Diachronic trends among Early Mesolithic site types? A study from the coast of Central Norway

Abstract

This article explores site type variability in the course of the Early Mesolithic at the coast of Central Norway. The Early Mesolithic was a period of great alterations in climate, landscape and oceanic environment. The arctic conditions that prevailed the coast when hunter-gatherers first arrived c. 9500, gradually gave way for a warmer climate. A cold pulse, known as the Preboreal Oscillation (PBO), hit Scandinavia and Europe c. 9300–9200 cal BC, before the temperatures rose again. Midway through the Early Mesolithic period, c. 8800 cal BC, the ice melted away from all the large fjords and coastal waters, pushing the cold tolerant fauna northwards. The parallel establishment of the Norwegian Atlantic Current provided stable and livable conditions to a new range of marine species. For the coastal hunter-gatherers, these fluctuations must have greatly affected the resource base. Previous studies have pointed out that generalized toolkits and flexible mobility systems seems to have been ways of coping with the changing conditions. Was also site type an active variable of their adaptive strategy within this period? On the basis of Binford's forager–collector continuum (1980), 18 sites are analyzed in terms of artifacts, tools, size, layout and features to see if there are diachronic trends in the frequency of different site types that can be related to the palaeo-environmental trajectory of the period. The study points to a development from short visits where hunting activities and gearing up was the focus in the earliest part of the Early Mesolithic, to a more stable site pattern where residential bases were established nearby predictable food resources. This happens parallel with the environmental and climatic fluctuations, and it is likely that these trajectories are related.

Introduction

The impacts of fluctuating temperatures, altering landscapes and changing resource situations on humans is a topic that has been of great interest in studies of the Post-glacial hunter-gatherers of Norway. The first humans that approached the seascapes of Norway some 11 500 years ago, met with a coastal environment influenced by cool temperatures, glaciers, seasonal sea ice, and inhabited by an arctic fauna (Breivik 2014). Due to increasing temperatures, however, the conditions along the Norwegian coast were under constant alteration. A cold pulse, known as the Preboreal Oscillation (PBO), hit Scandinavia and Europe c. 9300–9200 cal BC (e.g. Berner et al. 2010), and is identified by temperature drops at land and sea, readvancing ice sheets and retreating forests. Midway through the Early Mesolithic period, c. 8800 cal BC, the Norwegian Atlantic Current was established, bringing warmer water masses along the coast. The ice melted away from all the large fjords and coastal waters, pushing the cold tolerant fauna northwards, and providing stable and livable conditions to a new range of marine species (Breivik 2014).

Recent studies of adaptive strategies related to these climatic and palaeo-oceanographic developments along the coast of Norway has suggested that the toolkit used by the Early Mesolithic hunter-gatherers remained unaffected throughout the whole period. The settlement pattern, however, changed from being almost exclusively connected to the outer coastal zone in the first half of the Early Mesolithic, to being relatively more related to the mainland coast and sheltered coastal locations during the second half (Breivik 2014; Breivik et al. 2017). It thus seems that generalized toolkits and flexible mobility systems were ways of coping with the changing environment. In this article, I want to explore if also *site type* was an active variable of their adaptive strategy within this period.

Several studies of sites on the Norwegian west coast point to a reorganization of site types and mobility patterns in the course of the *Mesolithic* period (Bang-Andersen 2003; Bergsvik 1991, 1995; Olsen 1992; Bjerck 1990, 2007, 2008a). A loose organization with small field camps and high mobility in the Early Mesolithic phase, and a more sedentary lifestyle with larger residential bases in the Late Mesolithic is emphasized. The large archaeological projects around the Oslo fjord during the last decade point to similar trajectories. Here, more than 20 sites from the Middle Mesolithic have been detected and excavated, shedding light over a period from which until recently was poorly investigated. These sites indicate a settlement system that is still quite mobile, but increasingly connected to certain places and landscapes (Solheim 2017). The changes in Mesolithic site organization patterns is suggested to be result of a stabilization of marine resources, like fish in the tidal channels (e.g. Bergsvik 1991, 1995; Bjerck 2008h). They may thus express alterations in the subsistence strategy that partly can be connected to environmental changes.

As outlined above, climatic fluctuations and a gradual stabilization of the marine environment seems to occur already midway through the Early Mesolithic. In light of these results and hypotheses, I would like to take a closer look at the Early Mesolithic coastal sites of Central Norway: Does the present material reflect changes in site types parallel with the changing environment?

The forager–collector continuum and Early Mesolithic hunter-gatherers site types

The Early Mesolithic hunter-gatherers of Norway are commonly characterized as small groups with high mobility and focusing on marine resources. The archaeological record generally holds sites with similar signatures and a standard lithic tool inventory (e.g. Bjerck 2008h; Nærøy 2017). However, temporal differences have been detected in the material: In his studies of Early Mesolithic sites on the west coast, A.J. Nærøy (2000:69) finds that sites that predates c. 9500 uncal BP (i.e. 8800 cal BC) are similar in size, while they are more heterogeneous in the later phase. T.A. Waraas (2001:104–110) finds that sites from the late Early Mesolithic period tend to be larger in size and more abundant in

lithic artefacts, than do the earlier ones. Whether this is related to changes in the climate and environment is not thoroughly discussed in the cited publications. The purpose of this study is just to explore site variation in light of the chronology of environmental changes, and an appropriate starting point is L. Binford's forager–collector continuum.

Binford (e.g. 1980, 2000) has shown how site structure (including size, organization, features and artefacts) can relate to environmental factors. By combining ethnographic and environmental data, he finds that the climate and availability of food resources dictates the choice of mobility and subsistence strategies, and that different strategies produce different site types.

According to Binford (1980), a group that has a purely residential mobility system ("foragers") – where the whole social unit moves from one resource area to another, staying on one site for only a short period of time – produces *residential bases*, as well as smaller *locations*. The *residential base* is "the hub of subsistence activities, the locus out of which foraging parties originate and where most processing, manufacturing, and maintenance activities take place." The *location* – is "a place where extractive tasks are exclusively carried out. […] only limited quantities are procured there during any one episode, and therefore the site is occupied for only a very short period of time. […] few if any tools may be expected to remain at such places" (Binford 1980:9).

