social differentiations within the Sámi societies during the Late Iron Age and medieval period (Odner 1992; Storli 1994; Schanche 2000; Hedman 2003; Hansen & Olsen 2004). Although the hearths at the Brodtkorbneset site at first glance may look similar to each other, they too exhibit clear distinctions. Taking into consideration also the preliminary results from the ongoing excavation of the four remaining hearths, there is a clear tendency showing that the three central hearths (H3–5) stand out from the hearths located at both ends of the row (H1–2, H6–7). These differences include the construction, size and morphology of the hearths themselves, the amount of refuse, as well as the richness of the finds. This differentiation may even be related to the control of fire. The two strike-a-lights were found at a central hearth (H5), the central hearths also contained numerous flint finds (fire flint), while the two most peripheral hearths (H1 and H7) were curiously lacking flint finds.

Although this differentiation may be caused by a number of factors, including possible preservation biases, there are still ample reasons to suggest that the Brodtkorbneset site was affected by the differences among the hearth units. Such emerging differences may be related to the

status and prestige ascribed to successful hunters or herders and/or to a successful involvement in trade networks (cf. Hayden 1995). An emerging reindeer pastoralism may possibly have caused tensions in relation to property rights versus common access to resources. Whatever the reasons for this differentiation, it may still be suggested that the linear organization of the rectangular hearths – by emphasizing equality and order – acted to counteract the potentially disintegrating effect of these processes. At the same time the hearths themselves, through their internal differences, came to manifest this emerging differentiation, and as such, may have played a key role in mediating the opposition between equality and status, order and transition.

The Brodtkorbneset site in a wider context

As previously mentioned, hearth rows became a conspicuous feature of Sámi settlement organization during the late Viking Age and Early Medieval Period. Thus, a proper understanding of this phenomenon must be seen in relation to a wider, interregional context that includes both Sámi and neighboring societies. For one thing, the linearly organized hearth sites may be seen as part of a greater process of formalization and unification of Sámi material culture that seems to have taken place during this period (Hansen & Olsen 2004: 125–41; Fossum 2006). In terms of the settlement outline, the same linear pattern is reflected in the so-called *Stallo* house sites that spread throughout the northern Norwegian/Swedish alpine zone (Mulk 1994; Storli 1994; Liedgren et al. 2007; Liedgren & Bergman 2009). Ritual and religious practices also became formalized and unified over vast areas as manifested in sacrificial practices (Serning 1956; Zachrisson 1984), bear burials (Myrstad 1996) and the spread of the “scree-grave” burial custom (Schanche 2000; Fossum 2006). Also with regards to implements and ornaments, the Sámi material repertoire at this time appears as something distinctive by its mixture of foreign goods (such as eastern ornaments) and local products and styles (Serning 1956; Makarov 1991; Wallerström 1995). In general, these processes of unification and formalization led to a new “visibility” of Sámi material culture. While performing rather

anonymously and regionally patterned during larger parts of the Iron Age, Sámi material culture snaps into focus in the late Viking Age as something distinct and widespread, making its recognizable imprint on the vast territory ranging from the South Sámi area to the Kola Peninsula (Hansen & Olsen 2004: 140–1).

These processes of interregional material formalization and unification may be seen as responses to ongoing social and economic processes which took place within neighboring societies; processes that seriously affected interethnic relationships and thus Sámi societies themselves. The Norse societies become Christianized, local chiefdoms gave way to kingdoms and state formations, and in the east, the emerging Novgorod trade-empire subsequently started to spin its extensive trade network throughout the north. The effect of all this was a tense interethnic situation, especially in the western Sámi area. While earlier interaction was mediated by locally redistributed economies and shared religious values (Odner 1983; Price 2002; Hansen & Olsen 2004), the new regimes created a less symmetrical and less predictable sphere of interethnic contact. The intensification of the fur trade (and possibly taxation), particularly though far from exclusively as effectuated by Novgorodian interests, put the Sámi economy under pressure, causing a far more direct interface between “the local” and European markets and the emerging “world system”.

