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University of Bergen Archaeological Series

The Stone Age Conference in Bergen 2017

Dag Erik Færø Olsen (ed.)

UNIVERSITY OF BERGEN

12

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Preface

This anthology is based on contributions presented as part of *The Stone Age Conference in Bergen 2017 – Coast and Society, research and cultural heritage management*. The conference was co-organized by the Department of Archaeology, History, Cultural Studies and Religion (AHKR) at the University of Bergen and the Department of Cultural History at the University Museum of Bergen (UM). The organizing committee included Dag Erik Færø Olsen (leader) and Tina Jensen Granados from AHKR, together with Leif Inge Åstveit and Knut Andreas Bergsvik from UM.

The Stone Age Conference in Bergen 2017 was the third instalment of the "Stone Age Conference" series to be organized in Norway. The first conference was held in Bergen in 1993 (Bergsvik *et al.* 1995) and the second in Molde in 2003. The purpose for the 2017 conference in Bergen was to gather archaeologists with common interest in the Norwegian Stone Age and from all parts of the national Stone Age community. Several prominent research communities exist in Norway today and representatives from all University departments and from the majority of the County Municipalities was gathered to share current results and to discuss common issues and strategies for future research.

Since the last conference in 2003, the cultural heritage management in Norway has made large quantities of new archaeological data accessible for research. Such extensive new data has provided new methodological and theoretical challenges and opportunities which is reflected in the scope of research published within the last 20 years.

The Stone Age Conference in Bergen 2017 wanted to reflect the new empirical, theoretical and methodological diversity, and to highlight how these developments could be integrated into the cultural heritage management and within future research. The conference was structured by current themes and approaches and divided into five main sessions (including a poster session) and seven session themes (see Sessions and papers at the end of this volume).

An increasing association with the *natural scientific approaches* was one important theme of the conference focusing on research on climate change, aDNA and new and improved methods for analysis and dating. Related to this was the general theme *technology* were studies on raw material and technological studies are used in mobility- and network analysis.

Managing and utilizing the large quantities of data generated over the last two decades was the basis for the themes *demography* and *subsistence changes*. The theme *methodological developments* included increasing digitalization and how this is used in rescue archaeology, with challenges and new possibilities. The conference also wanted to explore aspects of *ritual communication* where various forms of expressions, such as rock art, could elaborate and increase our understanding of several of the other main themes mentioned.

During the three days of the conference a total of 46 15 minutes presentations addressed various topics and aspects within the seven session themes. All sessions were led by session leaders and three of the conference sessions were introduced by key note speakers.

After the conference, it was decided to publish an anthology, inviting all participants to contribute including the poster participants. The publication was to be in the University of Bergen Archaeological Series, UBAS, and with Dag Erik Færø Olsen as editor of the anthology. Ten papers were submitted from all the sessions and is representative of the topics presented and discussed during the three-day conference. The papers included in this volume are organized mainly geographically starting with Northern Norway moving southwards.

Kenneth Webb Vollan focuses on housepit sites in Arctic Norway using radiocarbon dates for distinguishing reuse or occupational phases. He presents a method for analysing dates following the Bayesian approach and shows that the housepits were reused to a much larger degree than previous acknowledged.

Skule Spjelkavik and *Axel Müller* explores similar topics in their paper about quartz crystal provenance. By using laser ablation inductively coupled plasma mass spectrometry (LA-ICP-MS) they were able to compare debitage from the Early Mesolithic settlement site Mohalsen I at the island Vega with samples from 19 known sources in Norway. This is especially interesting since there are no known quartz crystal occurrences at Vega and was consequently brought from the main land or other areas. This study shows the potential for using this method, even though no clear parallel to the Mohalsen debitage could be identified in the analysed material.

Jan Mangerud and *John Inge Svendsen* explores colonization processes from a geological perspective. They document how an ice sheet margin presented a physical barrier across the Oslofjord preventing human immigration until the onset of the Holocene, providing an interesting backdrop for discussing aspects of colonization processes in the Early Mesolithic.

Arne Johan Nærøy discusses the use of tools and behaviour patterns based on use-wear analysis of quartz assemblage from the site 16 Budalen in Øygarden, Hordaland County. He is able to distinguish two individuals operating at the site suggesting spatially segregated work operations. Nærøy shows through this study the potential for functional analysis of lithic material from settlement sites.

Astrid Nyland, Kidane Fanta Gebremariam and *Ruben With*'s contribution represents both the new technological and methodological developments and the interdisciplinary nature of archaeology today. This paper explorers the potential for using pXRF for regional provenance analysis of greenstone adzes in western Norway. This study revisits an older interpretation of the division of this region into two social territories in the Middle and Late Mesolithic. The results show that the method is robust and well suited for studying green stone and the authors can also largely confirm the original interpretations based on distribution networks of Mesolithic adzes.

Birgitte Skar discusses the early postglacial migration into Scandinavia based on aDNA studies on two Early Mesolithic Norwegian skeletons. Skar's results confirms the recent interpretation of a second migration into Norway from the Northeast thus contributing to the overall narrative of the colonization of Norway.

Almut Schülke revisits the topic of Mesolithic burial practises in Norway based on new data from recent excavations. Schülke highlights that human remains are often found at settlement sites, opening for discussions of various relationships between the living and the dead and human-nature engagement.

Krister Eilertsen presents results from an excavation of an Early Neolithic hut in Rogaland, Southwestern Norway. He discusses classical interpretative challenges where the lithic material and ^{14}C-datings are not comparable. Eilertsen emphasise the importance of not dismissing difficult results but rather try to find an answer to the differences in light of a wider analysis of the area including various natural and cultural processes. He is thus able to explain the contrasting data and provide new insight into settlement patterns and economy at the start of the Neolithic.

Dag Erik Færø Olsen reviews the rock shelters in the mountain regions of Hardangervidda and Nordfjella. The previous interpretation of these settlement sites as primarily from the Late Neolithic and onwards is discussed based on a reclassification of archaeological material. The results show that rock shelters have been used from at least the Middle Mesolithic and in some cases with an intensification and stronger continuity after 2350 BC.

