Anja Mansrud & Carine Eymundsson

SOCIALIZED LANDSCAPES? LITHIC CLUSTERS, HEARTHS AND RELOCATION RITUALS AT MIDDLE MESOLITHIC SITES IN EASTERN NORWAY

Abstract

Middle Mesolithic (8300–6300 calBC) sites in eastern Norway appear as distinct lithic clusters often associated with hearths. In this paper, a theoretical and methodological framework for analysing such locales is explored. We focus on how spatial arrangements can be interpreted in terms of social practice and world views, taking the question of how settlements relate to abandoned sites as our point of departure. GIS-based intra-site distribution analysis and Minimum Analytical Nodule Analysis (MANA), set within a chaîne opératoire framework, offers a methodology for targeting technological and temporal aspects of lithic clusters. Our analysis points to mobility in the utilization of the landscape and a settlement organization that was mobile within confined landscapes. Within the Oslo Fjord area, inhabited and abandoned camps were visually present along the coast and estuaries, creating a social environment, which directed the procedures of where to set up a new camp.

Key words: Hearth, lithic cluster, landscape socialization, cosmology, Middle Mesolithic

Anja Mansrud, Museum of Cultural History, University of Oslo, P.O. Box 6762 St. Olavsplass, N-0130 Oslo, Norway: anja.mansrud@khm.uio.no; Carine Eymundsson, Institute of Archaeology, Conservation and History, University of Oslo, P.O. Box 1008 Blindern, N-0316 Oslo, Norway: c.s.eymundsson@iakh.uio.no.

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INTRODUCTION

Settlement patterns and intra-site organization have been important targets for Mesolithic archaeological inquiry in eastern Norway. The social organization of Mesolithic communities has mainly been interpreted in terms of models that consider the overall subsistence-settlement patterns as responses to environmental constraints, and link the landscape utilization with foraging and the procurement of resources (Mikkelsen 1975; 1978; 1989; Mikkelsen & Nybruget 1975; Lindblom 1984; Boaz 1998; 1999). Due to the absence of archaeological sites, the spatial archaeology of the Middle Mesolithic and the general cultural-historical development during this period was for a long time largely unexplored (Bjerck 2008a: 93). In Egil Mikkelsen's seminal study of Mesolithic seasonality and ecological adaptation (Mikkelsen 1978), the Middle Mesolithic (termed Mesolithic phase 2) settlement pattern was based on a limited number of sites. Mikkelsen (1978: 97) interpreted Tørkop as a base camp in a semi-sedentary settlement system, an interpretation later supported by Jaksland (2001). At present, a large number of sites are available for study, and issues concerning site formation can be readdressed with a more firm set of data. The Middle Mesolithic phase in eastern Norway is, according to the latest re-evaluation, chronologically delineated to c 8400/7950–6300 calBC (Damlien 2016: 391). Recent archaeological excavations show that demarcated lithic clusters, often with associated hearths, characterize the spatial outline of Middle Mesolithic sites in eastern Norway (Mans-

Site	Total amount of finds	Dating	Clusters, hearths and other features	Reference
Anvik	4754	EM3	Four clusters	Eymundsson 2013
Nordby 1	50	MM1	Three clusters (?), two hearths	Olsen 2013b
Ragnhildrød	754	MM1	Five clusters	Mjærum 2012: 74
Vinterbro 12	1043	MM1	One cluster	Jaksland 2001
Svingen	1780	MM1	Four clusters, two hearths	Eymundsson 2014b
Rødbøl 54	2046	MM1	Two clusters, one hearth	Mansrud 2008
Nordby 2	2467	MM1	Five clusters	Koxvold 2013b
Hovland 5	3177	MM1	Two clusters	Mansrud & Koxvold 2013
Hovland 2	2969	MM1	Four clusters, cache	Koxvold 2013a
Hovland 4	4276	MM1	Four clusters, 10 hearths	Mansrud 2013b
Sundsaasen 1	6659	MM1	Two clusters	Eggen 2014
Campus Ås	167	MM2	One cluster, one hearth	Eymundsson 2014a
Skutvikåsen 4	688	MM2	One cluster	Ekstrand 2013
Torstvet	815	MM2	One cluster	Mansrud 2013c
Vinterbro 9	879	MM2	One cluster	Jaksland 2001
Storsand R 43	1123	MM2	One cluster, one hearth	Ballin 1998: 36
Trolldalen	1450	MM2	One cluster, one feature	Solberg & Schülke 2015
Tørkop	4811	MM2	Two clusters, remains of pithouses (?)	Mikkelsen et al. 1999
Skutvikåsen 3	7368	MM2	One large cluster, midden	Ekstrand 2013
Prestmoen 1	8063	MM2	Midden	Persson 2014
Hovland 1	8944	MM2	Three clusters, one hearth	Olsen 2013a
Hovland 3	21391	MM2	Pit house, 21 features	Solheim 2013a; Solheim & Olsen 2013
Gunnarsrød 8	771	MM3	One cluster	Fossum 2014b
Trosterud	5380	MM3	Two clusters, two hearths	Berg 1997
Torpum 1	6701	MM3	One cluster	Johansen 2003
Gunnarsrød 7	12402	MM3	Four clusters	Fossum 2014a
Langangen Vestgård 1	15699	MM3	Continous occupation of large area, 11 features	Melvold & Eigeland 2014

Table 1. Sites, amount of finds, chronological position, and number of clusters/hearths. The chronological positioning is set in accordance to Bjerck's (2008a) chronozones: EM3 – 8500–8000 calBC; MM1 – 8000–7500 calBC; MM2 – 7500–7000 calBC; MM3 – 7000–6500 calBC.

rud 2008; Melvold & Persson 2014; Solheim & Damlien 2013) (Table 1).

In the following, a theoretical and methodological framework is explored through the analysis of five locales with lithic clusters and hearths (Fig. 1). The aim of this paper is to move beyond the traditional functionalist and economic frameworks; to add to and expand the current views and approach human-environment relationships as inherently social. In order to approach the social and cultural aspects of site formation and to link observable patterns to past intentionality, we will draw on generalized ethnoarchaeological observations and anthropological models based on comparative, structural anthropology. Ethnoarchaeological and ethnographic analogy is a valuable tool for exploring additional information concerning the human use and perception of landscapes – without extant cultural illustrations, spatial archaeology tends to become lifeless (Bielawski 1982: 42).

Hearths and fire are essential vehicles for human survival in dissimilar climates and environmental settings. A hearth is more than a practical device for keeping warm, cooking food and heating water, it is also a socio-material structure with the ability to influence social relations. The campfire is the focus of practical tasks, as well as social and ritual life, among many hunter-gatherer groups (Barnard 1978: 7–9; Grøn 1991:

103; Hedman & Olsen 2009). Hearth-related activity is a well-documented, cross-cultural, universal attribute of human social behaviour at a small-scale level. Individuals in small groups tend to place themselves in circular arrangements, facing a common centre, usually demarcated by a hearth (Grøn 1991: 103, with references). This behaviour is transferable to prehistory, thus hearths and lithic clusters serve as important sources of information for inferring social behaviour on different analytical scales (Grøn 1991; Binford 2001; Spikins et al. 2010; Vogel 2010: 140).

The large number of similarly excavated sites makes the Middle Mesolithic locales suitable for a micro-archaeological, data-driven approach, that starts from the local sites and settings in order to identify recurring patterns and generalities (cf. Cornell & Fahlaner 2002; Manninen & Knutsson 2014: 95; Eigeland 2015; Damlien 2016). Moreover, the distribution of a large number of sites within a limited area offers an opportunity to explore a macro-scale perspective, focusing on how spatial arrangements can be interpreted in terms of social practice and worldviews. As recently emphasized by Birch and Williamson (2015: 139) the question of how *settlements relate to abandoned sites* is a diminutive theme in archaeology, and will be used as a point of departure for exploring within-site and between-site spatial patterning.

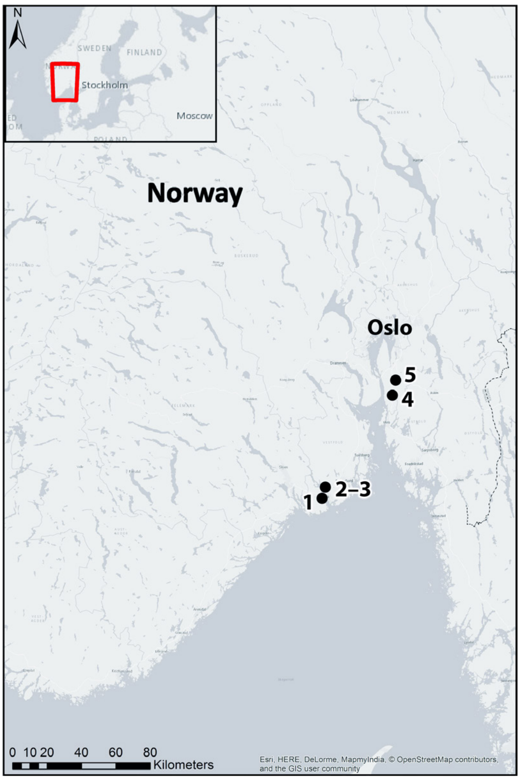


Fig. 1. Location of the five analysed sites: 1 – Anvik; 2 – Torstvet; 3 – Hovland 4; 4 – Svingen; 5 – Campus Ås. Illustration: C. Eymundsson (base map: OpenStreetMap).

BACKGROUND AND AIMS

'The creation of form and pattern is what makes the deep past accessible to our inquiry. It depends, as an act of investigation, upon those associations being social' (Gamble 1998: 439).