A group that has a logistical mobility system ("collectors") – where the social unit is stationed on a certain location for a longer period of time, and smaller task groups bring specific resources back to the site – produces *residential bases*, *locations*, *field camps*, *stations* and *caches* (Binford 1980:10). The *field camp* is a temporary operational center where a task group sleeps, eats, and maintains itself while away from the residential base (Binford 1980:10). *Stations* are described as sites where task groups are localized when engaged in information gathering, while *caches* are temporary storages (Binford 1980:12).

Although the Early Mesolithic sites of Norway are quite uniform, they differ somewhat in terms of size, features and artefact composition. To my knowledge, the record bear no evidence of caches, or long term residential camps with permanent dwelling structures, a diversity of features and distinguished activity areas – site types that comes with a logistical mobility system. Rather, we find sites that can be placed within the categories of short term residential bases, field camps and locations. In Norwegian studies, these site types have also been referred to as base camps, secondary sites, and activity sites or pit stops (Indrelid 1973; Bjerck 1990), and the Early Mesolithic hunter-gatherers are defined as foragers with pure residential mobility (e.g. Bjerck 2008h) or foragers with occasional logistical mobility (e.g. Bergsvik 1991, 1995; Olsen 1992; Bang-Andersen 2003; Breivik et al. 2016).

Several studies have sought to find archaeological parameters that articulate site variation. J. Chatters (1987) has reviewed a range of publications in order to define archaeological measures that relates to

Binford's site types. Similar characterizations are made by S. Indrelid (1973) and H. Bjerck (1990). For the present paper a customized version based on these studies will be applied (see below; Table 8.1).

Material and methods

Studying variations in site types

Referring to the discussion above, this analysis will include the following site types: Residential camps, field camps and locations. The factors used to distinguish between the different site types will be presented in the following, and the characteristics are systematized in Table 8.1.

Artefacts and tools: Looking broadly to the activities conducted, Binford's site types can be divided into *general-purpose* sites and *special purpose* sites. The general-purpose sites are the residential bases, where the whole social group is gathered for a longer or shorter period of time, and where a wide range of everyday tasks take place. This will manifest as a varied artefact assemblage with a wide range of tools, and lithic debitage from raw material procurement, manufacture, use, maintenance and discarded objects. On special purpose sites (field camps and locations), the narrower range of activities will generate low tool diversity, and probably a higher share of tools in relation to debris (Chatters 1987:342; Bjerck 1990).

Another aspect is tool function. Among the lithic components, projectiles (tanged points and microliths) are most certainly connected to hunting activities. Also unused blades may be related to the production of projectiles (e.g. Damlien 2016). Knives are cutting tools, perhaps used for butchering (e.g. Bjerck 1990), while scrapers, burins and borers are often associated with maintenance activities (e.g. Bølviken et al. 1982). Use-wear analysis has shown that Early Mesolithic adzes have filled different purposes including scraping, cutting, sawing and chopping (Solheim et al. 2018). This also goes for the informal tool category (flakes or blades with retouch and/or use-wear), which have been used for scraping, cutting, shaving, incision and boring (Nærøy 2000).

The tool inventory should be indicative of the site type. In the present analysis, the total artefact assemblages from each site is analyzed and organized in tool classes and according to the steps in an operational chain (see Eriksen 2000).

Size, layout and features: According to Chatters' review (1987:341–42), the size and layout may vary according to the number of residents and the activities carried out on the site. While general-purpose sites (residential bases) would be comparable in terms of size and layout, special purpose sites (field camps and locations) vary in layout and size according to their function.

Also the duration of stay and reuse of occupation areas are factors that influences site structure. The more time spent on a site, the more labour invested in the habitation. Thus, the residential bases are likely to exhibit a higher degree of camp organization in terms of dwelling structures and other features than do the field camps and locations (Chatters 1987:348).

In the analysis, the size of each site as expressed by the distribution of lithics ("site area") will be recorded. Also, the number of denser lithic concentrations will be investigated, as well as the presence of dwelling structures and fireplaces on each site.

Reoccupation of sites does, however, also have implications for site formation processes and the archaeological interpretation of the site: Archaeological palimpsests made up of multiple, short occupation events may resemble the signature of a residential base with continuous occupation over a longer period (e.g. Bergsvik 1991:36; Nærøy 2000:90–100). The presence of a wide variety of different flint qualities, observations of several lithic concentrations situated close to and/or partly on top of each other, or lithic concentrations clearly separated vertically or stratigraphically, are regularly understood as several occupation events. Most sites are not excavated and documented in a way that enables isolated analyses of different occupation events. Yet, in the present analysis, such observations will be used as an entrance to discuss site use and occupation intensity.

<Table 8.1>

The analyzes of the above factors will be followed by a collated assessment of each site, informed by the respective archaeological reports, with the purpose to classify the sites in terms of type, size and function. Finally, the results will be sorted chronologically and discussed in relation to the environmental and climatic changes occurring within the Early Mesolithic time span.

The Early Mesolithic sites on the coast of Central Norway

Central Norway (Møre og Romsdal and Trøndelag counties, Figure 8.1) is a region with many Early Mesolithic sites. The majority of the c. 300 sites are situated on the outer coast; either on islands, peninsulas or on the mainland, but oriented towards the archipelago (Breivik & Bjerck 2017). Out of the list of 50 archaeologically investigated sites in the region, several criteria were considered when selecting comparable and representative objects for this study:

Geographic area and topographical setting: Although Early Mesolithic sites in Norway seems to share a list of characteristics, some regional variations are detected in the use of features, raw material, and lithic reduction techniques (e.g. Hauglid 1993; Damlien 2016; Fretheim 2017). To include sites from a large geographical area in the present analysis, would entail a risk of misinterpreting regional variations as diachronic developments. The same goes for the topographical situation: There seems to

be differences in artefact composition between Early Mesolithic mountain and coastal sites – probably related to raw material accessibility and site function (Breivik & Callanan 2016). It is therefore important to compare sites that are located within a reasonably confined area and with comparable landscape settings.