Gaute Reitan discusses the chronological division of the Mesolithic based on new data from excavations the last 20 years. Reitan presents a revised chronology for the Mesolithic in Southeast Norway dividing each of the three main phases into two sub-phases, adding two new phases to Egil Mikkelsen's original from 1975.

Acknowledgements

On the behalf of the organizing committee, we would like to thank all participants of *Steinalderkonferansen i Bergen 2017* for sharing their knowledge and for the discussions that followed at the conference. We also want to express our gratitude to the conference key note speakers, Prof. Kjel Knutsson (Dep. of Archaeology and Ancient History, Uppsala University), Assoc. Prof. Per Persson (Dep. of Archaeology, Museum of Cultural History, University of Oslo) and Prof. Charlotte Damm (Dep. of Archaeology, History, Religious Studies and Theology, The Arctic University of Norway) for introducing three of the conference sessions. This gratitude is also extended to five session leaders, Assoc. Prof. Arne Johan Nærøy (Museum of Archaeology, University of Stavanger), Prof. Marianne Skandfer (The Arctic University Museum of Norway), Assoc. Prof. Birgitte Skar (Dep. of Archaeology and Cultural History, NTNU University Museum), Prof. Hans Peter Blankholm (Dep. of Archaeology, History, Religious Studies and Theology, The Arctic University of Norway) and Prof. Almut Schülke (Dep. of Archaeology, Museum of Cultural History, University of Oslo).

During the three-day conference the committee received assistance from voluntary students from The University of Bergen and they provided valuable help during the conference.

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The editor of this anthology would further like to express gratitude to all the anonymous peer reviewers whose valuable comments and insights has made this publication possible.

Last, but not least, thank you to the authors of this anthology for the patience and work on the papers that make out this volume.

Dag Erik Færø Olsen and Tina Jensen Granados – Oslo 2021

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Birgitte Skar

Mobility and material culture in the Middle Mesolithic of Fennoscandia – validating the input from biomolecular studies

Similarities in late-glacial lithic technology (direct percussion) of western Europe and the oldest counterparts of Scandinavia appearing around 11,700 BP have sustained arguments for an early postglacial migration from northwestern Europe into Scandinavia including coastal areas of northern Norway. However, another lithic technology (pressure blade), occurring in Fennoscandia around 10,300 BP, indicates contacts with groups in the east and potentially a second and east-west migration deriving from the Russian mainland.

aDNA studies of some of the oldest coastal human individuals from Europe, represented by two Norwegian skeletons (9500 BP) unveiled admixture of southern hunter gatherer (SHG) and eastern hunter gatherer (EHG), descended from isolated Glacial refugia. The Norwegian samples show dominance of EHG while contemporary samples from Gotland show a dominance of SHG ancestry. Isotopic markers of a diet consisting of more than 80% marine protein deriving from the highest level of the food chain sustain the importance and likely attraction of marine mammal resources. The biomolecular results underpin a second migration into Norway from northeast c. 10,300 BP, likely over the Cap of the North. Recent lithic studies covering larger parts of Central Scandinavia and Russia, however, provide a more fine-tuned narrative of networks and pulses of migration.

Introduction

In 2018 an article was published in *PLOS Biology* (Günther *et al.*) presenting the results of biomolecular studies of aDNA and stable isotope of some the oldest known human individuals from coastal Europe. The analyses of these individuals found in Norway and Sweden suggests that the first human settlers on the Scandinavian Peninsula followed two distinct migration routes.

There is consistent evidence of a human presence in the Scandinavian Peninsula from around 11,700 years ago on the Swedish west coast and from 11,500 cal. BP along the Norwegian coast (Breivik 2016, Appendix B). Similarities between stone tool artefacts and technology found in Scandinavia and those seen in Western Europe suggests that people deriving from the North West European Ahrensburg culture were the first to enter this part of Scandinavia. Approximately a millennium later, a new technology resting on specialized blade production from conical cores was introduced in Fennoscandia and on the west Scandinavian Peninsula.

Based on meticulous studies of technology and radiocarbon dates it has been suggested (Sørensen *et al.* 2013) that east european groups migrated into present day northern Finland and Norway from the northeast, around 10,300 cal. BP.

The genetic studies comprise seven Scandinavian hunter-gatherers dated to be 9500–6000 years old. The analysis indicates that migrations into the Scandinavian Peninsula most likely followed two routes; one from central Europe and one about a millennium later from the Northeast: from Russia, via Finland and further down along the Norwegian Atlantic Coast (Günther *et al.* 2018). The biomolecular analysis thus underpins the initial stone technological studies. Further studies (Kashuba *et al.* 2019) strengthen the evidence of an association between the introduction of technological innovations and human demographic processes involving admixture during the Middle Mesolithic. The two groups EHG and WHG are suggested to have met and mixed in Scandinavia, creating a genetically diverse population.

Stable isotope analysis gives an input to understanding the resource base of these Middle Mesolithic people (Skar *et al.* 2016, Günther *et al.* 2018, S1). The genetic studies also give comprehensive information on the physical nature of the analyzed people, this will however not be a focus in the present article.

In this article, we will seek to investigate how this new and independent information on the Middle Mesolithic population can be integrated in studies of cultural development together with material culture studies. Aspects of mobility will be at the core of the discussion, but also further lines of enquiry are suggested.

The setting – environmental trajectories

The environmental trajectories in early postglacial Scandinavia and part of Northern Europe have been described in a recent chapter in vol.1 of 'The Early Settlement of Northern Europe' (Skar and Breivik 2018, p. 1–18).