Binford (1980; 1982; 2001) has derived ethnoarchaeological 'templates' aimed at identifying spatial patterning on different scales. According to Binford's model (1982: 11) hunter-gatherer mobility is closely related to the distribution of food resources in a given environment, and mobility is the way a group adjusts according to these resources. Biomass conditions regulate resource access, and hunter-gatherers living in seasonal and high primary biomass environments, such as boreal forests, tend to move quite frequently in order to exploit animals that are dispersed throughout the environment (Kelly 1983: 277). Groups with low socio-political stratification, organized through kinship and clans, often display great variation in settlement patterns and social complexity (Kelly 2007). However, a distinct feature of human social organization is the spatial focus on a home base, or residential camp, and according to this model, the way a group uses its habitat is conditioned by movements in relation to the residential camp (Binford 1982: 6). Binford (1980) distinguishes between residential mobility (movements of the entire local group from one camp to another), and logistical mobility (foraging movements of individuals or task groups back and forth from residential camps). These types of mobility are expected to result in diagnostic forms of site patterning, and have been particularly influential for examining the spatial patterns in the archaeological record.

Whereas knowledge concerning hunter-gatherer mobility is well informed by ethnoarchaeology, inferring patterns of mobility based on archaeological remains is a challenging task, and various different models for dealing with this problem have been launched (Kelly 1983; 1992; Gamble & Boismier 1991; Kent 1991; Manninen & Knutsson 2014: 84). Distinguishing between a landscape utilization where the whole group moves, or where only a segment of the group moves within a wider range, is problematic (Bergsvik 2002; Solheim 2012: 194). As demonstrated by ethnoarchaeology, hunter-gatherers often include large areas in their settlements. Different kinds of activity taking place outside hubs or in the vicinity, for example, related to animal remains, does not necessarily leave material traces that can be inferred archaeologically (Grøn 2000; Grøn & Kuznetsov 2003; Grøn et al. 2008).

The problem of imposing general anthropological models for differentiating between 'types' of societies based on their economy, and to reconstruct social structure and spatial organization based on material remains, has long been acknowledged, and continues to impose a challenge to prehistoric archaeology (Grøn 1991). Still, such assumptions are often, explicitly or implicitly, lingering behind the overall temporal developments suggested for the Mesolithic phase in Norway. Several researchers have reasoned that the Early Mesolithic population (9500–8300 calBC) was characterized by residential mobility, organized in small, mobile bands with large annual and extended ranges (Lindblom 1984; Jaksland 2001; Bjerck 2008a; Fuglestvedt 2009; but see Åstveit 2014 for a different point of view), whereas the larger settlement sites dated to the Late Mesolithic period (6300–3800 calBC) with high densities of lithic finds, pronounced raw-material diversity, and occurrence of substantial structures, have been linked to incipient regionalization, logistical mobility and/or increased sedentism, and changes in social organization and complexity (Bergsvik 2001; Bjerck 2008a: 97–102; Fuglestvedt 2008; 2010a; 2011; 2012; Glørstad 2010a). For eastern Norway, several researchers have argued that changes in the utilization of the landscape, attachment to a more confined landscape and intensified regionalization *originated in the Middle Mesolithic period* (Glørstad 1999; Fuglestvedt 2008). The Middle Mesolithic sites differ from the Late Mesolithic locales, both in terms of number of artefacts, composition of the assemblages, and the lithic technology (Glørstad 2010a: 103–60; Eigeland & Fossum 2014; Melvold & Eigeland 2014; Eigeland 2015).

Damlien's (2016) recent analysis indicates that the Middle Mesolithic techno-complex was introduced into eastern Norway as a 'cultural package' by foraging groups migrating into the area from the east, sometime between 8400–7950 calBC. The artefact assemblages contain several novelties, including adzes, grinding slabs, and compound tools with inserts. The accompanying lithic technology comprises blade and microblade production by the use of conical cores, pressure blade technique and an 'eastern-related' technique for bone manufacture (Bergsvik & David 2015; Damlien 2014; 2016: 451). Common artefact types are burins on blades and blade borers. Microliths (in particular scalene triangular microliths and barbed points) have been considered diagnostic types; however microliths do not exceed 0.7% of the assemblages, and are not identified at sites dated after 6700 calBC (Mansrud 2013a). Blades are usually modified by breaks rather than retouch, and the assemblages are characterized by large amounts of retouched and unretouched bladelets, presumably used as inserts in composite tools (Mansrud 2013a; Solheim & Damlien 2013; Melvold & Persson 2014; Damlien 2016: 30). Polished and pecked adzes of basaltic rocks and grinding slabs of sandstone occur from about 7900–7600 calBC, but manufacture of pecked and ground adzes does not commence until c 6700 calBC. (Mansrud 2008; Mjærum 2012; Eymundsson et al. in press).

The reorganization of technology constitutes a break with the earlier technological traditions. The Early–Middle Mesolithic transition is also linked with the Late Preboreal climatic changes, c 8600–8300 calBC, where increased temperature and drier conditions initiated the final melting of the ice and opened up a travel route into the interior of eastern Norway (Knutsson & Knutsson 2012). The new migrations into eastern Norway might be connected with these environmental shifts (Damlien 2014: 10), however, the accompanying differences in settlement systems, landscape utilization and mobility that is inferred from the technological analysis, suggests that changes were driven by transformation of social institutions and networks, rather than resulting from environmental constraints and adaptive strategies (Damlien 2014; 2016: 451). We suggest that these fundamental modifications of nature and society presumably also involved changes in world views, and human-environment relations.

Human utilization of the natural environment is partly determined by subsistence practices and raw material availability, but in current archaeology, a more varied utilization of the hunter-gatherer landscape is acknowledged (Anschuetz et al. 2001; Grøn & Kuznetsov 2003; Grøn et al. 2008; Langley 2013; Manninen & Knutsson 2014: 85). Landscapes are more than simply a 'space for survival' – landscapes preserve the memory of the society that occupies it, and is closely related to the identity of a particular group (Surrallés & Hierro 2005: 17). The landscape can also be regarded as a material and non-material structure, structuring the practice of humans (Fuglestvedt 2011: 32). We argue that recurrent features in the utilization of space reflect notions involving cosmologies and concepts of landscapes as social spaces, related to other humans as well as other-than-human agencies. This constitutes a step towards an understanding of the natural environment as a cultural milieu (cf. Westerdahl 2002).

As contended by Clive Gamble (1998: 439) in the introductory quote, spatial patterns in the archaeological record are what makes the deep past accessible to us, and these patterns are the outcome of social actions and institutions. For the last 20 years, the main trend in social archaeology has been to locate social life in practice and action, as the outcome of the behaviour of individuals who create the social world around them, rather than focusing on super-individual structures (Fuglestvedt 2011). As contended by Phillipe Descola (2013: 110), human cultures exhibit variety in the perception of landscapes and other-than human agents, however human collectives also resort to a limited number of general integrating schemas in order to structure their relations with the world. Thus, the cultural construction of space and relationships can be generalized into models used for systematizing cultural variation (Descola 2013). The structural view involves a higher degree of abstraction, but is useful for prehistoric archaeology. Because spatial organization is situational and historically situated, archaeologist Pierre Vogel (2010: 143) has recently suggested *contextual concurrency* as the only viable analytical unit for examining sites that span millennia. In this paper, contextual concurrency denotes sites and materials that belong to the same historical context and techno-complex.

Stone tools are rarely used by present day hunter-gatherers, thus analysing the prehistoric spatial organization based on ethnoarchaeological and ethnographic data is problematic (Manninen & Knutsson 2014: 84). Additionally, hunter-gatherer archaeology has been hampered by the employed methods: classifying assemblages and artefacts into types is not a suitable method for distinguishing site variability or mobility (Binford 1982: 28; Dobres 1995: 29–30; Sassaman 2000: 148). As contended by Marcia-Ann Dobres (1995: 342), the *chaîne opératoire* framework as a method focuses on studying composite assemblages on multiple analytic scales simultaneously. The method also offers a methodology for targeting technological and temporal aspects of the clusters at different sites. GIS-based intra-site distribution analysis and examination of Minimum Analytical Nodule Analysis (MANA) will be used in order to interpret the spatial arrangements on a micro-scale level.

MIDDLE MESOLITHIC ARTEFACT CLUSTERS AND HEARTH-RELATED DISTRIBUTIONS: A MICRO-SCALE ANALYSIS

Envisioning the prehistoric landscape and topography of the Oslo Fjord area is a challenging task, because the sites, once located in an archipelago, are presently situated in dense forest, between 48–155 m a.s.l. (Fig. 1). This situation is a consequence of the rapid deglaciation of the late glacial ice sheet, which led to isostatic uplift during the Preboreal and Boreal chronozones, resulting in substantially raised shorelines. The sites were only accessible from the sea for relatively short time spans, and are unaffected by later transgressions. Over the past 20 years, an important methodological objective of eastern Norwegian Mesolithic field archaeology has been to unearth large, continuous areas. This is partly in order to identify indistinct features, but also to document unoccupied spaces between lithic scatters, as this is a prerequisite for their delineation (Glørstad 2006: 93–7). As cultural layers are seldom preserved in this geographical region, the conventional excavation method is the removal of 10 cm of mechanical layers, within 50 x 50 cm squares, within a GPS-derived grid system. All soil beneath the turf is wet-sieved, using a 4 mm sieve (Glørstad 2006: 89). Lastly, each site is stripped with a machine, in order to search for deep-set structures. All the lithic debris from each unit is collected and quantified, and the material is accessible from a national database (MUSIT).