<Figure 8.1>

<Figure 8.2>

Properly excavated and documented sites: A diachronic study that explores site layout and artefact composition is dependent on good excavation records. The selected sites should be more or less fully excavated, and be comparable in terms of excavation method and documentation standards. The sites in this study are excavated using mechanical excavators to remove the topsoil, and proceeding with manual excavation in square meters, removing layers of 5–10 cm in thickness at a time.

Reliable age determination: In order to place the sites in study chronologically, a reliable age determination is essential. Only a minor part of the Early Mesolithic sites in the region are radiocarbon dated. The remaining sites may be dated by its elevation according to the present sea-level, provided that accurate georeferences and altitude measurements are recorded. Sea-level dating is, however, potentially problematic as it only gives a maximum date of the site. The general assumption is that the coastal sites of the Early Mesolithic were positioned a few meters above the contemporary shoreline. Studies that have addressed this issue systematically by comparing radiocarbon dates and shore displacement curves from the same site, finds that the models are quite reliable for the region in study (see Åstveit 2018). Yet, similar studies from northern Norway suggest that the sites must have been located of 2–6 m from the contemporary shoreline (Blankholm 2008:5, with further ref.). Thus, by subtracting a span of 2–6 m of the measured m a.s.l., it can be assumed that we get a sea-level date that is likely to cover the actual occupation period (see Table 8.2). For my study area, a span of 2–6 m usually gives a discrepancy of 100–200 uncal BP years on generated shore displacement curves. This is actually more precise than some of the radiocarbon dates, and is at present the best we can hope for.

Undisturbed context: A comparison of site types calls for clean contexts. Sites that were not significantly disturbed by post-depositional factors or reoccupations in later phases were thus preferred when selecting cases for the analysis. There are no certain ways to detect later disturbances in the material, and reoccupations or scavenging for material when the site was exposed would certainly occur. Nevertheless, sites with radiocarbon dates or tool types that indicated occupations in later chronological periods, as well as sites with more recent disturbances (e.g. erosion, ditching, ploughing, construction work) that obviously affected the layout or artefact distribution were eliminated from the study.

<Table 8.2>

In the light of these requirements, 18 sites from Aukra, Aure, Averøy and Kristiansund municipalities in Møre og Romsdal County were selected (Figure 8.1, Table 8.2). This is a low number of sites, taking into account the 1500 years period they cover. As it turns out, however, the material cluster around three time slices that are convenient for the present diachronic study: Four sites can be dated to 9400–9200 cal BC (sites 1–4), seven sites can be dated to 9100–8800 BC (sites 5–11), and seven sites can be dated to 8800–8500 cal BC (sites 12–18, Figure 8.2). These time slices relates quite nicely to the environmental trajectory outlined in the introduction, with the cold PBO kicking in from 9300–9200 cal BC, and the change to a milder climate, less influenced by ice and melting water from c. 8800 cal BC. Despite the source critical factors discussed above, it should be possible to detect diachronic trends with the material at hand.

Analysis

Artefacts and tools

There are very large differences in the total artefact number between the sites (Table 8.3). The assemblages range from under 200 to over 90 000. The earliest sites (sites 1–4) are mostly in the lower end of the scale, while the two largest are dated to 9000–8800 cal BC (sites 9 and 10). The three smallest assemblages in this study (sites 12, 15 and 18) are dated to the time span 8800–8500 cal BC.

If we break up the tool assemblages, we see that the earliest sites exhibit a restricted set of tools. Even on Site 2 (Hestvikholmane 2-2012), with nearly 3600 artefacts, projectiles is the only formal tool category. However, more likely than being related to a chronological pattern, the tool repertoire seems to be connected to the assemblage size. The sites that contain only one (sites 2, 8 and 18) or two formal tool classes (sites 1, 11, 15 and 16) tend to be the smaller ones, while the very largest sites in study have a more varied tool composition.

<Table 8.3>

<Table 8.4>

Table 8.4 illustrates the different artefact categories as sorted by the successive steps in an operational chain (see Eriksen 2000). All sites in the study hold the categories primary production debris, cores, blades and tools. A majority of the sites lack traces of maintenance and repair of tools. The sites with the largest assemblages of lithics contain artefacts from all steps in the operational chain, but

otherwise there does not seem to be a direct relation between the number of artefacts and the categories present.

Looking chronologically at the relation between the different artefact categories in Figure 8.3, there is a tendency towards a higher percentage of tools (2–4 %) on the oldest and youngest sites in the study, when compared to the sites dated to the 9100–8800 cal BC time span (around 1 % tools). Secondary production debris is generally low on the oldest sites, while three of four sites have evidence of use and repair of tools. Among the younger sites in study, only one (site 17) holds artefacts that can be related to maintenance and repair of tools.

<Figure 8.3>

Size, layout and features

Based on the data in Table 8.5, the sites can be divided into three different size categories: *Small-sized* (10–20 m^2); *medium-sized* (30–100 m^2); and *large* (250 m^2 and up). According to the present record, no large sites are found among the earliest ones – they seem to appear at a later stage.

<Table 8.5>

The earliest sites are also characterized by one distinct concentration of artefacts, but it must be emphasized that the number of lithic concentrations seems to increase with the size of the site. Also traces of fireplaces appear to be related to site size rather than age. Dwellings are found on small, medium and large sites, but there is a propensity towards a higher frequency on the larger sites.

A collated assessment of the sites

The earliest sites, 9400–9200 cal BC:

1. Seterbekken 3: During the excavation, the site appeared as scattered lithics with a denser concentration of artefacts in an area of 3–4 m^2. The concentration was associated with a fireplace, structured by large, fire cracked rocks placed in a circle (Berglund 2001).