The environmental development during the timeframe from the preboreal period 11,500 cal. BP until the subatlantic arround 4500 cal. BP can in many respects best be understood as an aftermath of the Weichselian. It represents a period of dramatic landscape changes in Scandinavia and Northern Europe; the final melt down of continental glaciers, isostatic land uplift and sea-level fluctuations, as well as alternation between a dammed and open Baltic Sea (Skar and Breivik 2018). While the general trend during this period is gradual heating, three marked early Holocene cold events, at c. 10,300 cal. BP, 9200 cal. BP and 8200 cal. BP that can be traced in climate reconstructions from the Greenlandic Ice cores (Björck *et al.* 2001, Rasmussen *et al.* 2007, Seppä *et al.* 2007, Manninnen *et al.* 2018) with effects throughout large areas in Europe would have had impact on both marine, lacustrine and terrestrial ecosystems. The inland ice still lingered in the interior of Northern Scandinavia, and the area covered by the Fennoscandian Ice sheet was not completely ice-free until c. 8700 cal. BP (Patton *et al.* 2017, see also Mangerud and Svendsen in this volume). Around 10,300 cal. BP a shortlived cold period has been documented particularly in the Fennoscandian areas to have had eco-dynamic repercussions, also potentially influencing demography and for a while halting the beginning spread of human population towards northwest from Russia and Finland (Manninen 2014, Manninen *et al.* 2018).

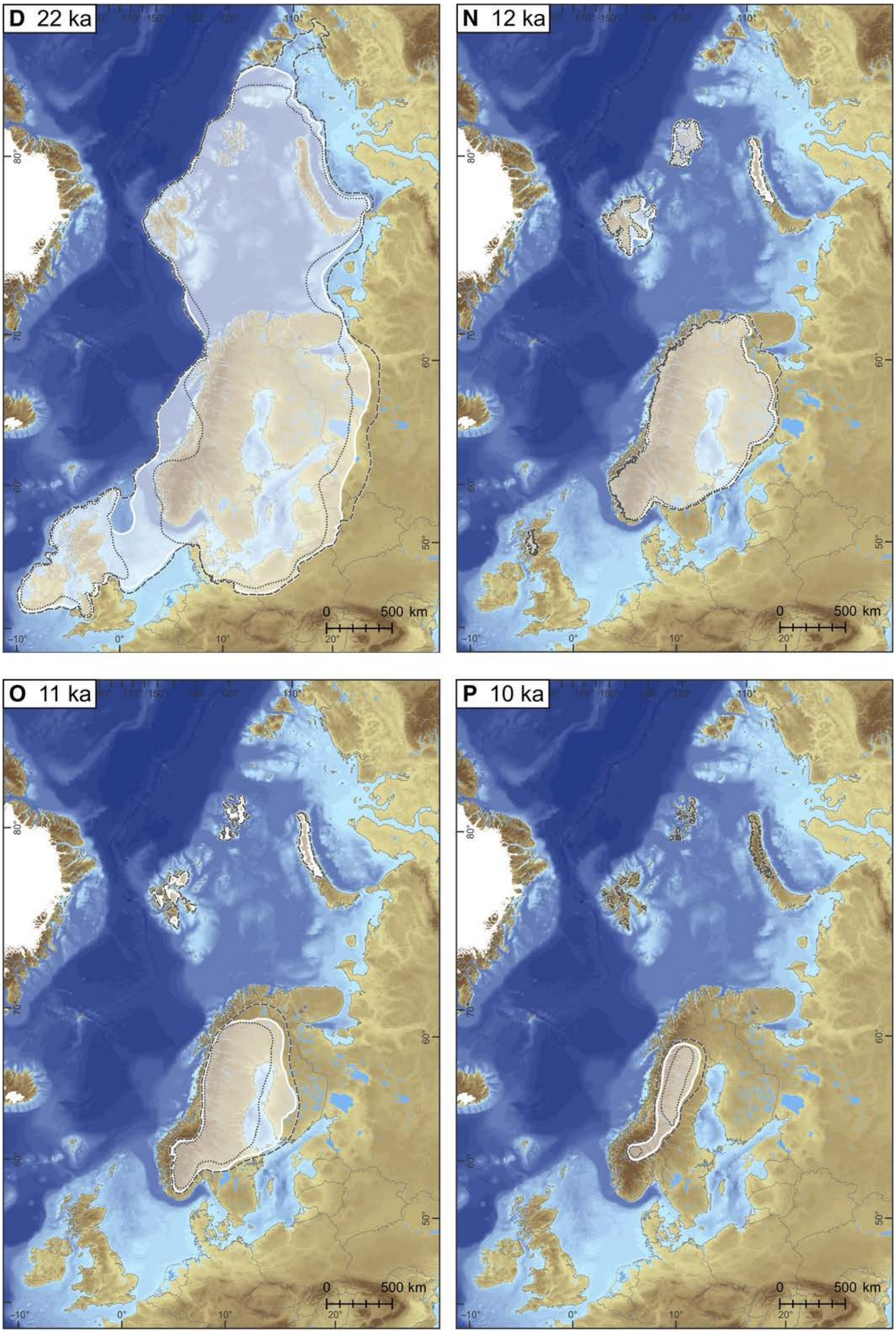

***Figure 1**: Timeslice reconstruction of the extent of the Eurasian ice sheet from Late Glacial Maximum (LGM) to the 10000 cal BP. Dates are expressed in calibrated years BP. After Hughes et al. 2016, Figure 6. The datasets are available for download at https://doi.pangaea.de/10.1594/PANGAEA.848117. Reprinted with permission.*

In most parts of Europe, Early Holocene coastal areas are now inundated, resulting in early postglacial shore-bound settlement being submerged. Due to the great thickness of the ice sheet, the Scandinavian Peninsula underwent rapid isostatic land uplift, parallel with sea-level rise, as the weight from the ice diminished during the Late-glacial meltdown. This has resulted in elevated ancient shorelines in larger parts of central and northern Scandinavia (Schmitt *et al.* 2009, Schmitt and Svedhage 2015, Breivik 2016, Skar and Breivik 2017). A more characteristic development on the west and southern coast of Norway and Sweden is, however, that at least boreal coastlines were eroded and covered by the Tapes transgression occurring between 9000–6000 BP (i.e. c. 8200–4900 cal. BC) (Svendsen and Mangerud 1987). Some parts of the ancient Norwegian coast from this period remain inundated today, and can be compared with the situation in other parts of Europe (Bjerck 2008, Nymoen and Skar 2011). These factors have important repercussions for our ability to reconstruct middle Mesolithic settlement along larger parts of the coastline.