Wind, frost and rain, and processes of bioturbation and podzolization will quickly erase all traces of ephemeral fireplaces, leaving only burnt lithics, hazelnut shells and calcined bones. However, our methodological efforts have resulted in a number of sites with lithic clusters, stone-built hearths and other features. The related features vary from well-built stone structures associated with pithouses, stone-filled cooking pits with or without charcoal, to small surface concentrations of fire-cracked stones without any charcoal (Jaksland 2001: 65; Mansrud 2008: 254; 2013b; 2013c; Solheim & Olsen 2013; Melvold & Eigeland 2014: 256–63; Eymundsson 2014a; 2014b). In other cases, the existence of a fireplace can be inferred from clusters of burnt flint (Mansrud & Koxvold 2013: 67). The majority of sites are dated within the time span 7600–7300 calBC (the MM1 and MM2 chronozone) (Table 1).

As shown in Table 2, not all the charcoal samples fit with the typological or the shoreline-dating of the sites. In addition to some hearths of younger origin (hearth no. 13 at Hovland 4), some of the hearths are probably contaminated by charcoal from natural or non-related activity. Charcoal from younger activities, for example forest clearance, is often better preserved, and post-depositional disturbances from later human activity, as well as root impact, may have transported coal from younger episodes into older structures (Glørstad 2010a: 110). There will, therefore, always be some degree of uncertainty related to ^{14}C dates on charcoal samples from wooded areas (Vogel 2010: 133). The problem can be illustrated by results from the Torstvet site, where a charcoal sample from a hearth was initially dated to the Early Bronze Age. A new analysis later dated material from the same sample to Pre-Roman Iron Age, a thousand years younger (Mansrud 2013c: 247–8) (Table 2). However, the distribution of lithics suggests concurrency between the hearth and the Middle Mesolithic activity, and burned hazelnut associated with the lithic scatter was dated to 7535–7444 BC (Tra-3406) and 7505–7430 BC (Tra-3407).

Assemblages are sets of artefacts and features which are found in clustered association (Binford 1982: 5). Assessed together (Table 1), the sites can be roughly separated into three categories based on the number of artefacts: 1) small assemblages (c 50–2000 finds) consisting of one lithic cluster, with or without a hearth, displaying specialized activity; 2) medium sized assemblages (c 2000–10000 finds) of several lithic clusters with or without visible hearths, displaying a diverse range of activities and tasks; 3) large assemblages (c 10000 finds – <20000), with substantial structures such as dwellings/pithouses and large areas of lithic debris indicating reuse or long-time occupation. So far only two sites belonging to the third category have been identified (Solheim & Olsen 2013; Mansrud & Persson 2016), whereas the majority of sites belong to the first two. This outline of assemblages characterizes Mesolithic sites in general (e.g. Fischer et al. 1979: 140; Boaz 1999; Sergant et al. 2006; Bjerck 2008b: 231–48; Gelhausen et al. 2009; Glørstad 2010a: 111; Vogel 2010). Consequently, we consider this recurring pattern as a meaningful unit for analysis.

In our study, we are prevented from inferring other activities related to organic materials, as sites with non-lithic activity are rarely recognized during an archaeological survey, and even more rarely excavated. Bone, wood and other organic remains were probably more important than lithics in prehistory, as evidenced from sites with better preservation (e.g. Nordqvist 2005). This creates a considerable bias. However, as demonstrated by recent research (Eigeland 2012; 2014; 2015; Koxvold 2013a; 2013b; Damlien 2014; 2016; Eymundsson et al. in press), technological attribute analysis within a *chaîne opératoire* framework offers a methodology targeting technological as well as temporal aspects of the

Museum no.	Site	Feature	Lab-index	BP	±	CalBC/AD (2σ, 95.4%)	m a.s.l.	Shoreline displacement date	Reference
C58917	Anvik	S10520, hearth	Ua-46950	7818	49	6820–6500 calBC	77–80	8550–8250 calBC	Eymundsson 2013
		S10520, hearth	Ua-46951	7875	52	7030–6830 calBC			Eymundsson 2013
		S10520, hearth	Ua-46952	7744	49	6650–6470 cal.BC			Eymundsson 2013
		S10520, hearth	Ua-46953	7678	49	6610–6430 cal.BC			Eymundsson 2013
C58328	Hovland 4	S3, hearth	Ua-45492	2090	32	165–55 calBC	65	7900–7800 calBC	Mansrud 2013b: 154
		S6, cooking pit	Ua-45493	8568	51	7606–7545 calBC			Mansrud 2013b: 154
		S1, hearth	Ua-45494	8526	52	7590–7541 calBC			Mansrud 2013b: 154
		S8, hearth	Ua-45495	3534	34	1926–1776 calBC			Mansrud 2013b: 154
		S10, hearth	Ua-45496	3016	32	1371–1215 calBC			Mansrud 2013b: 154
		S14, cooking pit	Ua-45497	2327	32	408–381 calBC			Mansrud 2013b: 154
		S7, 90x/45y, SW, 2. hearth	Ua-45499	8630	49	7680–7587 calBC			Mansrud 2013b: 154
		101x/59y, NE, 2	Ua-45498	1751	31	241–335 calAD			Mansrud 2013b: 154
		90x/45y, SW, 2	Ua-45499	8630	49	7680–7587 calBC			Mansrud 2013b: 154
		93x/46y, NV, 2	Ua-45500	8747	64	7938–7657 calBC			Mansrud 2013b: 154
C58428	Svingen	S301, hearth	Ua-45460	8583	48	7716–7536 cal.BC	84–87	7700–7500 calBC	Eymundsson 2014b
		S312, hearth	Ua-4563	6336	39	5465–5218 calBC			Eymundsson 2014b
C57995	Torstvet	61x/101y, layer 2	TRa-3406	8460	55	7535–7440 calBC	59	7500 calBC	Solheim 2013b: 42
		63x/102y, layer 2	TRa-3407	8425	55	7505–7430 calBC			Solheim 2013b: 42
		S1, hearth	Ua-45677	2218	34	362–209 calBC			Solheim 2013b: 42
		S1, hearth	TRa-3405	3090	30	1400–1310 calBC			Solheim 2013b: 42
C59050	Campus Ås	S1375, hearth	Ua-48560	859	30	1155–1220 calAD	73	7200 calBC	Eymundsson 2014a

Table 2. Overview of radiocarbon dates of presented sites (datings calibrated using the software OxCal 4.2).

Site, cluster	Tools (retouched)	Blades/bladelets	Flakes	Micro-flakes	Cores	Fragments
Torsvet	33 / 4.1	133 / 15.9	254 / 31.2	N/A	3 / 0.4	391 / 48.4
Campus Ås	13 / 8.8	7 / 4.7	55 / 37.5	7 / 4.7	2 / 1.4	63 / 42.9
Anvik, K1	52 / 1.6	43 / 1.4	1347 / 43.4	310 / 10.1	6 / 0.2	1341 / 43.3
Anvik, K2	15 / 1.7	9 / 1.1	441 / 51.8	105 / 12.4	5 / 0.6	276 / 32.4
Anvik, K3	4 / 1.2	3 / 0.8	198 / 56.6	36 / 10.3	3 / 0.8	106 / 30.3
Anvik, K4	9 / 3.1	9 / 3.1	133 / 45.6	28 / 9.6	2 / 0.7	111 / 38.1
Hovland 4, K1	12 / 2.6	14 / 3.1	103 / 22.3	46 / 9.9	0 / 0	287 / 62.1
Hovland 4, K2	35 / 2.4	126 / 8.6	477 / 32.3	165 / 11.3	4 / 0.3	664 / 45.1
Hovland 4, K3	58 / 4.2	89 / 6.4	186 / 13.2	83 / 5.8	2 / 0.2	985 / 70.2
Hovland 4, K4	35 / 4.2	75 / 8.9	122 / 14.5	26 / 3.1	2 / 0.3	580 / 69
Svinge, K1	18 / 13.8	13 / 10.1	33 / 25.4	1 / 0.7	4 / 3.1	61 / 46.9
Svinge, K2	2 / 7.7	3 / 11.5	12 / 46.2	0 / 0	0 / 0	9 / 34.6
Svinge, K3	0 / 0	7 / 4.7	35 / 23.8	7 / 4.7	2 / 1.4	96 / 65.4
Svinge, K4	24 / 2.1	159 / 13.9	408 / 35.6	39 / 3.4	5 / 0.4	509 / 44.6
Svinge, K5	2 / 0.7	20 / 7.4	103 / 38.1	13 / 4.8	2 / 0.7	131 / 48.3

Table 3. Overview of main artefact categories (given in pieces and percentages) from each cluster at each presented site. Note that amount presented for Hovland 4 diverge slightly from previous publications, since artefacts found in structures are not included here.

clusters at different sites. Although located in areas presently covered by forest, Middle Mesolithic sites in the Oslo Fjord region are often relatively undisturbed by later activity such as agriculture. Taphonomical N-factors (Schiffer 1983: 692) have, only to a small degree, affected the vertical and horizontal distributions. Thus, the lithic assemblages are well suited for intra-site analysis, technological studies and refitting. This may provide insight into the social, cultural and natural formation of single lithic clusters, as well as the relationship between clusters.

In addition to an overall morphological classification into formal types and debris (undertaken according to Helskog et al. 1976), the lithic debris of each cluster has been analysed according to the MANA method (Larson & Kornfeld 1997; Manninen & Knutsson 2014; Damlien 2016: 115). The aim of the method is to quantify the number of nodules that were worked on the site, and collate debris considered to originate from the same nodules. This is done according to visual raw material characteristics. The majority of the artefacts are made of flint. The classification of flint types have been conducted following a system established by our colleagues Lotte Eigeland (2015) and Hege Damlien (2016). All artefacts were macroscopically examined, and the non-altered flint (non-burned and non-patinated) separated into types based on texture, inclusions, and other visual variations such as colour, homogeneity, translucency and granularity (Inizian et al. 1999: 21; Soressi & Geneste 2011: 338). Each type was assigned with a code, and the stages of reduction sequence for each type recorded. The sorting into visually differentiated types of flint only make them relevant for analysing the activity at each individual site, and cannot be used to infer links between sites. The result is displayed in Table 3 and Figs. 2–5 and 7. As argued by Cornell and Fahlander (2002: 31–2) detailed small-scale studies are a necessary starting point before embarking upon the loftier issues, and in the following, an in-depth analysis of a selection of five sites will be presented.