From the present analysis it is evident that raw material procurement, as well as production, use and maintenance of tools has taken place. The lithic assemblage contains a narrow tool repertoire with its flake adze, projectiles and small amount of informal tools. However, the number of projectile points (8) is actually quite high, compared to similar sites in the study. According to Table 8.1, it is reasonable to interpret the site a small *field camp* where preparation of hunting tools, and perhaps butchering of prey took place.

2. Hestvikholmane 2-2012: The site appeared as an area of c. 45 m^2 packed with stones and artefacts. A circular area of 9–10 m^2, which was cleared of stones, held a denser lithic concentration. This was interpreted as traces of a tent or temporary dwelling. Two small deposition points within the living space, containing small flint fragments, secondary production debris, blades and projectiles, were interpreted as knapping areas. Close to the living space, two areas with heat fragmented flint, was suggested to be traces of fireplaces. Based on the tool repertoire (projectiles), the site was interpreted as a hunting station. Because the site had several deposition points and activity areas, as well as considerable investment in the dwelling, it was thought to be visited two or more times (Brede 2012).

The present analysis shows that projectiles are the only formal tool category (5). However, there is debris from adze production, and a relatively large amount of informal tools, suggesting a site function comparable to Seterbekken 3 above. It is therefore classified as a medium-sized *field camp*.

3. Kvernberget Site 20: The excavation uncovered a small site with a more concentrated artefact deposition of c. 7 m^2. The concentration partly coincided with a ring of stones interpreted as traces of a tent with an internal fireplace. The site was thought to represent one short term stay (Strøm & Breivik 2007).

The present analysis shows a narrow selection of tools that include four projectiles, two Høgnipen points and a burin, in addition to informal types. The cores and blades points to production of at least preforms, and use and maintenance of tools has been carried out. According to the archaeological criteria presented in Table 8.1, it is classified as a small *field camp*.

4. Ormen Lange Site 51: The site appeared as an activity area of c. 100 m^2, with a denser concentration of lithics at the center of the artefact distribution. No distinct features were detected. An axe dated to the Early Neolithic period was recovered from the fringes of the activity area, but there were no other clear indications of later use of the site (Bjerck 2008c).

The present analysis shows that the assemblage holds a relatively high share of tools – mostly informal, but also adzes, knives and a projectile are present. All steps in the operation chain (from primary production to repair and discard) have been conducted on the site. It seems reasonable to place it in the general purpose site category – a medium-sized *residential base*.

Sites from 9100–8800 cal BC:

5. Kalvheiane 5: The uncovered area of 32 m^2, and was seen as more or less coinciding with the Early Mesolithic occupation. An area of c. 8 m^2 contained a denser concentration of artefacts. The excavation team observed a decrease in the number of artefacts pr. quadrant in mechanical layer IV, before an increase in layers V–VI. This was interpreted as reuse of the site at least once. Flake adzes were recovered from both levels, suggesting that the reoccupation took place within the Early Mesolithic time span – and most likely within the suggested period 9000–9100 cal BC. No traces of dwelling structures were detected, but three smaller stone circles were interpreted as possible fireplaces (Berglund 2001).

In the present analysis, the site is placed in the medium-size category. The site contains a relatively high number of artefacts (>10 000), and the assemblage exhibit a wide range of tools, and artefacts that reflects gathering and testing of raw materials, production of tools and blanks (blades), as well as the use and discard of formal tools. The site must be interpreted as a medium-sized *residential base* that was visited several times.

6. Hestvikholmane Site 3: The site appeared as lithics scattered over an area of c. 40 m^2. As the excavation proceeded, a dense concentration of artefacts (7–8 m^2) was recovered centrally on the site. A ring of tent stones with an internal fireplace lay a few meters away from the artefact concentration. Artefacts were also found in a layer beneath the tent stones, suggesting an earlier occupation event. A second, more dubious feature was interpreted as a possible ring of tent stones. Additionally, a small collection of adze preparation flakes and other lithic debris recovered within the site seemed to denote a production area (Wammer 2006).

The present analysis shows that the lithic assemblage of almost 4000 artefacts holds a restricted tool repertoire: two Høgnipen points, a fragment of a flake adze and a microlith, in addition to some informal tools. The site also has, compared to the others in this study, a very low tool ratio. The artefact composition points to production and maintenance activities, and the tent rings and the two occupation layers indicate investment and repeated use of the site. Based on this, the site is interpreted as a medium-sized *residential base*.

7. Ormen Lange Site 62 Øvre: The site was part of a large Stone Age settlement area, estimated to be c. 950 m^2. The Early Mesolithic component was excavated by an area of 33 m^2, which more or less coincided with the activity area. A denser concentration of artefacts (2–3 m^2) was detected centrally on the site. No features were recovered but the restricted distribution of artefacts may indicate that a tent was erected on the site (Bjerck 2008d).

In the present study the site belongs to the medium category, but with a quite high number of artefacts (>5000). The assemblage contains all the steps in the operational chain from production and use, to repair and discard. In the published report, the site was interpreted as a delineated activity area where production of tools was conducted. Referring to the measures in Table 8.1, it is placed in the *field camp* category.

8. Hestvikholmane Site 2: The artefact concentration on this small site was clearly defined, and coincided with a ring of stones thought to be traces of a tent. Two denser deposition points within the lithic concentration were interpreted as individual knapping sequences. An internal fireplace, situated near what was believed to be the tent wall, was also recovered (Fretheim 2007).

In the excavation report, the site was presented as a single visit, where tool production was kept within the tent. In the present analysis, the site is among the smallest, and the only formal tool category are three projectile points. It may be compared with Site 1 and 2 above, and should be classified as a *field camp*.