The environmental trajectories of the Baltic Sea are also mutable. The subject is addressed in many publications latest by Påsse and Daniels (2015). The Baltic Ice Lake had already by the Boreal period been though several phases of transformations, from a long phase during the Late Glacial as a dammed freshwater basin through a dramatic drainage episode towards the end of Younger Dryas (11,700–11,600 cal. BP), that caused the waterlevel to drop approximately 25 meters during the course of 1–2 years. The following period – the Yoldia Phase – was brackish/saline where the basin was connected to the North Sea towards the northwest lasting until approximately 10,700 BP. A new tilting caused by the diminishing inland ice led to a new damming called the Ancylus Lake stage (Tikkanen and Oksanen 2002, Skar and Breivik 2017). This is the period of particular relevance to the present study. Areas previously inundated emerged from the sea, and former dry land became submerged. Approximately 8500 cal. BP, the conditions again turn back to marine, marking the transition to the Littorina Sea stage. During this period the southern Baltic, up to approximately the Stockholm-south Finland area, would experience transgressions.

These climatic and eustatic changes would have had a contemporary impact on both ecosystems and humans, in addition to our ability to relocate archaeological sites from the Boreal period. The question is, however, to which degree the pioneer societies were resilient to the very dynamic nature grid conditions, as suggested by some authors (Breivik *et al.* 2018). Perhaps particularly the alterations in the Baltic Sea and substitution of biomass between saltwater, brackish and freshwater ecosystems would have affected the human impression of stability or instability of resource access in this region. The tilting around 10,700 cal. BP may also to a lesser degree have affected the terrestrial biomass, at times demanding longer periods of vegetation recovery, and thus influencing grazing areas for large ungulates and other sources of prey. The question of migration roads particularly in the Fennoscandian areas has recently been discussed in an article by Kleppe (2018) who suggests a delay in the first pioneer migration from the south along the northwest coast of Norway due to calving ice and subsequent tectonic activity in the earliest Holocene from Northern Trøndelag to southern Troms. Instead, he suggests that the first pioneers of western Fennoscandia would have derived from the northeast already during the Preboreal period. However, Kleppe's (2018) comprehensive and thought-provoking studies do not comprise an analysis of the actual material culture remains on the settlement sites. The question is to which extent the natural circumstances that took place from 11,600–11,400 cal. BP, and would clearly have affected the terrestrial ecosystem, would also have influenced a highly marine oriented occupation entering contemporaneously or a bit later.

On the east side of the Baltic, we have the earliest settlement in southern Finland 11,100 cal. BP (Tallavaara *et al.* 2010, Tallavaara and Seppä 2011, Rankama and Kankaanpää 2011). The Baltic sites represent a Post-Swiderian technology deriving from the east. Settlement sites and radiocarbon dates suggest a climatic setback caused by the 10,300 cal. BP cold event, thus indicating two pulses of migration into northeastern Fennoscandia (Tallavaara *et al.* 2014, Manninen *et al.* 2018), of which the Sujala assemblage (c. 10,300 cal. BC) represents the earliest (Rankama and Kankaanpää 2018). The Baltic Sea would have been at the Ancylus stage and thus a freshwater basin during this period while the Coast of Norway represented extensive areas of relatively sheltered archipelago rich in marine resources. In the inland areas of Southern Norway and Sweden as well as in Finland east and north of the ice-cover, the ice was gradually giving way to vegetation and thus providing grazing resources for large ungulates (Tallavaara *et al.* 2014, Kleppe 2018).

Further east, north of the Ural mountains late Paleolithic sites have been found on the northern coast. These sites have a very wide specter of dates – the oldest from 43,000 cal. BP (Pitulko *et al.* 2004). More recent data on deglaciation and archeological documentation exists from for example Pymva Shor cover the period 26,300–11,600 BP (Hughes *et al.* 2016, Stroeven *et al.* 2016; Östlund 2018). Some early Mesolithic sites that are contemporary to the North Scandinavian sites have been documented on the Kola Peninsula and the coast of the White Sea. Although such a scenario does open the possibility of very early Holocene migration from the northeast into western Fennoscandia, we presently lack a more detailed knowledge of the chronology of these sites (Hartz *et al.* 2010, Günther *et al.* 2018, S1).

Material culture indications of mobility during the middle Mesolithic in Middle and Northern Scandinavia

The lithic material

During the last years, an impressive amount of work has been done analyzing lithic materials with a particular focus on the spread of the middle Mesolithic narrow blade technology in Scandinavia (e.g. Sørensen *et al.* 2013, Damlien 2016, Damlien *et al.* 2018, Guinard 2018, Manninen *et al.* 2018, Rankama and Kankaanpää 2018, Sørensen 2018). It has been argued that producing long narrow blades from conical blade cores by pressure or lever is a technology that has its point of departure in 'Post-Swiderian' hunter-gatherer lithic traditions dated to approximately 11,500 cal. BP on the Russian plain (Sørensen *et al.* 2013). This technology is found on sites belonging to the Butovo/Veretye inland forager groups (Damlien *et al.* 2018). Around 10,300 cal. BP this technology spread as earlier mentioned from the east to northern Finland north of the Scandinavian Ice Sheet where it can be found on the Sujala site and in the Varangerfjord area (Rankama and Kankaanpää 2018). Sørensen *et al.*'s (2013) analysis is based on a chronological trend from east to west in the materials. They argue that technology spread primarily because of intergroup communication along the Norwegian west coast towards the south, while there may have been a route south of the Scandinavian Ice Sheet back towards the east. The spread of this so-called conical core pressure blade technology (CCPBC) was suggested to have taken a different route slightly later and more directly via the Baltic towards Bornholm and southern Scandinavia, where the lack of platform preparation on the cores distinguishes it from the chaine operatoire of the northern version.