SMALL ASSEMBLAGES

The intra-site distribution at the sites Torstvet and Campus Ås exemplify small type sites (Figs. 2 & 3). Torsvet is presently situated at 59 m a.s.l., in a marshy forest area. The site is dated by shoreline displacement to 7500–7100 calBC, and ^{14}C dated to 7535–7440 calBC (Mansrud 2013c: 236) (Table 2). If shore-bound at 58 m a.s.l., the site would have been situated on the northern side of an island, facing an inlet. A stone-built hearth and a scatter of 815 lithic artefacts were excavated. With the exception of one flake from a polished diabase axe, the raw material consisted exclusively of flint. 4% of the flint assemblage was identified as formal tools (three scrapers, two burins, one borer and four blade-knives) and informal tools (blades, microblades and flakes with retouch) (Mansrud 2013c: 240). Eleven core tablets and eight backed blades suggest preparation of conical cores. 11% of the material consisted of sectioned blades and bladelets, of which 12% were modified by retouch. These were presumably used as inserts (cf. Damlien 2016: 349). Additionally, some of the bladelets had use-wear in the corners, and are suggestively interpreted as burins for bone work, possibly for making the grooves for inserts (cf. Sjöström & Nilsson 2009). This could imply that composite tools were manufactured on the site. Thus, the site was interpreted as a short-term occupation, where blade/microblade production and manufacture of compound tools was the principal activity.

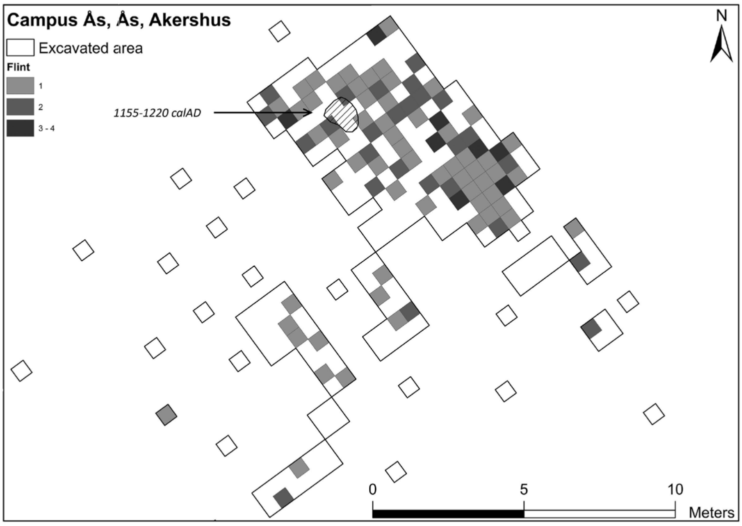
According to the MANA, seven different types of flint were identified by visual examina-

Torstvet, Larvik, Vestfold

MAN	TB1	TB2	TS1	TS2	TD1	TD2	TD3
CO1	0	0	0	0	0	0	0
CO2	0	0	0	0	0	0	0
CO3	0	0	0	0	0	0	0
CO4	x	0	x	0	x	x	x
CO5	0	x	0	x	0	0	0
CO6	0	0	0	0	0	0	0

One concentration of artefacts.
Short time occupation.
Tool maintenance, small scale blank production.

Fig. 2. Distribution chart and MANA table of Torstvet. TB1, TB2, TS1, etc. – different flint types; note that the abbreviations of raw materials diverge slightly from previous publication (Mansrud 2013c: 241). The chaîne opératoire for different flint types/MAN's are presented here as presence (x) or non-presence (0) within the following trajectories (modified after Eigeland 2015: 30–1): CO1 – Testing and discard of (local) raw material; CO2 – Opening and initial shaping and discard of raw material; CO3 – Complete production sequence from opening to finished/exhausted core; CO4 – Prepared cores or cores already used at a previous location are brought in to the site, used, discarded or brought out of the site again; CO5 – Import of blanks or finished tools; CO6 – Preforms ready for production left at the site as a cache. Illustration: C. Eymundsson (reworked after Olsen 2013: Fig. 13.26).



Campus Ås, Ås, Akershus								
MAN	CF1	CF2	CF3	CF4	CF5	CB1	CQ1	CBK1
CO1	0	0	0	0	0	0	x	0
CO2	0	0	0	0	0	0	0	0
CO3	0	0	0	0	0	0	0	0
CO4	x	x	x	x	0	0	0	0
CO5	0	0	0	0	x	x	0	x
CO6	0	0	0	0	0	0	0	0

One concentration of artefacts.
Short time occupation.
Tool maintenance, small scale blank production.

Fig. 3. Distribution chart and MANA table of Campus Ås. CF1, CF2, CF3, etc. – different flint types; CB1 – volcanic rock; CQ – quartzite; CBK – rock crystal (see Fig. 2 for abbreviations of the chaîne opératoire). Illustration: C. Eymundsson.

tion. The technological screening and the identified analytical nodules revealed no complete reduction sequences, but several cores were brought in to the site, used and discarded when exhausted. Blades were also imported as finished tools, used and left on site. This is consistent with the steps 4 and 5 of the *chaîne opératoires* (CO) (Fig. 2).

The distribution analysis showed that within the main lithic cluster, two activity areas could be distinguished. Based on the distribution of cores/core fragments, unretouched blades and microblade splinters (flakes <1cm), a knapping area was identified on the western side of the hearth. On the eastern side, there was no evidence of knapping, instead blade fragments and burins indicate activities involving bone work. A bipolar core, a blade-knife and a fragmented microlith were deposited adjacent to the fireplace. The refitted artefacts consist of a fractured core, several core tablets and blades (Mansrud 2013c: 242). Pieces could be refitted across the main cluster, in distances up to five metres apart. This supports the interpretation of the site as a single and coherent occupation.

Damlien (2016: 315–6) has performed a separate technological analysis of the Torstvet assemblage. Her analysis revealed several knapping sequences related to production of narrow blades and microblades on conical and semi-conical cores, consistent with the use of pressure technique.

At Campus Ås, a stone-built hearth and an associated scatter of 167 artefacts was excavated on the highest portion of a c 65 m^2 large, slightly sloping area. The site is presently situated at 73 m a.s.l. It would have been shore-bound when the sea level was 71 metre higher than present level, at c 7200 calBC, and situated at the mouth of a long, narrow fjord. The assemblage is dominated by flint artefacts (86.3%), with a small number of basaltic rocks, quartz and rock crystal artefacts. 9.2% of the flint assemblage was identified as formal and informal tools, the majority of these consisting of sectioned blades (Eymundsson 2014a). The majority of the assemblage was found in close association with the hearth. The hearth had small amounts of visible charcoal, and although this was dated to the medieval period (1155–1220 calAD), the association between the lithic artefacts and the structure nonetheless indicates a concurrency between them. The technological screening and MANA revealed that approximately half of the analytical nodules at the site consisted of imported blanks, while the others testified to small scale production of blades where the majority where transported out of the site together with the remaining cores (Fig. 3). Similarly, as at Torstvet, a large portion of the tools at this site consisted of section blades with wear consistent with use as burins. Bone work and manufacture of composite tools is the suggested activity at this short-term occupation.

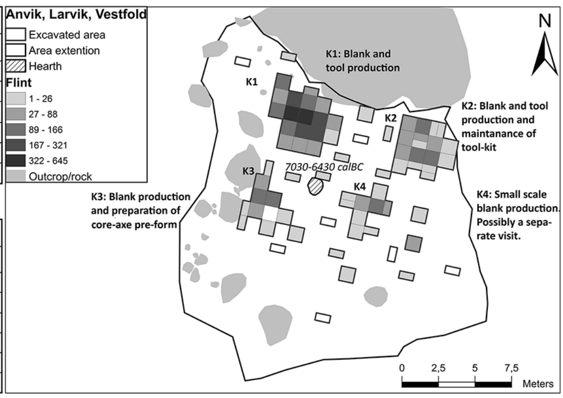
The two small sites, Torstvet and Campus Ås, display similar lithic assemblages, distribution patterns and MANs. Both sites are interpreted as short-term occupations related to a hearth. The spatial association with the hearths indicate that the clusters are activity areas rather than waste deposits (cf. Hernek 2005: 224). The activity was specialized, and involved blade and micro-blade production, with the use of pressure technique and maintenance of the tool kit related to compound tools (Mansrud 2013c; Eymundsson 2014a). Both assemblages encompass the production and maintenance of tools, and represent the CO stages 4 and 5. The MANs testifies that raw material, as imported blanks and blades, were transported in an out of these sites. This implicitly connects the small sites to other locales within a foraging range. Eigeland (2015: 350–2) has argued that a high degree of relocated cores, in combination with a high amount of imported blanks, can be related to a high level of mobility. The refits from Torsvet, and the comprehensive refitting from Vinterbro 12, support the transitory character of the small sites (Jaksland 2001: 55–6).