9. Kalvheiane 2a & b: In the part of the site named Kalvheiane 2a, an area of 77 m^2 was excavated. Within the site, three denser artefact concentrations was detected – one large of c. 25 m^2, and two smaller of 4–5 m^2. A stone circle, measuring c. 6 m in diameter, was recovered in connection to the largest artefact concentration. The structure had a floor of even-sized stones, and was interpreted as traces of a dwelling – probably a tent. Up to four possible fireplaces were detected on the site. Almost 40 000 artefacts were collected, but it was not possible to differ between several occupation events (Berglund 2001).

On Kalvheiane 2b, an area of 80 m^2 was excavated. The 50 000 artefacts that were recovered was distributed vertically all the way down to mechanical layers 5 and 6. Three denser concentrations were detected within an area of c. 20 m^2 – each measuring 5–6 m^2. A circular feature of c. 3 m in diameter, with two internal fireplaces, was interpreted as the traces of a tent. Up to three additional fireplaces were recovered on the site (Berglund 2001).

The distance between the excavated areas were c. 60 m, but positive test pits indicated a coherent activity area. From the artefact inventory, presented in this study, the site appears as a large *residential base* of dimensions and layout that may be comparable to Ormen Lange Site 48 (see below): It is likely that this site too has been visited several times by small groups within a residential mobility system.

10. Ormen Lange Site 48: The site covered an area of over 500 m^2. Within the excavated area, 18 artefact concentrations measuring 7–27 m^2 were identified, each of them containing 1–2 denser deposition points. Most of the concentrations were associated with central fireplaces. Two tent rings were also recovered, together with four additional ones of more dubious character. In the published report, it was emphasized that the 18 assemblages contained more or less the same repertoire of tools and debris, and the site complex was interpreted as a location that was visited repeatedly by small groups within a limited period in the Early Mesolithic (Bjerck 2008b). The present study supports a classification as a large *residential base*.

11. Ormen Lange Site 72: The site consisted of two artefact concentrations of 15–20 m^2 situated approximately 15 m from each other. Together, the settlement area covered c. 250 m^2. The concentrations were comparable with the units detected on the nearby Ormen Lange Site 48 (see above), with denser deposition points measuring 6–7 m^2. Each of the artefact concentrations were associated with traces of a fireplace and a tent floor – areas of 6–8 m^2 packed with even-sized stones. Also the artefact composition was comparable to the Ormen Lange Site 48, and the site was interpreted as a *residential base* used at the same time as Site 48 (Bjerck 2008e). The present study supports the classification.

The later sites, 8800–8500 cal BC:
12. Hestvikholmane Site 6: The site appeared as a limited area with a small lithic accumulation. A denser artefact concentration of c. 9–10 m^2 was recovered within the area. The distribution coincided with an area cleared of stones, suggested to be a tent floor. A nearby concentration of charcoal and smaller stones was interpreted as a fireplace (Sauvage 2007).

In the present analysis, the site is categorized as small, and it holds a very low number of artefacts (246 in total). The tool inventory consists of two borers and a projectile, and the site probably represents a single visit, perhaps just an overnight pit stop. It is thus classified as a small *location*.

13. Ormen Lange Site 73, Trench 1: The main excavation area held a loosely structured artefact concentration, with 2–3 denser deposits. Due to the undefined character of the lithic distribution, it was suggested that the location was used more than once (Bjerck 2008f). Two flake adzes and production debris was found 15 m away from the deposits (see below).

From the present analysis, we see that the tool repertoire is quite varied, and holds forms that are associated maintenance activities (adzes, scrapers and burins) as well as hunting activities

(projectiles). Both production and discard of tools have taken place on the site. The site has a very high amount of primary production debris, and it seems reasonable to interpret the site as a medium-sized *residential base*.

14. Ormen Lange Site 73, Trench 2: Two flake adzes was found 15 m away from the artefact concentration of the previous site. A trench of 3 m^2 was opened around the artifacts, exposing production debris in the same flint quality as the adzes. The site was interpreted as an episodic event, probably related to another larger site in the vicinity (Bjerck 2008f). It is categorized as a small *location* in the present analysis.

15. Ormen Lange Site 76B: This site was situated beneath a beach ridge that was deposited during the Tapes transgression c. 8000–6000 cal BC. The excavation revealed an artefact distribution within a defined area of c. 10 m^2. The lithics were centered on a fireplace (Bjerck 2008g).

In the present analysis, the site has relatively high amounts of cores, blades, secondary production debris and tools, in comparison with other sites. However, the low total rate of artefacts (193) makes the assemblage vulnerable for these kinds of analysis; the tool category is for instance represented only by two projectiles, one adze and five informal tools. According to the excavation report, the site had an episodic character, and it seems reasonable to interpret it as a short pit stop where gearing up was the main task. In the light of this, the site is classified as a small *location*.

16. Ormen Lange Site 76: The main activity area on this site was visible as an artefact concentration of c. 10 m^2 that held three smaller lithic deposits. Two of the deposits had associated fireplaces. A fourth lithic deposition was discovered in the nearby squares, and it was suggested that this represents a second unit of c. 12 m^2 (Bjerck 2008g). Considering this, the site measures at least 25 m^2 and is characterized as a medium-sized site in the present study.

The site was interpreted as one short-term occupation in the published, and a large part of the artefacts were related to production of flakes from one core report (Bjerck 2008g). The present analysis of artefact composition shows that it has a narrow range of tools: two adzes and a burin, in addition to a few informal forms. It is therefore classified as a *field camp.*

17. Kvernberget Site 1: The site appeared as artefacts scattered over an area of c. 500 m^2. During the excavation, five denser concentrations of lithics were recovered. The largest concentration (c. 20 m^2) had 1–2 associated fireplaces, where one of them seemed to have been used more than once. The concentration was interpreted as a living space, maybe traces of a tent. Interesting is also the dwelling structure, measuring 3x3.5 m and distinguished by a cultural layer consisting of artefacts, decomposed organic material and eroded pebbles. A fireplace, probably used several times, was situated near the wall. The feature was related to one of the artefact concentrations (Fretheim 2008).