Within such a turbulent context, the extensive formalization of settlement outline as reflected in hearth rows and *stallo* house sites, together with the extensive unification of religious and ritual practices, may be seen as a way to respond and cope with this new situation (cf. Olsen 2000, 2003). While also playing a role in terms of negotiating local social processes as suggested above, on a grander scale this material mobilization may have acted in additional ways, such as to consolidate identity and values and to manifest rights to land and resources. While earlier Sámi ethnic identity was probably primarily locally meaningful and thus differentially manifested, the new material manifestations contributed in helping to create this identity as something relevant and distinctive on a large geographical scale. For the first time, Sámi culture and identity probably emerge as something relatively unified and recognizable within most parts of what is today considered Sápmi. Hearth rows contributed to this process of

ethnic consolidation and unification. Moreover, by being constructed over increasingly larger areas, their presence may have reminded travelling traders and tax collectors of to whom this land belonged. Against the backdrop of state economies and trade networks competing over Sámi resources, the hearth rows may have thus also acted as a mutually comprehensible if tacit statement of Sámi rights to pastures and hunting grounds.

CONCLUSION

The hearth row site at Brodtkorbneset has yielded a surprisingly rich material grounding the preliminary results and analyses presented here. This material is of great importance both to our understanding of the local society they formed part of and, more generally, of row-organized hearth sites as a northern historical phenomenon. The richness of the site constitutes a cautionary tale to widespread assumptions about the interior north – and hearth sites in particular – as being of little reward to the archaeologist studying the Iron Age and medieval period (see Hedman 2003).

The large rectangular hearths with their peculiar linear organization were long considered as displaying “non-Sámi” features. Stereotyped conceptions of Sámi culture as static and spatially disorganized clearly grounded such opinions. On a par with Sámi material culture more generally, the extensive repertoire of hearth row sites brought to archaeological attention over the past 30–40 years clearly challenges these and other prejudiced conceptions. In this paper, we have argued that the order and symmetry implied by the row-organized hearth sites were probably related to both the role they played in internal social dynamics and in negotiating regional processes of change. As such, their conspicuous design and spatial order were clearly historically contingent, responding to transitional processes in one of the most decisive epochs of Sámi and northern history.

The material from Brodtkorbneset also provides a thought provoking supplement to the narratives based on the ethnographic record. Although there may be significant commonalities with settlement patterns and subsistence practices as depicted for the Skolt and eastern Sámi societies from the 16th to the early 20th century (cf. Tanner 1929; Tegengren 1952), the material also suggest ways of

dwelling and organizing domestic space that do not conform to the historical and ethnographical information. Neither does it comply well with basic socioeconomic taxonomies separating hunters from herders and pastoralists, and/or “simple” from “complex” societies. Those who tented at Brodtkorbnset nearly a millennium ago may well have been *both* reindeer hunters and herders, and their pastoral skills were not restricted to just reindeer. Even sheep (and goats?) were enrolled into their hybrid economy and thus included far earlier than what has previously been acknowledged. As such, the material from Brodtkorbnset contributes to a richer, less anticipated, and in our opinion, more exciting account of the Sámi past.

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NOTES

¹ A few sites are also known from the coastal region of Finnmark, Norway; however, the sites are located up hills or in small river valleys well away from the seashore where most other prehistoric coastal sites are found.

² *Lapp* was previously the common term used to designate the Sámi in Scandinavian languages.

³ Sven Donald Hedman led the survey assisted by Kenneth Webb Vollan.

⁴ The shards are small and most likely tempered with steatite. Although the Kjelmøy ceramic is usually tempered with asbestos, other means of tempering are observed. Two shards were radiocarbon dated yielding the results 2475 ± 35 BP (770–410 BC within 2 sigma calibration range) and 2450 ± 35 BP (760–400 BC), which dates well in compliance with the chronology of the Kjelmøy pottery.

⁵ All charcoal samples are from pine. To reduce the potential the old wood effect, only the charcoal of thin branches or from outer growth rings were selected for dating.

⁶ All calibrated dates are given with two sigma calibration range.

⁷ Cutting the front jaw section of the pike head was done prior to splitting the fish along its spine to facilitate better/faster drying.

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