MEDIUM-SIZED ASSEMBLAGES

Anvik, Hovland 4 and Svingen exemplify the medium type sites with several clusters (Figs. 4–7). At Anvik, four clusters with a total of 4751 lithic artefacts were collected. None of the clusters were directly associated with hearths (Eymundsson 2013). The site is presently situated between 77 and 80 m a.s.l., and would have been shore-bound at c 8300 cal. BC. During this period, the site had an exposed location in the outer part of the prehistoric fjord. The site is topographically delimited by a small hill and outcrop, which would have provided a natural protection towards the north and west. At 8300 calBC, the assemblage would, according to traditional chronology (Glørstad 2010a: 36), belong to the very end of the Early Mesolithic period. Technologically, however, the material definitely belongs to the Middle Mesolithic technical tradition. This is shown by the blade production concept which is dominated by conical core pressure blade technology (Eymundsson 2013: 217–23; Damlien 2016: 217–22). The assemblage mainly consists of flint artefacts (99.2%), with a small element of basaltic rock and sandstone artefacts. The four clusters have differing amounts of formal and informal tools, ranging from 1.2% to 3.1%. The technological screening and MANA of the assemblage identified different activities at the separate clusters (Fig. 4). Three of the clusters (K1–K3) seem related and contemporaneous. This is in particular indicated

K1

MAN	AF1	AF2	AF3	AF4	AF5	AF6
CO1	0	0	0	0	0	0
CO2	0	0	0	0	0	0
CO3	0	0	0	0	0	0
CO4	x	x	x	x	x	x
CO5	0	0	0	0	0	0
CO6	0	0	0	0	0	0



K2

MAN	AF1	AF2	AF3	AF4	AF5	AF6
CO1	0	0	0	0	0	0
CO2	0	0	0	0	0	0
CO3	0	0	0	0	0	0
CO4	x	x	x	0	x	x
CO5	0	0	0	x	0	0
CO6	0	0	0	0	0	0

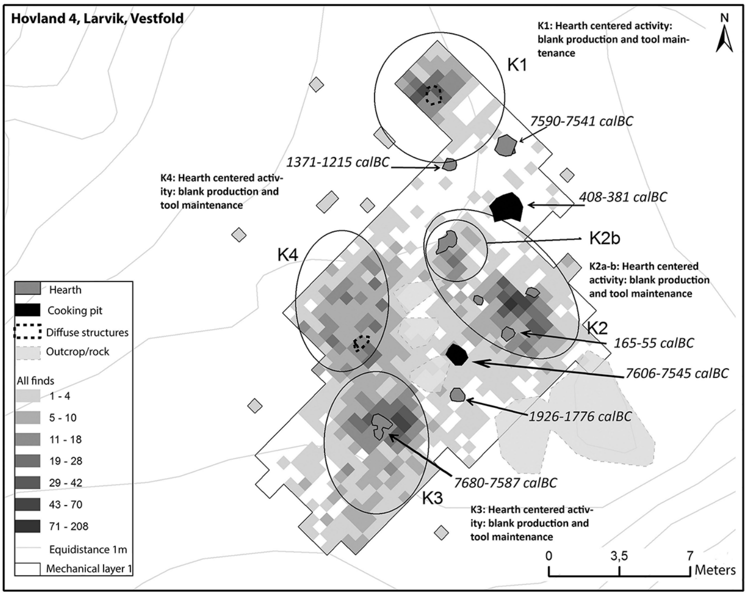
K3

MAN	AF1	AF2	AF3	AF4	AF5	AF6
CO1	0	0	0	0	0	0
CO2	0	0	0	0	0	0
CO3	0	0	0	0	0	0
CO4	x	x	x	0	x	x
CO5	0	0	0	x	0	0
CO6	0	0	0	0	0	0

K4

MAN	AF1	AF2	AF3	AF4	AF5	AF6
CO1	0	0	0	0	0	0
CO2	0	0	0	0	0	0
CO3	0	0	0	0	0	0
CO4	x	x	x	0	x	x
CO5	0	0	0	x	0	0
CO6	0	0	0	0	0	0

Fig. 4. Distribution chart and MANA table of Anvik. AF1, AF2, AF3, etc. – different flint types (see Fig. 2 for abbreviations of the chaîne opératoire). Illustration: C. Eymundsson.



K1

MAN	HF1	HF2	HF3	HF4	HF5	HF6	HF7	HF8
CO1	0	0	0	0	0	0	0	0
CO2	0	0	0	0	0	0	0	0
CO3	0	0	0	0	0	0	0	0
CO4	0	0	0	0	0	0	x	x
CO5	x	x	x	x	x	x	0	0
CO6	0	0	0	0	0	0	0	0

K2

MAN	HF1	HF9	HF10	HF3	HF7	HF8	HF11
CO1	0	0	0	0	0	0	0
CO2	0	0	0	0	0	0	0
CO3	0	0	0	0	0	0	0
CO4	x	x	0	x	x	0	x
CO5	0	0	x	0	0	x	0
CO6	0	0	0	0	0	0	0

Fig. 5. Distribution chart and MANA table of Hovland 4. HF1, HF2, HF3, etc. – different flint types (see Fig. 2 for abbreviations of the chaîne opératoire). Illustration: C. Eymundsson (reworked after Olsen 2013: Fig. 16.16).

by the production sequence of at least one flint core axe. Flakes were found within these three clusters, representing slightly different stages of axe production. However, in the fourth cluster (K4) no debris related to axe production was recognized. This cluster has been interpreted as possibly representing a separate occupation. Although it contained similar flint types as the other three clusters, the production stages and slight variations in the raw material types indicate that this activity was chronologically separate from the others.

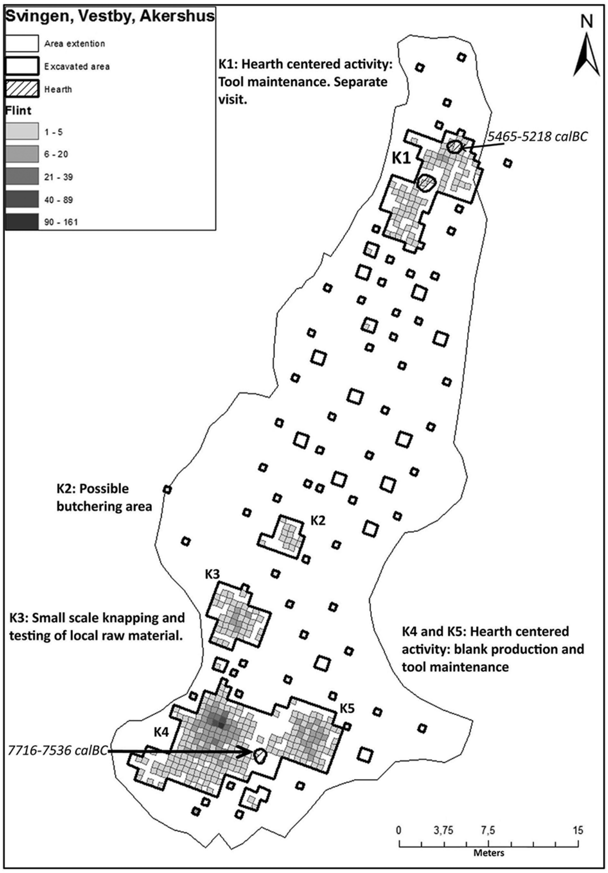
At Hovland 4, four clusters and a total of 4274 lithic artefacts were collected, of which 99% was flint (Mansrud 2013b). The site was located at 65 m a.s.l. It was dated by shoreline displacement to 8000–7800 calBC, and dated by several to ^{14}C dates between c 7900–7500 cal BC (Table 2). At c 65 m a.s.l., the site would have been situated on the south-western side of a small peninsula, facing an inlet. The site was topographically delimited to 1200 square metres, of which 190 m^2 were excavated. Four lithic clusters termed K1–K4 were uncovered. The clusters were located in the southern part of the area, and were related to a distinctive formation of three large stone boulders (Fig. 6). Between and around the boulders, ten stone structures were identified. These are interpreted as hearths and cooking pits.

Clusters K1 and K4 were related to uncertain structures, K2a and b were centrally located between the boulders, in relation to three stone-built hearths (S2–4, S13). K3 was associated with hearth S7 (Fig. 5). Four features (S1, S6, S7) were dated within the time-frame 7900–7500 BC (Table 2). A statistical analysis of the ^{14}C datings by use of the Bayesian method indicates that K2 and K3/K4 were deposited on different occasions (Solheim 2013a: 291–6). The site thereby represents both contemporaneous occupations where some hearths and associated clusters were utilized simultaneously, as well as separate visits related to other clusters. Charcoal from S3, S8, S10 and S14 were dated to the Neolithic, Bronze Age and Pre-Roman Iron Age, and S2, S4 and S13 did not contain enough charcoal for ^{14}C dating. However, for S2, S3 and S4, a close association between cluster and hearth suggest contemporaneity, and S2, S3, S4, S10 and S13 additionally contain Middle Mesolithic flint artefacts. Blades are found in three hearths.

The assemblage is dominated by flint artefacts (99%). 3% of the total collection of flint was classified as tools. The clusters had differing amount of finds, and formal and informal tools vary between 1–5% (see Table 3). Knapping related to blade and microblade production is evidenced by the distribution of splinters (flakes/fragments <1 cm), cores and core tablet/core rejuvenation flakes. Additionally, a similar set up of formal tools (microliths, borers, scrapers, blade-knives and burins) and informal tools (modified blades, microblades and flakes) are consistently distributed in relation to the hearths. In K2 there are fewer tools, but a higher percentage of informal tools (retouched bladelets and microblades). K2 also contains three pieces of an axe made of metaryolite, but no debris of the axe was found. A MANA was performed for the assemblage of two of the lithic clusters at the site (Mansrud 2013b). Both clusters contain several different types of flint, but they display slightly different COs. For K1, most of the flint types consist of blades and tools without associated cores (CO5) and for K2, several knapping sequences on cores prepared elsewhere could be identified. Several exhausted cores were discarded here (CO4).