In the present analysis, the site is comparable with the large Ormen Lange 48 and Kalvheiane 2a & b, as all steps in the operational chain are present, and the tool inventory is varied. The site seems to represent several visits, and the dwelling remains and cultural layer suggest that some of the occupation events were probably longer than what is common for other Early Mesolithic sites. The signature of the inventory and site puts it in the *residential base* category.

18. Kvennbergmyra: The site appeared as a small, confined distribution of relatively few artefacts (327). A denser lithic concentration of c. 9–10 m^2 was connected to a fireplace. The fireplace was distinguished by heat fragmented stones and sooty sediments. The site was interpreted as an episodic event, where up to four knapping sequences were performed (Sauvage 2007).

The artefact analysis in the present study shows that a microlith is the only formal tool found on the site. Additionally, four informal types are registered. The overall impression of the assemblage is that primary production has taken place, and that blanks and tool have been taken away from the camp and used elsewhere. It is reasonable to interpret is a short pit stop where gearing up and maintenance took place, and may be classified as a small *location*.

Diachronic trends among Early Mesolithic site types?

In the analysis, three types of sites were identified: The residential bases, which vary in size according to the number of times it has been visited; the small and medium-sized field camps where a narrow range of activities has taken place, and the very smallest pit stops or locations (Table 8.6).

In a diachronic perspective, there are several interesting things to point out: In the earliest phase (9400–9200 cal BC), the predominant site category is the *field camp*. Here, we find small and medium-sized sites that contain one lithic concentration, a low amount of artefacts, and a restricted repertoire of tool. Sites 1–3 are interpreted as short term occupations where a narrow set of activities

were carried out. Site 4 is larger, and is interpreted as a residential base, although the tool repertoire is quite limited here as well.

In the time span 9100–8800 cal BC the predominant site category is the *residential base*. Here we find the largest sites in the study, both in terms of size and artefact assemblage. With the artefact abundance follows a varied tool repertoire, but the share of tools in relation to debris is very low. Most of the sites contain traces of fireplaces and dwellings. Three of the largest site complexes in the study (sites 9, 10 and 11) are dated to the same 200-year-period (9000–8800 cal BC). They are all interpreted as residential bases, and it is likely that small, mobile groups returned frequently over a period of time. Although smaller in size, sites 5 and 6 also seem to have been visited several times, and it is likely that they are residential bases comparable with the units on the larger sites.

The youngest sites (8800–8500 cal BC) are varied in size, layout and artefact composition. The four smallest sites (site 12, 14, 15 and 18) in the study belong to this phase, and they are interpreted as small, random pit stops – *locations* – where gearing-up sessions took place. There are, however, also larger and more complex sites. Site 17, particularly, includes an unusual dwelling structure that may speak of longer occupation, yet it is not comparable with the later Mesolithic sites with thick cultural layers that have accumulated over a longer period of use.

In the introduction of the paper, an environmental trajectory for Early Mesolithic Norway was outlined: A cold pulse (the PBO) identified by readvancing ice sheets and retreating forests occurred c. 9300–9200 cal BC. Several studies suggest that although the Preboreal Oscillation may have had a negative impact on the terrestrial resources, this climatic event could actually have enhanced the marine productivity along the Norwegian coast (Breivik 2016). A skeleton of a bearded seal, found in the Trondheimsfjord and dated to this phase (Rosvold & Breivik 2018), verifies that arctic marine species were present in this region. Arctic seals have been emphasized as a prime motivator for the initial colonization of the Norwegian coast (e.g. Bjerck 2016, 2017). The small field camps dated to the early phase in this study speaks for a settlement pattern where new locations were sought each time, and it is tempting to relate them to an economy that was based on targeting highly mobile pinnipeds.

Midway through the Early Mesolithic period, c. 8800 cal BC, the Norwegian Atlantic Current was established, bringing warmer water masses along the coast. The ice melted away, pushing the cold tolerant fauna northwards, and providing stable and livable conditions to a new range of marine species. It is interesting that the large site complexes in this study appear in the period when the marine environment stabilizes, and it seems likely that they represent predictable hunting places that were revisited several times. The change in the use of site types seems to occur parallel with an orientation towards more retracted locations along sheltered waters (see above), indicating that perhaps fish was on the diet (see e.g. Bergsvik 1991, 1995, 2001).

The site variation that we see in the final phase of the Early Mesolithic could be a further development, where the residential sites become central in a mobility pattern that to a larger degree includes special purpose sites.

The study points to a development from short visits where hunting activities and gearing up was the focus in the earliest part of the Early Mesolithic, to a more stable site pattern where residential bases were established nearby predictable food resources. This happens parallel with the environmental and climatic fluctuations, and it is likely that these trajectories are related. It also fits with theories of authors like Bang-Andersen (e.g. 2003) about landscape learning and adaptations to a new resource situation in the stages of the pioneer colonization of the Norwegian coastal landscape.

References

Bang-Andersen, S. (2003). Southwest Norway at the Pleistocene/Holocene transition: Landscape development, colonization, site types, settlement patterns. *Norwegian Archaeological Review*, 36(1), 5–25.

Berg-Hansen, I.M. (2017). *Den sosiale teknologien – teknologi og tradisjon i Nord-Europa ved slutten av istida, 10 900–8500 f.Kr.* (Unpublished doctoral dissertation). Oslo: University of Oslo.

Berglund, B. (ed.) (2001). *'Gassprosjektet' – arkeologiske undersøkelser på Tjeldbergodden, Aure kommune, Møre og Romsdal fylke i forbindelse med bygging av metanolanlegg.* Rapport, Arkeologisk serie, 2001:1. Trondheim: NTNU University Museum, Norwegian University of Science and Technology.

Bergsvik, K.A. (1991). *Ervervs- og bosetningsmønstre på kysten av Nordhordland i steinalder, belyst ved funn fra Fosnstraumen* (Unpublished cand.mag. thesis). Bergen: University of Bergen.

Bergsvik, K.A. (1995). Bosetningsmønstre på kysten av Nordhordland i steinalder. En geografisk analyse. *Arkeologiske skrifter*, 8, 111–130.