In their 2018 article Damlien, Kjällquist and Knutsson (p.110–112) diversify Sørensen *et al.* (2013) initial interpretation of a potential eastern migration. In line with Tallavaara *et al*'s studies (2014) the authors suggest that there must have been at least two and possibly more pulses of eastern migration. Their studies are underpinned by a large amount of radiocarbon dated and analyzed sites along an east-west gradient from Russia to Norway (Damlien *et al.* 2018, Appendix 5.1). Based on the lithic technological studies the first expansion (10,500–10,300 cal. BP) did not reach further into Norway than the Varangerfjord area. A second and more massive migration, resulting in many dated sites and a substitution of the old direct percussion technology with the new indirect and pressure technologies, happened after 10,150 cal. BP in Central Sweden and inland Norway. This expansion can be linked to the meltback of the Fennoscandian Ice Sheet, where eastern foragers would have investigated the recently opened areas also south of the Ice sheet. The re-examination of the narrow blade technology from the deep pit at the Huseby Klev site in Bohuslän on the westcoast of Sweden dated to c.10,040–9610 cal. BP can indeed be taken to underpin such a scenario (Kashuba *et al.* 2019). On the southwest coast of Norway, the earliest dates of the CCPBC technology are dated to 9600 cal. BP (Damlien *et al.* 2018, p. 111)

The settlement record and thus the database for the above mentioned studies do not have entire geographical coverage. Particularly on the southern and large parts of the western Norwegian coastlines the earlier mentioned effects of the tapes transgression, which peaks around 7700 cal. BP and the Storegga tsunami (8250–8100 cal. BP) have superimposed middle Mesolithic sites (Prøsch-Danielsen 2006). A number of known sites in key areas in northern and western central Norway where analysis has just started will help filling in the knowledge gaps concerning the mentioned hypothesis. Still the accomplished lithic analysis does give a remarkably detailed understanding of demographic processes that took place during this approximately 500–1000 years of the Boreal period.

The bone material

A similar route around the Cap of the North has been suggested for the so-called specialized 'shaft-wedge-splinter' technique used in bone industry (Bergsvik and David 2014). It has been suggested that the production of bone tools at the two cave sites Viste and Sævarhelleren (c. 9000–8000 cal. BP) consisted of a combination of fracturing techniques (shaft-wedge-splinter) and abrasive techniques (drilling, sawing, scraping and grinding). This mode of production clearly distinguishes northeastern European (Post-Swiderian) tradition of producing bone tools from the southern Maglemose tradition (David 1999). The authors argue that the industry developed between 10,000 and 9000 cal. BP partly as a result of eastern technological influences, and partly from regional innovations and adjustments related to an increased focus on a marine economy during this period. Later studies (Mansrud and Persson 2018) have recognized this technology in contemporary settlement deposits along the Oslo Fjord. The linkage between the bone technology and the CCPBC is related to the use of slotted bone tools during this period. In terms of chaine operatoire the grinding, polishing and even decoration of bone tools can also be related to grinding and polishing as we find it in ground stone axes and hatchets (Bergsvik and David 2017). Unfortunately, the archaeological record in the northern and central part of Scandinavia only seldom provides us with organic remains. Compared to the lithic record, which is rich – the organic record is often very fragmented or burnt if at all existing. The lack of preservation may very well limit our insight into fine-grained studies of regional expressions and indications of direct contact between groups that one can imagine such a material would have entailed (David and Kjällquist 2018).

The above-mentioned analyses supplemented by extensive investigations of demographic dynamics and climate change based on radiocarbon dates (Tallavaara *et al.* 2014, Manninen *et al.* 2018) are presently the most comprehensive studies that seek on the basis of archaeological material to underpin a hypothesis of migration and knowledge transfer from Post-Swiderian hunter-gatherer groups in Russia into Scandinavia during the Middle Mesolithic.

Migration, mobility, cultural encounters and social development

A general review of other aspects of material culture remains help fill in the picture and illustrate innovations and cultural changes that are introduced during the approximately 500–1000 years from the first transformation observed in change of archery and cutting tools. These changes may have been inspired by or introduced as a result of cultural encounters.

Rock art in northern Norway clearly predates rock art in the east by several thousand years and is thus likely in its origin a western tradition. A relatively large amount of the polished rock art has been shoreline dated to the period between 11,200 and 9000 cal. BP (Gjerde 2010, p. 386, fig. 275). The naturalistic polished art found in the Ofoten and Steigen areas illustrating different types of prey, can be taken to represent arenas of ritual practice for the pioneer groups that first arrived in this landscape. The interpretation of rock arts role as a material culture expression is challenging but can most directly be associated with descriptions of hunting scenes and communication with the other world in a context of rite of passage (Gjerde 2010). Whether the rock art is also a manifestation of power in terms of demarcation of territory in a type of intergroup communication is less clear. One can assume, however, that rock art sites and imageries are meant to communicate and it is interesting that the early stages of this material culture expression overlaps in time with the above mentioned transformations in other material culture. Does the rock art have a role in the interplay between groups in this northern region of Norway where meetings between eastern and western groups would likely have taken place?

Human ritual deposits are not present until this time in Scandinavia. We have close to a thousand archaeological sites from the Early Mesolithic in Norway alone, but so far no indications of intentional burial or other ritual deposition of the dead during this period. The DNA and isotope analyzed individuals from Hummervikholmen (Sellevold and Skar 1999, Nymoen and Skar 2011, Skar *et al.* 2016, Günther *et al.* 2018 S1), Stora Förvar (Lindqvist and Possnert 1999, Günther *et al.* 2018 S1) and Stora Bjers (Arwidsson 1979, Günther *et al.* 2018: S1) are among the oldest individuals found in Scandinavia (9732–8553 cal. BP). The earliest dated skeletal remains are, however, from the northeastern Skagerrak area. A female from Österöd from the Swedish west coast is dated to c. 10,200 BP (Ahlström and Sjögren 2009), and the human remains from Huseby Klev are dated to 10,040–9619 cal. BP (Nordqvist 2005, bilaga 1, Kashuba *et al.* 2019). Whether the Huseby Klev human findings represents a grave/ritual deposit, can also be debated.The burial practice varies considerably between these localities. The Middle Mesolithic graves cover a spectrum from cave burials adjacent to settlement deposits like Stora Förvar on Gotland to open-air graves on lakeshores, like for example Kams or Stora Bjers on Gotland (Grünberg 2000, p. 260f, Martinsson-Wallin 2011, Apel *et al.* 2018), or Hummervikholmen in Søgne, which is situated on the contemporary beach. Even bodies deposited in an inland lake like Bredgård, Hanaskede, Västergötland (Jonsson and Gerdin 1997) (c.10,000 BP), and possibly the individual found on Kyrkjetangen, Bønes in Bergen (c. 8500 cal. BP) exist (Hufthammer, pers. com.). The somewhat younger (c. 7900–7600 cal. BP) sacrificial site of Kanaljorden, Östergötland (Hallgren 2011) where several individuals were decapitated and the heads put on poles in a contemporary lake presently stands out as unique. The most common body pose varies from a dorsal position to a squatting position. Grave goods and the use of ochre is a frequent but not always present phenomenon. Several but not all indicate violence as a cause of death.