Damlien (2016: 279–85) has also executed a more comprehensive technological analysis of the Hovland 4 assemblage, which include clusters K3 and K4. Her results suggest several raw material procurement strategies at Hovland 4. The most prevalent is on-site production, maintenance and discard of cores (equivalent with our CO3 and CO4), where raw materials have been brought to the site as prepared cores or preforms. A few beach-flint nodules have been tested and disposed of. Debris without associated cores, as well as flint represented by single blade blanks and discarded tools indicate transportation of artefacts to and from the clusters. The reduction sequences are related to blade and microblade manufacture on conical cores, including blades produced by several techniques: direct percus-

Fig. 6: Overview of Hovland 4, presently located next to a highway. Four lithic clusters and 10 hearths/cooking pits were located adjacent to several large boulders. The boulders were characteristic landmarks when the site was shore-bound c 8000–7800 calBC. Photo: R. Bade, Museum of Cultural History, University of Oslo.



K1

MAN	SF1	SF2	SF3	SF4	SF5	SF7	SF8
CO1	0	0	0	0	0	0	0
CO2	0	0	0	0	0	0	0
CO3	0	0	0	0	0	0	0
CO4	0	0	x	0	0	0	x
CO5	x	x	0	x	x	x	0
CO6	0	0	0	0	0	0	0

K2

MAN	SF1	SF5	SF7	SF8	SF9
CO1	0	0	0	0	0
CO2	0	0	0	0	0
CO3	0	0	0	0	0
CO4	0	0	x	0	0
CO5	x	x	0	x	x
CO6	0	0	0	0	0

K3

MAN	SF2	SF5	SF6	SF7	SF8
CO1	0	0	x	0	0
CO2	0	0	0	0	0
CO3	0	0	0	0	0
CO4	0	0	0	x	0
CO5	x	x	0	0	x
CO6	0	0	0	0	0

K4

MAN	SF1	SF2	SF3	SF4	SF5	SF6	SF7	SF8	BK1
CO1	0	0	0	0	0	0	0	0	0
CO2	0	0	0	0	0	0	0	0	0
CO3	0	0	0	0	0	0	0	0	0
CO4	0	x	0	x	0	x	x	0	0
CO5	x	0	x	0	x	0	0	x	x
CO6	0	0	0	0	0	0	0	0	0

K5

MAN	SF1	SF2	SF3	SF4	SF5	SF7	SF8	KV1
CO1	0	0	0	0	0	0	0	0
CO2	0	0	0	0	0	0	0	0
CO3	0	0	x	0	0	0	0	x
CO4	0	x	0	0	0	0	0	0
CO5	x	0	0	x	x	x	x	0
CO6	0	0	0	0	0	0	0	0

Fig. 7. Distribution chart, MANA table and interpreted activity areas of Svingen. SF1, SF2, SF3, etc. – different flint types; BK1 – rock crystal; KV1 – quartz (see Fig. 2 for abbreviations of the chaîne opératoire). Illustration: C. Eymundsson.

sion, pressure and indirect percussion (Damlien 2016: 280–4). A third technological screening of the Hovland 4 material undertaken by Eymundsson et al. (in press) confirmed that the lithic debris is consistent with blade and microblade production and tool maintenance exclusively. Axe production could not be verified.

The association between artefacts and hearths is clearly evident for some of the features, but not for all. S6, interpreted as a cooking pit, and S1, a large stone-built construction, both dated to the Middle Mesolithic period, and had a small amount of associated lithic artefacts. These features may be related to different functions. Also, this situation demonstrates the constraints and inherent problems of intra-site analysis based solely on lithics.

At Svingen, five clusters with a total of 1775 lithic artefacts were collected. Two of the clusters were associated with hearths (Eymundsson 2014b). The site is presently situated between 84 and 87 m a.s.l. in a forested area, close to the industrial area, south of Vestby city centre. The site would have been shore-bound at c 7600 BC. During this period the site was located on a large island in the inner part of the Oslo Fjord. The clusters are topographically delimited by low outcrops on all sides, except one area in the southern part of the site, which would have made a small natural harbour. The assemblage is dominated by flint artefacts (97.3%), with a small element of quartz, basaltic rock and rock crystal. The clusters have differing amount of formal and informal tools, ranging from 0–15.5% (see Table

3). A technological screening of the assemblage identified different activities at the separate clusters. Although no refits have been made between them, the MANA and CO screening indicates a relation between some of them and a possible lack of contemporaneity between others (Fig. 7). At least one cluster (K1) has been interpreted as representing a separate occupation. Although the cluster displays similar flint types as the other clusters, the production stages and slight variations in the raw material types indicate that this activity is chronologically separate from the other clusters. Similar to Hovland 4, a flint bladelet found in one of the hearths dated to 7716–7536 calBC.

The 'contextually concurrent' medium-sized assemblages, Anvik, Hovland 4 and Svingen, display similar organizational outlines of discrete lithic clusters (Figs. 2, 5, 7; see also published distribution maps in references listed in Table 1). The assemblages are lithic scatters, measuring approximately 5 metres in diameter, representing various activities, and often, but not always, associated with visible hearths. Without refits between scatters or sites, temporal connections between clusters cannot be securely verified. In addition to the above-mentioned indications of contemporaneity between lithic clusters, solid proof by refitting between clusters have thus far only been established at one Middle Mesolithic site in the Oslo Fjord area (Koxvold 2013b: 139).

Although no refits have been made between the clusters at sites of our case study, the COs of certain analytical nodules, site structure and interpreted activity areas nonetheless indicate contemporaneity and transference of artefacts by people between certain clusters at sites. Subsequent use of the same area has left artefact clusters *spatially respecting other deposited clusters and hearths*. Such a patterning is also clearly evident at Nordby 2 (Koxvold 2013b: 126) and Hovland 2 (Koxvold 2013a: 90), although hearths were less common here. A majority of the lithic clusters contain a standardized set up of formal tool types (scrapers, borers, blade-knives, burins, microliths and inserts) presumably used for manufacturing bone and wood artefacts. The MANA show that the most common COs of both small and medium sized sites are blade, blank and tool production, and tool maintenance, use and discard; thus they do not display the complete *chaîne opératoires* from procurement to discard (CO3), but rather selected parts of the operational sequences. Secondly, the MANA testifies to a 'flow' of cores and artefacts in and out of the sites, which points to an itinerant use of the landscape. This flow is also documented for other published Middle Mesolithic sites within the Oslo Fjord region, such as at Hovland 5, where a technological screening demonstrated how a knapper sat by a hearth whilst producing a core-axe. The axe itself was not recovered, and was probably brought along and used somewhere else (Mansrud & Koxvold 2013). Thirdly, at Hovland 4 and Svingen, artefacts, in particular blades and bladelets, were deposited in the hearths. This phenomenon was also observed at the Middle Mesolithic site, Rødbøl 54 (Mansrud 2008).

How can these recurring patterns be interpreted? In the following pages we will discuss in what way the identified patterns provide information on social organization, by focusing on different types of mobility. Then we will proceed to consider the abandonment of hearths and campsites. Lastly, we will consider the relationship between utilization of the landscape and cosmology.

HEARTHS, CLUSTERS AND TYPES OF MOBILITY

Within hunter-gatherer subsistence systems, the social organization, degree of mobility, and use of space is extremely diverse, but clearly defined territories are characteristic of hunter-gatherer landscape utilization (Kelly 1983). The notion of territory is linked with territoriality, which implies the exclusive use of a defended area, manners not generally applicable to hunter-gatherer societies (Ingold 1986: 130–47; Kelly 2007: 163–4). These authors rather suggest the term *land tenure* as more appropriate for describing hunter-gatherer landscape utilization. This concept includes sharing and exchange as integrated forms of the permission-granting behaviours, whereby hunter-gatherers regulate access to resources. For the same reason, Binford (1982: 7) employs the more neutral term *range* for describing the geographical space used annually by a human group, and makes a useful distinction between the term *camp range* (the area utilized starting from the residential base) and *annual range*. The camp range in the vicinity of the residential hub will rapidly become over-exploited. Even for sedentary hunter-gatherers who combine foraging with cultivation, the base camp is commonly relocated every 10–30 years, and the decision to relocate was often related to depletion of arable land and firewood (Birch & Williamson 2015: 140). Beyond the camp range is the foraging radius, rarely extending beyond 6 miles of the residential camp, and utilized by work parties who are able to leave and return in a single day. Outside the foraging radius is the logistical radius, used by task groups staying away from the base camp for a longer periods of time. Lastly is the extended range, an area with which groups are familiar, and inhabited by others; relatives, trading partners and wife-sharing partners (Binford 1982: 8).

From an archaeological perspective, locations would be expected within the foraging radius, and field camps, stations and caches within the logistical radius. However, mobility patterns may be geographically variable and regionally complicated, and are difficult to assess archaeologically. In an anthropological perspective, neither the groups/clans nor the territories are stable over several generations; boundaries are constantly expanded and reduced (Forde 1971: 374; Morphy 1988). Different sites may relate to the season, but also to the organization of past socio-cultural systems. Repeated seasonal movement of residential sites may cause repetitive types of occupations at particular logistical sites, but accumulative use of particular places is also anticipated if the social system is becoming more sedentary (Binford 1982: 19–20).

As suggested by Manninen and Knutsson (2014: 85), site structure may be used as a proxy for inferring the degree of residential mobility. Their interpretation is based on an ethnoarchaeological model of anticipated mobility, forwarded by Susan Kent (1991). This model predicts that the anticipated length of time people expect to spend at a given location influences the spatial organization of the site. This implies that site structure among highly mobile foragers reflects anticipated mobility, which is manifested in features that may be defined archaeologically, such as small sites and dwellings, low investment in housing, high feature discreteness, a low degree of debris accumulation and preventive site maintenance (Manninen & Knutsson 2014: 85, with references). These characteristics fit well with the spatial outline of the sites presented here. Such a pattern is claimed to typify residential mobility and movement of small, mobile groups, for example families or bands with a 'repetitive activity of a more or less fixed repertoire of tools' as suggested by Hein Bjerck (2008c: 569) for the Early Mesolithic period (see also Boaz 1998: 27).