Bergsvik, K.A. (2001). Sedentary and mobile hunter-fishers in Stone Age western Norway. *Arctic Anthropology*, 38(1), 2–26.

Berner, K.S, Koç, N. & Godtliebsen, F. (2010). High frequency climate variability of the Norwegian Atlantic Current during the early Holocene period and a possible connection to the Gleissberg cycle. *The Holocene*, 20(2), 245–255.

Binford, L.R. (1980). Willow smoke and dogs' tails: Hunter-gatherer settlement systems and archaeological site formation. *American Antiquity*, 45(1), 4–20.

Binford, L.R. (2001). *Constructing frames of reference. An analytical method for archaeological theory building using ethnographic and environmental data sets*. Berkeley: University of California Press.

Bjerck, H.B. (1990). Mesolithic site types and settlement patterns at Vega, northern Norway. *Acta Archaeologica*, 60, 1–32.

Bjerck, H.B. (2007). Mesolithic coastal settlements and shell middens (?) in Norway. In: Milner, N., Craig, O.E. & Bailey, G.N. (eds.), *Shell Middens in Atlantic Europe*. Oxford: Oxbow Books, pp. 5–30.

Bjerck, H.B. (2008a). Norwegian Mesolithic Trends: A review. In: Bailey, G.N. & Spikins, P. (eds.), *Mesolithic Europe*. Cambridge: Cambridge University Press, pp. 60–106.

Bjerck, H.B. (2008b). Lokalitet 48 Nordre Steghaugen – Tidligmesolittiske boplasser med ildsteder og telttufter. In: Bjerck, H.B. (ed.), *NTNU Vitenskapsmuseets arkeologiske undersøkelser Ormen Lange Nyhamna*. Trondheim: Tapir Academic Press, pp. 217–256.

Bjerck, H.B. (2008c). Lokalitet 51 Søndre Steghaugen – Tidligmesolittisk boplass. In: Bjerck, H.B. (ed.), *NTNU Vitenskapsmuseets arkeologiske undersøkelser Ormen Lange Nyhamna*. Trondheim: Tapir Academic Press, pp. 285–294.

Bjerck, H.B. (2008d). Lokalitet 62 Litle Grynnvika Øvre/Nedre – Boplasser fra tidligmesolittisk og senmesolittisk tid. In: Bjerck, H.B. (ed.), *NTNU Vitenskapsmuseets arkeologiske undersøkelser Ormen Lange Nyhamna*. Trondheim: Tapir Academic Press, pp. 347–363.

Bjerck, H.B. (2008e). Lokalitet 72 Søndre Steghaugen – Tidligmesolittisk boplass med ildsted og telttufter. In: Bjerck, H.B. (ed.), *NTNU Vitenskapsmuseets arkeologiske undersøkelser Ormen Lange Nyhamna*. Trondheim: Tapir Academic Press, pp. 435–444.

Bjerck, H.B. (2008f). Lokalitet 73 Søndre Steghaugen – Tidligmesolittisk boplass og produksjonssted for skiveøks. In: Bjerck, H.B. (ed.), *NTNU Vitenskapsmuseets arkeologiske undersøkelser Ormen Lange Nyhamna*. Trondheim: Tapir Academic Press, pp. 445–451.

Bjerck, H.B. (2008g). Lokalitet 76 og 76B Søndre Steghaugen – Tidligmesolittiske boplasser under strandvoll. In: Bjerck, H.B. (ed.), *NTNU Vitenskapsmuseets arkeologiske undersøkelser Ormen Lange Nyhamna*. Trondheim: Tapir Academic Press, pp. 453–467.

Bjerck, H.B. (2008h). Tidligmesolittisk tid (TM) og Fosnatradisjon 9500–8000 BC. In: Bjerck, H.B. (ed.), *NTNU Vitenskapsmuseets arkeologiske undersøkelser Ormen Lange Nyhamna*. Trondheim: Tapir Academic Press, pp. 552–575.

Bjerck, H.B., Breivik, H.M., Piana, E.L. & Zangrando, A.J.F. (2016). Exploring the role of pinnipeds in the human colonization of the seascapes of Patagonia and Scandinavia. In: Bjerck, H.B., Breivik, H.M., Fretheim, S., Piana, E., Skar, B., Tivoli, A. & Zangrando, A.F.J. (eds.). *Marine ventures: Archaeological perspectives on human–sea relations*. *Proceedings from the Marine Ventures international symposium in Trondheim 2013.* Sheffield: Equinox Publishing, pp. 53–73.

Bjerck, H. B. (2017). Settlements and Seafaring: Reflections on the Integration of Boats and Settlements Among Marine Foragers in Early Mesolithic Norway and the Yámana of Tierra del Fuego. *The Journal of Island and Coastal Archaeology* 12(2), 276–299.

Blankholm, H.P. (2008). *Målsnes 1. An Early Post-Glacial Coastal Site in Northern Norway*. Exeter: Short Run Press.

Brede, A. (2012). *Arkeologisk undersøkelse i forbindelse med utbyggingsplaner for Hestvikholmane industriområde, Averøy kommune, Møre og Romsdal, 2012. Lokalitet 1 og 2*. (Unpublished report). Trondheim: NTNU University Museum, Norwegian .

Breivik, H.M. (2014). Palaeo-oceanographic development and human adaptive strategies in the Pleistocene–Holocene transition: A study from the Norwegian coast. *The Holocene*, 24(11), 1478–1490.

Breivik, H.M. (2016). *Dynamic relations between humans and environment in the earliest settlement phase of Norway (9500–8000 cal. BC)* (Unpublished doctoral dissertation). Trondheim: Norwegian University of Science and Technology.

Breivik, H.M. & Callanan, M. (2016). Hunting high and low: Postglacial colonization strategies in Central Norway between 9500 and 8000 cal BC. *European Journal of Archaeology*, 19(4), 571–595.