The very fragmented record of ritual deposition of humans in the Middle Mesolithic of Scandinavia provides us with highly dissimilar traditions. One can thus conclude that burial or ritual depositions of the dead appears to be a newly introduced cultural characteristic of this period, as can also be observed in the east on for example the expansive grave sites of Olenii Ostrov (c. 10,000–8400 cal. BP) (Jacobs 1995). However, one cannot attribute this ritual tradition entirely to potential migrating Post-Swiderian groups arriving with a complete and uniform ritual practice. Perhaps the practice of burial is rather inspired by cultural encounters and admixture, further reflecting the contemporary society's group organization and finally stimulated by a gradually more stable regional belonging. Underlining the ritual aspects of society is the introduction of polished and often decorated hatchets of bone, antler or ground stone. Such artefacts can also carry anthropomorphic traits and they rather resemble procession weapons than part of a working tool-kit. This is a type of artefact that is introduced and lasts for a very long time as part of the middle and late Mesolithic inventory. The oldest directly dated example of hatchets is a decorated bone hatchet from Hidra on the south Norwegian coast (9850 cal. BP) (Nymoen and Skar 2011).This type of artefact is rarely found in settlement deposits, but more often as stray finds in association with water, potentially as part of ritual activity (Glørstad 1999, 2010, p. 231). The chaine operatoire of producing such hatchets have a counterpart in the Post-Swiderian axe and club inventory (Oshibkina 1997, Zhilin 2006, Hartz *et al.* 2010, Anttiroiko 2015).

Several authors have underlined a beginning regionalization and regional belonging as well as a diversification of foraging strategies as an accelerating process from the late Early Mesolithic and into the Middle Mesolithic (Damlien 2016, Nyland 2016, Skar and Breivik 2017, Boethius 2018, Mansrud and Persson 2018, Nilsson *et al.* 2018). The Scandinavian settlement record displays a variety of site types and documents exploration of both the coast and the inland. A common denominator is, however, resource exploitation taking its point of departure in repeated returns to base localities along the coast displaying particularly stable and favorable sources of food. While semi-long distance resources for example in the inland, reachable along watersystems, provide periodic supplement and raw materials like skin, antler and bone (Mansrud and Persson 2018, Mjærum 2018). The growing record of semi-subterranean and larger dwelling structures indicates settlement of longer duration and intensity, as does the finding of potential assembly sites (Fretheim 2017, Gjerde and Skandfer 2018). This all ads to the picture of emerging regional belonging and a beginning semi-sedentism, towards the end of the Middle Mesolithic.

The stone quarries have been interpreted as nodal points for social encounters and redistribution of raw material and axes, within quite clear social territories. The oldest in Norway are dated to approximately 10,000 cal. BP (Nyland 2016) While quarrying of raw material for cutting equipment can be dated back to the final stages of the Preboreal (at the latest 10,500 cal. BP) (Niemi 2015) at least in northern Norway. Quarrying from particular sources of quality raw material where it is easily accessible has a long tradition going back into the late Paleolithic in northern Europe. But on the Scandinavian peninsula this tradition starts during the Late Preboreal/Early Boreal period and can be seen in context with a potential population supplement and the introduction of a more regionally confined lifestyle (Nyland 2016).

The general trend is that the Middle Mesolithic society becomes more complex during this period and that influx of eastern inspired cultural traditions plays a part.

The input from aDNA and stable isotopes

The aDNA analysis (Günther *et al.* 2018) was based on deep sequencing of seven Scandinavian individuals directly dated between 9500 cal. BP and 6000 cal. BP from Norway and Sweden (Günther *et al.* 2018). The analysis draws its conclusions based on comparative studies of 36 complete mitochondrial genomes from European Mesolithic humans. The comparative sample comprises seven earlier published individuals from Sweden (Motala), Latvia, Spain, Luxembourg, Italy, Hungary, Georgia and Ukraine, France, Germany and Russia.

The analysis includes three Norwegian samples Hummervikholmen 1 and 2 from Søgne on the south coast and Steigen from Nordland in addition to four Swedish samples: three from Stora Förvar (SF9, SF11, SF12) and one from Stora Bjers (SBj) all on Gotland. The Hummervikholmen individuals derive from a submerged locality, a grave-site that was deposited on land prior to the Tapes transgressions. While the Steigen individual that has a 3000 year younger date derives from a cave-site. The three individuals from Stora Förvar were also found in a cave site, while the Stora Bjärs individual is from an open air site.

Stable carbon and nitrogen isotope data for the Scandinavian humans has been analyzed (Günther *et al.* 2018, S1). The Norwegian samples show values between –14.2‰ and–13.5‰ for δ 13C, og 18.2–20.5‰ for δ 15N. This indicates a very large intake of marine mammal protein both at Hummervikholmen and in Steigen. The isotope signatures are so high that they only compare to more recent populations living off almost 100% marine diets (Skar *et al.* 2016). The life history data from two of the Norwegian individuals (Hum 1 and Steigen) suggests that their diet has not changed significantly throughout their lifespan. (Günther *et al.* 2018, S1). The Stora Förvar samples have considerably lower values between –18.8‰ and –16.4‰ for δ 13C og 9.8–12.9‰ for δ 15N. The Nitrogen isotope values indicate a diet consisting of freshwater fish like pike and perch or possibly migrating seal (Günther *et al.* 2018, S1). This is not surprising considering that the individuals lived on Gotland during the Ancylus Lake stage.