For Scandinavia in general, several researchers have argued that blade production and microlith manufacture was undertaken *inside dwellings* (Blankholm 1984: 62; Indrelid 1994: 229; Hernek 2005: 228; Nilsson & Hanlon 2006; Glørstad 2010a: 120–8). A number of studies have argued that lithic clusters are residues of dwellings (Fischer et al. 1979: 19–21; Nilsson & Hanlon 2006; Bjerck 2008c: 560; Åstveit 2009: 415; Glørstad 2010a; Vogel 2010). This alternative was discussed regarding Torstvet and Hovland 4 (Mansrud 2013b: 170; 2013c: 252–3; see also Olsen 2013a: 192–3). A distribution analysis in combination with multivariate statistics (attraction matrices) (Solheim 2013a: 296–9) could not confirm this interpretation. However, in a cold or temperate environment, a hearth is of little value without some kind of superstructure to keep the heat inside. Most likely some kind of transportable tent or shelter was used for accommodation. Thus, closely positioned clusters could suggest a social organization of several groups or families camping together, performing similar tasks and transporting materials between clusters when visiting each other.

Contrary to the Bjerck's (2008c) model, several researchers have argued that the Middle Mesolithic blade technology was flexible and suited for mobile foraging, facilitating the mobility of groups leaving the base camp in order to undertake different tasks (Sjöström & Dehman 2009: 29–30; Hertell & Tallavaara 2011; Eigeland 2015: 382; Damlien 2016). From an archaeological perspective, task group activity can be recognized by the occurrence of specialized sites such as hunting camps and lithic procurement sites, and caches, in combination with more extensive residential camps. According to Damlien's (2016: 232–4, 330) MANA, all the Early Mesolithic sites except one are single, short-term visits where blade production, maintenance and discard took place on-site (see also Fuglestvedt 2007; 2010b), whereas the Middle Mesolithic sites display a greater variety in terms of layout, intra-site organization and 'artefact flow'. Increased regional differences, both in terms of artefact style and raw material procurement/use, and diversification in site types and reoccupation of previous sites, are more evident compared to the Early Mesolithic phase (Damlien 2016: 405–16).

As emphasized by Kelly (1983: 288–9), the use of stable aquatic resources may reduce the need for frequent residential moves. The Middle Mesolithic faunal assemblages found at the coastal sites are suggestive of a broad-spectrum economy. A great variety of fish bones, as well as bone fishhooks, demonstrate the importance of fishing (Mansrud 2014; Persson 2014). A delayed-return subsistence strategy relies on storage, and specialized fishing intended for later consumption was suggested for the Middle Mesolithic site Dammen in Bohuslän (Schaller-Åherberg 2007). Storage is difficult to assess archaeologically, but recently, an alleged gutter for fermenting large quantities of fish was identified at a Middle Mesolithic site on the east coast of Sweden (Boethius 2016).[1] Curated tools like fishhooks and composite tools, along with the pressure blade technology, also point to technological specialization (Eigeland 2015: 381). Additionally, there is a considerable increase in the number of sites dated to the Middle Mesolithic phase, compared to the preceding and succeeding phases (Solheim & Persson in prep.).

Whether the pattern of mobility reflects task group activity or nomadic family groups moving between islands and estuaries in the Oslo Fjord archipelago remains to be solved. Specialized flint knapping such as pressure technique and microlith manufacture is often implicitly associated with male activities, for example hunting parties (cf. Grøn 2000: 182). Regardless of the exact organization of activities, it is fair to suggest that compound technologies may reflect the cooperation of groups rather than individuals. Making a composite tool involves a number of interrelated tasks such as providing the lithic raw material, making the resin for gluing the flint inserts into the groove, and so on (Finley 2003). Compound technology also involved hunting of ungulates, in order to acquire bone material (Glørstad 2010a; 2010b). Hearth-centred activities were entangled with other tasks, connecting the locales to a wider network of events and sites dispersed throughout the landscape (cf. Gamble 1998: 438–9; Conneller 2010: 187). Mikkelsen et al. (1999: 54) suggested that the prominent agglomeration of Mesolithic sites at the River Glomma mouth were seasonal sites in a system of residential mobility. Recent investigations have confirmed several Middle Mesolithic ^{14}C dates from one of the pithouses discovered at the Sandholmen site at the Glomma River (Mansrud & Persson 2016).

Proximity to fresh water is imperative for human habitation, especially for campsites of longer duration (Tanner 1979: 36–43; Berkes 1999: 52). Hunting and trapping territories in boreal environments are often separated by rivers, and consist of patches with a variety of habitats that can be used interchangeably (Tanner 1979: 40). The location of pithouses adjacent to the watercourses and river estuaries created opportunities for seasonal exploitation of a variety of lacustrine, terrestrial and maritime resources (Solheim & Damlien 2013). The major *social importance* of this particular landscape as meeting point for coast and inland groups have also emphasized by Ingrid Fuglestvedt (2006). A semi-sedentary settlement organization resonates well with the landscape utilization previously advocated by several authors for the later part of the Middle Mesolithic in eastern Norway and western Sweden (Lindblom 1984; Nordqvist 1999; 2000; Jaksland 2001; Hernek 2005: 234; Ortman & Petersson 2012). Taken together, these indications may suggest a development toward logistic organization and mobility within fixed regions/landscapes (Fuglestvedt 2011; 2012; Mansrud 2014: 86–91; Damlien 2016: 446).

We have shown how the 'flow' of cores and artefacts in and out of clusters and sites points to an itinerant use of the landscape. A part of the explanation that advanced the landscape mobility could be attributed to the specific historical and environmental context. According to Damlien (2016: 279), small beach pebbles were brought in and tested at Hovland 4. At coastal sites in general, cores appear to originate from beach-flint nodules, having been brought to the sites as unworked nodules, pre-cores and prepared cores (Damlien 2016: 326). The question of whether such nodules could be found locally has been discussed by Eigeland (2015: 85–122, 363–79). The availability of flint in the Oslo Fjord is scarce; the nearest area with easily available larger quantities of good quality beach flint is the west coast of Sweden. This could imply that the Middle Mesolithic landscape utilization involved mobility within a coastal range primarily encompassing the Oslo Fjord archipelago, the river outflows and the current Swedish west coast. This wide range was facilitated by the use of boats for travel and transport (Jaksland 2001; Glørstad 2013).

The majority of sites were located close to the sea, on islands or inlets directly on the beach, creating a web of visible sites along the coast. The persistent land rise fashioned a landscape continuous in transformation. For Telemark and Vestfold, the isostatic uplift was about 0.5 cm per year around 8000 calBC, and then increased from approximately 1 cm per year after 7500 calBC up to about 1.5 cm per year around 7000 calBC (Sørensen et al. 2014: 46). These processes must have been evident, and could have been experienced. In the northern part of Bohuslän, and the Oslo Fjord, the former living spaces and fishing grounds would slowly end up further away from the shore. Thus, we suggest that movability was perceived as an affordance of the landscape in the Oslo Fjord area that continued to inspire an itinerant way of life (cf. Ingold 2000: 166). The overall transformation of the environment was gradual, however; these changes could have been reiterated and converted into the cultural memory, thus becoming a part of the history of the landscape (Nimura 2013: 25). Some of the Middle Mesolithic features described here were well-built and visible (Fig. 6). The same location was returned to and there was a greater level of investment in structures. This could be suggestive of active engagement with earlier habitation.

HEARTH-CENTRED ACTIVITY, SOCIAL PRACTICE AND COSMOLOGY

Fire was essential for survival in the Middle Mesolithic boreal landscape. Constructing a camp and hearth creates stability in a changing world and makes a place a home; it is part and parcel of the technology of dwelling (cf. Ingold 2000: 190; Westerdahl 2002; Grøn & Kuznetsov 2003: 217). In Tim Ingold's (2000: 189) words, the landscape is constituted as an 'enduring record of – and testimony to – the lives and works of past generations who have dwelt within it, and in so doing have left there something of themselves'. Transculturally – from the Bushmen of the Kalahari deserts to the Inuits of the Arctic – hearths are perceived as *gates to other worlds,* they are realms of ancestors and spirits (Westerdahl 2002; Grøn & Kuznetsov 2003; Odgaard 2003: 369; Grøn et al. 2008). The fire itself is sometimes acknowledged as an agent capable of communication, or even as a personification of a deity. 'Feeding the hearth', by offering a piece of meat, fat, or other items, or by burning the bones of prey animals in order to release their spirit, are also common rites performed in relation to hearths (Watanabi 1994; Westerdahl 2002: 186; Grøn & Kuznetsov 2003: 369; Odgaard 2003; Grøn et al. 2008).

Land tenure may include occupied and abandoned settlements, living and dead community members, as well as natural features (rivers, springs, lakes, specific features) plants and animals (Birch & Williamson 2015: 140). An abandoned camp may contain the spirits of the previous inhabitants, even when the site has been abandoned for a long time. Thus, establishing a new camp may be dangerous, as it may offend the spirits of an old hearth or cause bad luck, therefore a new hearth is often situated some metres away from the previous tent site (Grøn et al. 2008). As visible markers in the landscape, hearths and previous campsites may signify places for a group to return to (Hedman & Olsen 2009; Hedman et al. 2015), or features to be avoided (Grøn et al. 2008; Birch & Williamson 2015). The latter seems to be the case in the Middle Mesolithic, where the majority of sites are interpreted as single occupations/short visits and, in cases of return, the new occupations hold a clear distance to previous clusters and hearths; hence it appears that the Middle Mesolithic people, in many cases, *circumvented* the habitations where 'Others' had camped and lit their fire.