Breivik, H.M, Fossum, G. & Solheim, S. (2017). Exploring human responses to climatic fluctuations and environmental diversity: Two stories from Mesolithic Norway. *Quaternary International*, 465, 258–275.

Breivik, H.M., Bjerck, H.B., Zangrando, A.F.J. & Piana, E.L. (2016). On the applicability of environmental and ethnographic reference frames: An example from the high-latitude seascapes of Norway and Tierra del Fuego. In: Bjerck, H.B., Breivik, H., Fretheim, S., Piana, E., Skar, B., Tivoli, A. & Zangrando, A.F.J. (eds.), *Marine ventures: Archaeological perspectives on human–sea relations*. *Proceedings from the Marine Ventures international symposium in Trondheim 2013.* Sheffield: Equinox Publishing, pp. 75–94.

Breivik, H.M. and Bjerck, H.B. (2018). Early Mesolithic central Norway: A review of research history, settlements, and tool tradition. In: Blankholm, H.P. (ed.), *Early economy and settlement in Northern Europe: Pioneering, resource use, coping with change*. The early settlement of Northern Europe, 3. Sheffield: Equinox Publishing, pp. 169–206.

Bølviken, E., Helskog, E., Helskog, K., Holm-Olsen, I.M., Solheim, L. and Bretelsen, R. (1982). Correspondence analysis: An alternative to principal components. *World Archaeology*, 14(1), 41–60.

Chatters, J.C. (1987). Hunter-gatherer adaptations and assemblage structure. *Journal of Anthropological Archaeology*, 6(4), 336–375.

Damlien, H. (2016). *Between Tradition and Adaption. Long-term trajectories of lithic tool-making in South Norway during the postglacial colonization and its aftermath (c. 9500–7500 cal. BC)* (Unpublished doctoral dissertation). Stavanger: University of Stavanger.

Eriksen, B.V. (2000). *Flintstudier – en håndbog i systematiske analyser af flintinventarer*. Aarhus: Aarhus Universitetsforlag.

Fretheim, S.E. (2007). *Arkeologisk undersøkelse i forbindelse med regulering av Hestvikholmane industriområde, Averøy kommune, Møre og Romsdal, sommeren 2006. Lokalitet 1 og 2* (Unpublished report). NTNU University Museum, Norwegian University of Science and Technology.

Fretheim, S.E. (2008). *Arkeologisk undersøkelse i forbindelse med utviding av Kristiansund lufthavn, Kvernberget, Kristiansund kommune, Møre og Romsdal, 2007. Lokalitet 1.* (Unpublished report). NTNU University Museum, Norwegian University of Science and Technology.

Fretheim, S.E. (2017). *Mesolithic dwellings. An empirical approach to past trends and present interpretations in Norway* (Unpublished doctoral dissertation). Trondheim: Norwegian University of Science and Technology.

Hauglid, M. (1993). *Mellom Fosna og Komsa. En preboreal «avslagsredskapskultur» i Salten, Nordland* (Unpublished cand.mag. thesis). Tromsø: University of Tromsø.

Indrelid, S. (1973). Mesolitiske tilpasningsformer i høyfjellet. *Stavanger Museum Årbok*, 1972, 5–27.

Nærøy, A.J. (2017). Early Mesolithic spatial conformity in southern Norway. *Journal of Archaeological Science: Reports*, 18, 905–912.

Olsen, A.B. (1992). *Kotedalen – en boplass gjennom 5000 år. Bind I. Fangstbosetning og tidlig jordbruk i Vestnorsk steinalder, Nye funn og nye perspektiver*. Bergen: University of Bergen.

Rosvold, J. & Breivik, H.B. (2018). An Early Holocene bearded seal from the Trondheimfjord: Environmental and archaeological implications. In: Persson, P., Riede, F., Skar, B., Breivik, H.M. & Jonsson, L. (eds.). *Ecology of early settlement in Northern Europe: Conditions for subsistence and survival*. The Early Settlement of Northern Europe, 1. Sheffield: Equinox Publishing, pp. 381–391.

Sauvage, R. (2007a). *Arkeologiske undersøkelser. Hestvikholmane industriområde Lok 6, boplass fra eldre steinalder* (Unpublished report). Trondheim: NTNU University Museum, Norwegian University of Science and Technology.

Sauvage, R. (2007b). *Arkeologisk undersøkelse i forbindelse med reguleringsplan for Kvennbergmyran, Kristiansund kommune, Møre og Romsdal, 2007. Lokalitet 1* (Unpublished report). Trondheim: NTNU University Museum, Norwegian University of Science and Technology.

Solheim, S. (2017). Kunnskapsstatus og faglig bakgrunn for undersøkelsene. In: Solheim, S. (ed.), *E18 Rugtvedt-Dørdal. Arkeologiske undersøkelser av lokaliteter fra steinalder og jernalder i Bamble kommune, Telemark fylke*. Kristiansand: Portal forlag, pp. 29–42.

Strøm, I.O. & Breivik, H.M. (2008). *Arkeologiske undersøkelser. Reguleringsplan Kvernberget Lufthavn. Lokalitet 20* (Unpublished report). Trondheim: NTNU University Museum, Norwegian University of Science and Technology.

Wammer, E.U. (2006). *Arkeologiske undersøkelser av lokalitet 3 i forbindelse med utvidelse av Hestvikholmane industriområde på Averøya, sommeren 2006* (Unpublished report). Trondheim: NTNU University Museum, Norwegian University of Science and Technology.

Waraas, T.A. (2001). *Vestlandet i tidleg Preboreal tid. Fosna, Ahrensburg eller vestnorsk tidligmesolitikum?* (Unpublished master's thesis). Bergen: University of Bergen.

Åstveit, L.I. (2018). The Early Mesolithic of western Norway. In: Blankholm, H.P. (ed.), *Early economy and settlement in Northern Europe: Pioneering, resource use, coping with change*. The early settlement of Northern Europe, 3. Sheffield: Equinox Publishing, pp. 231–274.