The dates have been corrected for marine reservoir effect. At Hummervikholmen and Steigen where individuals lived from an almost 100% marine diet 380 +/-30 radiocarbon years have been subtracted from the 14C date, following Mangerud *et al.* (2006) (Günther *et al.* 2018). As Hummervikholmen is positioned on the Skagerak coast in southern Norway this is the absolute maximum correction, while for Steigen which is much further north this value is probably closer to the truth. There are nine radiocarbondates from five human skeletal elements from Hummervikholmen, the calibrated (95.4 probability) is approximately 9500–9300 cal. BP. For the Steigen individual there was only one radiocarbon date, with a 2Σ range of app. 6000–5800 cal BP. The Stora Förvar dates fall between a 2Σ range approximately 9000–8500 cal. BP having subtracted 300 year for freshwater reservoir effect (Apel *et al.* 2018).

A Principal component analysis (PCA) demonstrates that the contemporary Mesolithic hunter gatherers fall into markedly distinct groups; the Scandinavian hunter gatherers being a clear admixture of the two well-defined different Western and Eastern hunter-gatherer groups. The results from the DNA analysis thus indicate that Fennoscandia was colonized from two definite groups and from two directions before 9500 cal. BP. One group from the south that is related to the West-European Hunter gatherers (WHG) and one group from the East, related to the Eastern European hunter-gatherers (EHG), the admixture (SHG) originating in Scandinavia. What may surprise us is that hunter-gatherers from Southern Norway are genetically more like the EHG compared to the central and east Scandinavian contemporary hunter-gatherers–these showing a larger genetic similarity with the western hunter-gatherers (WHG). The results from analyzing human DNA from chewed birch bark pitch mastics representing three different individuals from the deep pit trench at Huseby Klev (Kashuba *et al.* 2019), further underlines this pattern.

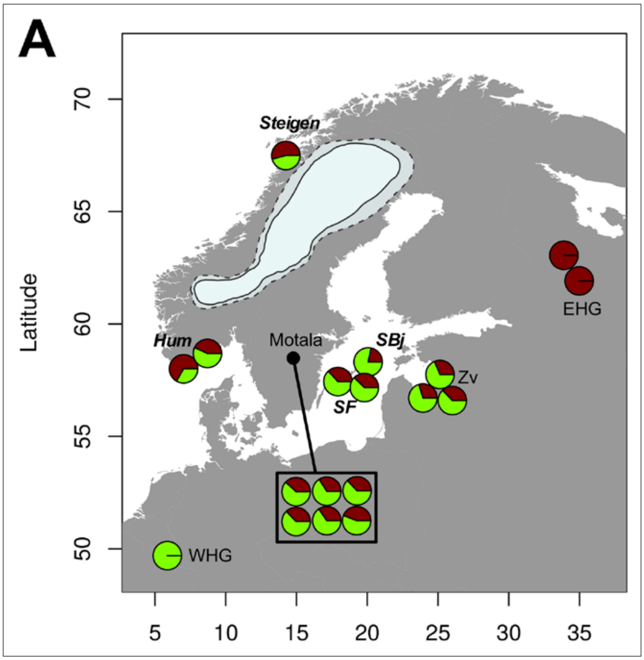

Figure 2: *Mesolithic samples and their genetic affinities. (A) Map of the Mesolithic European samples used in the genetic study. The pie charts show the model-based estimates of genetic ancestry for each SHG individual. The map also displays the ice sheet covering Scandinavia 10,000 cal BP (most credible [solid line] and maximum extend [dashed line] following Hughes et al. 2016). The sequenced individuals are shown with bold and italic site names. (B) Magnified section of genetic similarity among ancient and modern day individuals using PCA, featuring only the Mesolithic European samples. Symbols representing the sequenced individuals have a black contour line. (C) Allele sharing between the SHGs, Latvian Mesolithic hunter-gatherers (Zv), and EHGs versus WHGs. Data shown in this figure can be found in Günther et al. 2018: S1 data. EHG, eastern hunter-gatherer; SHG, Scandinavian hunter-gatherer; WHG, western hunter-gatherer; Zv, Latvian Mesolithic hunter-gatherer from Zvejnieki. Re-printed with permission from © 2018 Günther et al.*

Admittedly the sample is small, but getting a so-called representative sample of human remains from the Middle Mesolithic of Scandinavia is unlikely to ever occur.The above mentioned success in extracting human DNA from chewed mastics is, however, a promising future line of investigation, as mastics when recognized at Mesolithic sites, does preserve better than bone. The presence of the particular admixture found at Hummervikholmen to be repeated 3000 years later in Steigen, is an indication of continued influx of EHG into Middle Scandinavia over a long time. The stable isotope signatures in the Steigen individual is a strong indication of the specialized maritime adaption persisting at least as one of several into the Late Mesolithic.

If we combine climatic modelling, material culture analysis, radiocarbon dates, isotope analysis and genetic results it becomes clear that post-glacial colonization of Scandinavia is complex. The DNA results collaborate the chaîne opératoire analysis of blade technology and give us an indication that migration is an important aspect of the spread of technological innovations during the Middle Mesolithic.

The above analysis leads to a hypothesis on migrations scenarios during the early post-glacial (Günther *et al.* 2018, fig. 2). The scenarios are based on a combination of studies of lithic technology with the output from the genetic analysis.