The campfire is known to be the focus of practical tasks as well as social and ritual life among many hunter-gatherer groups (Barnard 1978: 7–9; Grøn 1991: 103; Odgaard 2001; 2003;

Hedman & Olsen 2009). Ethnographically, different types of hearth-related social behaviour have been documented. For example, among the Bushmen in the Kalahari Desert, a camp consists of several hearths, with different functions, inside and outside the huts. Each campfire is regarded as a separate social unit, and on visiting other hearths, people only address those sitting around the same campfire (Barnard 1978: 7–8; see also Odgaard 2003: 366–7). Social rules of conduct have also been inferred from archaeological remains for other geographical areas and other prehistoric periods. One of the most famous and cited examples is the late Upper Palaeolithic site Pincevent, where refitting of bone remains indicates practices of food sharing (Enloe 2003).

As examples of social practices, we will in the following focus on the placement of artefacts in the hearths. Deposits in hearths could imply that people consciously left their material traces behind in order to signal their presence in the landscape. Abandonment rituals related to settlement relocation is well documented ethnographically (Watanabi 1994; Birch & Williamson 2015: 141–4). Such practices in association with dwellings have previously been discussed for the Middle Mesolithic in Bohuslän (Hernek 2005: 272; see also Johansson 2004; 2006; 2008; 2013). These authors assume that the placement of axes and pickaxes in walls of dwellings indicate that they were deliberately given over, perhaps constituting a ritual action connected to relocation (Hernek 2005: 288–318; Johansson 2013: 71–6). The Middle Mesolithic dating of simple, cruciform and star-shaped stone axes is recently verified by their occurrence at settlement sites such as Tørkop, Hovland 1, 3, 4 and 5, possibly also Rødbøl 54 (Mansrud 2008; Solheim & Damlien 2013; Damlien 2014; 2016: 418).

Rather than lost and forgotten objects, the occurrence of blade/bladelets in hearths could, in a similar manner, relate to *intentional abandonment* of significant artefacts (cf. Strassburg 2000). Perhaps the exhausted ('dead') artefacts were buried in association with the abandonment of a site (Chapman 2000: 24). Blades are obviously mundane, multifunctional tools; however, artefacts and artefact manufacture is closely related with world views and can simultaneously involve technical, social and ritual aspects (Lemonnier 2013). Artefacts associated with an uncertain outcome, for example, hunting, are likely to become ritualized (Fogelin & Schiffer 2015). The special significance attached to large blades is demonstrated by their presence in burials (Karsten & Knarrström 2003: 85), and also by the occurrence of blade caches and deposits associated with the Maglemose/Kongemose settlements in the Rönneholm peat bog in Scania in southern Sweden (Dehman & Sjöström 2008: 18), and a large backed blade was found in a cache at Middle Mesolithic site Hovland 2 (Koxvold 2013a: 84). These material practices may be interpreted as signs of increased landscape socialization in the Middle Mesolithic, involving more focus toward the humanly fashioned elements of the landscape.

FROM SPACE TO PLACE: THE SOCIALIZATION OF THE LANDSCAPE

> […] emphasis placed on natural resources distorts the territorial vision. The natural resources – water, hills, waterfalls, animals, including people, spirits of the forest and every single small insect – are primarily integral beings within a relational space that simultaneously identifies them in myth and situates them in history, the environment, the economy as well as in society. This 'relational' space is not a space divided into zones of utility. From this perspective, far from constituting a geometrical area framed by physical landmarks that separate and demarcate it, an indigenous territory is simply the consolidation of a very specific and singular fabric of social ties between the different beings that make up that environment (Surrallés & Hierro 2005: 11).

Michelle Langley (2013) differentiates between 'socialized landscapes' and 'landscape socialization' and argues that the perception of the landscape can be inferred archaeologically, by examining the degree of *physical inscription into the landscape*. A socialized landscape refers to humanly created paths and trackways mapped over and onto the physical landscape. On the other hand, landscape socialization refers to cultural construction, the universal human habit of ascribing meaning to the topographies of the environment (cf. Helms 1988: 20–1). Meaning is often attributed to the most impressive physical features such as mountains, plains, rivers, oceans; and powers, beings, and the spirits of the dead are often associated with cracks, openings and other unusual features in the landscape. Through stories and various ritual ceremonies, the landscape gradually becomes 'a storied and mythical fabric' (Langley 2013: 617).

On the basis of ethnographic observation, Langley (2013: 617) contends that, under conditions of low population density, there is limited physical intervention, and knowledge of the landscape is transferred between community members through oral transmission only. However, as population density increases, more visual signs are required in order to communicate information about place to both in-group and out-group members. Hence, common visual cues, indicating landscape socialization, is the modification of the physical features by creating rock art, cairns or other monuments (Langley 2013: 619; see also Sogness 2002; Nash & Smiseth 2015). Other indications of landscape socialization can be inferred from evidence of marking of group and individual identity (personal ornamentation, portable art, distinctive and/or decorative artefacts), regional distinctiveness (which becomes more visible as social stress increases), long-distance transport of raw materials (which indicates extended networks), and finally raw materials deposited at particular places in the landscape (Langley 2013: 619). How do these characteristics fit with the archaeological record of the Middle Mesolithic?

Throughout the Middle Mesolithic there are similarities in the use of material culture, both in terms of technology and typology, all over southern Norway and western Sweden down to Halland. These parallels, together with distributions of raw material over vast distances in the interior (Melvold 2011) and the appearance of blades made of non-local (exotic) raw materials (Solheim & Færø-Olsen 2013) point to the existence of large scale contact networks perhaps of a seasonal character (Nyland 2016: 254). Differences in the utilization of raw material and the landscape also begin to appear. In western Norway, rock quarries become established, whereas in eastern Norway and western Sweden, flint remains the most common raw material (Eigeland 2015: 363; Nyland 2016: 251). The practice of placing deer and elk antlers and antler-shaped stone axes in rivers, lakes and marshes can also be extended back to the Late Middle Mesolithic (Glørstad 1999; 2002), and bone and stone objects decorated with abstract designs also appear at the end of the Middle Mesolithic (Schülke & Hegdal 2015). These material practices may thus be interpreted as signs of increased engagement with the landscape in the Middle Mesolithic. Except for the Tumlehed rock painting in Bohuslän, suggestively dated to the Middle Mesolithic period (Andersson et al. 1988: 7; Nordqvist 2003: 536; however, see discussion about the date in Nash 2002), rock art is not a typical phenomenon within the eastern Middle Mesolithic range. Rock art sites in eastern Norway are dated by shoreline displacement to the Late Mesolithic (6300–4000 BC) (Mikkelsen 1977; Fuglestvedt 2008; Glørstad 2010a: 216–23).

Cultural memory is often connected to places. A sense of belonging is linked to a routinized motion though familiar physical settings and these settings include both built and natural features (Gamble 1998: 439; Langley 2013: 616; Birch & Williamson 2015: 140). In non-literate societies, geographic location is an important vehicle for memory because people are inclined to emphasize space rather than temporality: events are remembered by reference to where they happened, not when they happened (Barth 1987: 47–8). Furthermore, memory may be encoded in song, dance, stories (Ong 2002[1982]: 5–15), but also in material culture (Coward & Gamble 2010). From what has been argued here, the Middle Mesolithic landscape socialization may have been focused towards the settlement sites. Within the home range of Middle Mesolithic coastal groups, inhabited and abandoned camps were visually present along the coast, creating a social environment which directed rules of where to set up a new camp. Visible camps and abandoned sites signify the human appropriation of a place, and discernible features of past activities such as hearths or former camps sites became tokens of the ancestors, their spiritual presence that the group engages actively with. Living and transmitted memory of earlier visits would facilitate rules of where to set up a new camp, and promote a long-term memory connected to a particular physical landscape. The revisited or abandoned sites gradually became places imbued with history (Glørstad 2010a: 243; Nyland 2016: 255).

In the beginning of this paper, we maintained that the cultural construction of the environment can be generalized, because human collectives resort to a limited set of integrated schemas in order to structure their relations with the world (Descola 2013: 110). The difference in perceptions of landscape suggested by Langley (2013) resembles the analytical distinction proposed by Ingrid Fuglestvedt (2008; 2010a; 2011; 2012) for differentiating between 'animist' and 'totemist' world views in prehistory. Animism denotes a sociocentric ontology where humans and animals are encompassed in a shared social world. Rather than 'exploiting a territory', animists engages in a dialogue with it, stressing a relational continuity between humans, animals and features of the landscape (Bird-David 1999). Whereas the animistic ontology is focused on individual animals, a totemic mode of relation is concerned with animals as symbols and metaphors, with classes and species, consanguinity and ancestry, *stressing the common origin of the human group, animals and features in the landscape.* Neither animals nor humans are subjects both are physical manifestations of essences created by ancestral beings, derived from prototypical forms that existed in a mythical past (Ingold 2000: 111–31; Descola 2013: 163–5).

According to Fuglestvedt (2011: 28–9) the Late Mesolithic rock art with stylized inner designs is indicative of an emerging totemic world view in the Late Mesolithic. Lineage-based social organization can be found in animist societies, but is a prerequisite for totemism (Pedersen 2001; Fuglestvedt 2010a: 28; Descola 2013: 258–61). It has been proposed that the reorganization of the stone and bone technology at the beginning of the Middle Mesolithic phase incited changes in the social organization, settlement system and landscape utilization. We have argued that specialization in bone and stone technology, increase in the number of sites and adjustment of procurement strategies suggests a development toward logistic organization and mobility within confined land/seascapes (Damlien 2014; 2016: 451). This specialized technology may also hold a potential for the development of social differentiation (Eigeland 2015: 383; Damlien 2016: 446). Within a totemic system tools like axes may be of high social value, and could be seen as objects within a system of gift exchange (Fuglestvedt 2010a: 29; Glørstad 2010a: 193–7).

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NOTES

[1] Dated to the Early Mesolithic Maglemose culture, according to the south Scandinavian chronology.

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