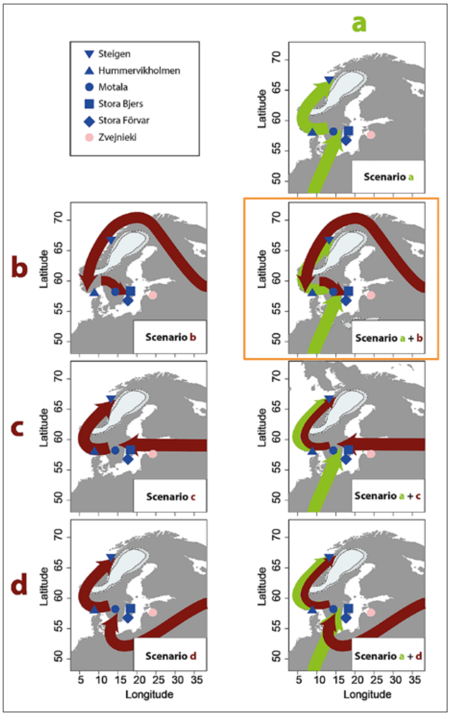

Figure 3: *Migration scenarios into postglacial Scandinavia. Maps showing potential migration routes into Scandinavia. Scenario (a) shows a migration related to the Ahrensburgian tradition from the south. Scenarios (b), (c), and (d) show different possible routes into Scandinavia for the EHG ancestry. The scenarios are discussed in the text and the scenario most consistent with genetic data and lithic technological introduction is a combination of routes (a) and (b). EHG, eastern hunter-gatherer. Re-printed with permission from © 2018 Günther et al.*

As there has been documented no Eastern hunter gatherers ancestry (EHG) in central and western Europe, it is assumed that the Ahrensburgians would have been of Western hunter gatherer ancestry (WHG). Scenario a) illustrates the entry of this population from northern Germany and through Denmark during the early Holocene. The entry of the EHG into Scandinavia has three possible scenarios b, c and/or d. Combining lithic technological studies with outcomes of the DNA studies warrants that the EHG migration took place after the WHG migration, as the earliest eastern-associated pressure blade finds postdate the southwestern-associated direct percussion finds in Scandinavia. Two migrations with admixture at different time-periods would generate a genetic gradient with the highest contribution of a source close to its geographic region of entry. The article thus states that the observed genetic pattern is consistent with a migration of the EHGs from the northeast moving southwards along the ice-free Norwegian Atlantic coast where the two groups started mixing (scenarios a and b). This would cause more EHG ancestry in western SHGs which is closer to the point of entry than the analyzed individuals from Gotland. The individuals sequenced here postdate these migrations, but a genetic eastwest gradient would be maintained over time in Scandinavia and only additional large-scale migrations from different sources would alter this pattern. This observation is important as the geographic pattern still holds with the results of analysis from Huseby Klev, thus indicating an influx of admixed people moving between todays Norway and central and western Sweden, as originally suggested by Sørensen *et al.* 2013. The inhabitants of Huseby Klev may, however, also be the result of a second migration wave entering directly into western Sweden from the East. The technologies of western Sweden and southern Norway are interchangeable during this period, which signals a high degree of mobility and networks among people. The chronologically much younger Steigen individual, may represent local continuity or most likely continued influx into northwestern Scandinavia from the east (Günther *et al.* 2018).

Discussion and conclusion

Considering the suggested scenarios of migration from the DNA studies one can question if it is in line with the structure of band organized Mesolithic societies to generate population movements on a very large scale. Alternatively, such movements would rather be at question of gradually taking new and recently opened territories into possession and admixture taking place as a result of cultural contact, while technology and adaptation strategies would have developed through transmission of knowledge. The cold event 10,300 cal. BP seems to have halted further expansion of Post-Swiderian groups following the northwestern colonization route until around 10,150 cal. BP, at this time the central Fennoscandian ice sheet is very reduced. After this setback, the colonization continues and perhaps along several routes of entry (Damlien *et al.* 2018). From the technological evidence this leads to a substitution of the old technology in southern Norway, while this scenario is not entirely clear in other parts of the country, for example recent studies in Central Norway rather indicate contemporaneous use of both direct percussion and CCPBC on the same sites (Holen 2018). This narrative of culture mix will most likely always be vague and transmission of knowledge between groups may well have taken different shapes depending on the amount and character of contact. The question is to which degree these forager societies were resilient to the very dynamic nature grid conditions. We are lacking a detailed understanding of the contemporary push and pull factors for the suggested exodus. While the pull factors may be related to the rich marine environments and utilizing newly opened inland resources, the push factors are ambiguous.

The DNA results supplement the narrative that can be told based on the lithic studies by demonstrating a clear admixture of the two groups, rather than a substitution of populations. It is also reasonable to assume that the specialized coastal adaptation, demonstrated in the Hummervikholmen individuals is part of a pioneer cognition that was shared as part of the communication between groups and individuals in the process of cultural exchange. In southern Norway there is, however, an apparent transformation in lithic tradition and thus in the hunting and fishing gear, illustrating knowledge transfer pertaining to lithic and bone technology. The introduction of rituals as expressed in the use of procession artifacts and ritual deposition of the dead could have been part of a Post-Swiderian cultural package, as these material culture elements are predated on Russian sites. These phenomena, however, take a variation of shapes in the transfer process. In combination with a gradually stronger belonging to particular landscapes as demonstrated in settlement structures and quarrying, ritualization also points towards a beginning social stratification of society. Providing the shoreline dating of the pronounced rock art tradition in northern Norway is correct, and there are no good reasons why they should not be, the tradition predates and survives the cultural transformation and the likely meetings between groups of independent cultural origin.

Analyzed together the records demonstrate a fascinating merge of cultural cognition that comes into being during the first 500–1000 years of the middle Mesolithic in Scandinavia. Further studies will help deepening the understanding of regional dissimilarities, networks and social processes during this period. While the record of Middle Mesolithic human individuals is fragmented, particularly the chaine operatoire studies of lithic material – the most abundant source of knowledge from these sites – has enabled a remarkably detailed understanding of demographic expansion in association with this until recently unacknowledged early Holocene migration. The records interpreted together quite clearly demonstrates that one can neither directly translate genetic populations into cultural groups, nor take technological changes to indicate entire population replacement.

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In this volume, 10 papers from the Stone Age Conference in Bergen 2017 are presented. They range thematically from the earliest pioneer phase in the Mesolithic to the Neolithic and Bronze Age in the high mountains. The papers discuss new research and methodological developments showing a diverse and dynamic Stone Age research community in Norway.

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