

## **New Perspectives on Old Shores: Current Approaches to the Mesolithic in South-Eastern Norway and their Potential**

### *Nouvelles perspectives sur d'anciens rivages : les approches actuelles du Mésolithique du sud-est de la Norvège et leur potentiel*

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**Abstract:** Research on coastal societies in Mesolithic south-eastern Norway (9300-3900 cal. BC) has increased significantly in recent years, against the backdrop of a much larger, more substantial and constantly growing source material over the last two decades, but also through the adoption of different theoretical frameworks and methodological tools. Thus, various new insights into Mesolithic coastal living have been gathered. However, the diversity in theoretical and methodological approaches has received rather little theoretical reflection concerning the aims and potential of these various ways of dealing with the archaeological material. This article presents and discusses a number of current approaches on human relations with the shore in the Mesolithic in south-eastern Norway. It reflects on differences and similarities with respect to underlying concepts, theory, and methodology within these approaches. We ask which aspects of our topic do the different approaches actually shed light on, and whether the approaches are compatible. By comparing these approaches this article aims at clarifying the investigatory breadth present, but also at highlighting challenges and limitations pertaining to individual analytical perspectives. This can contribute a better understanding of hunter-gatherer lifeways on the Mesolithic coast, potentially through a combination of approaches that have so far been applied separately. We will focus on five thematic areas and on the potential for combining them: population dynamics and radiocarbon dates, settlement patterns and site location, adaptation and choice of place, moving and dwelling, and technology as tradition.

**Keywords:** Coastal society, Mesolithic, hunter-gatherers, south-east Norway, theoretical framework, methodology, population dynamics, site location, choice of place, movement, technology.

**Résumé :** La recherche sur les sociétés côtières mésolithiques (9300-3900 av. J.-C.) du sud-est de la Norvège s'est considérablement développée ces dernières années, grâce à un matériel archéologique toujours plus important, plus substantiel et en constante augmentation au cours des deux dernières décennies. L'adoption de différents cadres théoriques et outils méthodologiques a éclairé sous différents angles la vie côtière mésolithique. Cependant, ces diverses approches théoriques et méthodologiques n'ont pas été accompagnées d'une réflexion sur les objectifs et sur le potentiel de ces différentes manières de traiter l'information archéologique et de l'interpréter. Cet article présente et discute un certain nombre d'approches actuelles portant sur les relations qu'ont entretenues les sociétés humaines avec le littoral durant le Mésolithique dans le sud-est de la Norvège. Il réfléchit aux différences et aux similitudes en ce qui concerne les concepts sous-jacents, la théorie et la méthodologie des recherches récentes dans ce domaine. Quels sont les différents aspects mis en lumière ? Comment les différentes manières d'aborder ces relations peuvent-elles s'enrichir mutuellement ? En comparant ces approches, le présent article souligne l'ampleur des investigations archéologiques menées actuellement, en insistant également sur les défis et les limites des perspectives analytiques individuelles. Ce travail souhaite contribuer à une meilleure compréhension des modes

de vie des chasseurs-cueilleurs mésolithiques sur la côte, en recommandant une combinaison d'approches qui, jusqu'à présent, ont été mises en œuvre séparément. Nous nous concentrerons sur cinq domaines thématiques et sur le potentiel de leur combinaison : la dynamique de la population et les dates radiocarbone, les modèles de peuplement et la localisation des sites, l'adaptation et le choix du lieu, le déplacement et l'habitation, et enfin la technologie comme tradition.

**Mots-clés :** société côtière, Mésolithique, chasseurs-cueilleurs, sud-est de la Norvège, cadre théorique, méthodologie, dynamique de population, emplacement du site, choix du lieu, mouvement, technologie.

## INTRODUCTION AND AIM

Research on Mesolithic coastal societies in south-eastern Norway has increased significantly in recent years, activating the constantly growing amount of archaeological material brought forth by extensive development-led excavation. Hence, our knowledge of the Mesolithic period (9300-3900 cal. BC) in this area has increased dramatically. We have to deal not only with a much larger, more substantial, and constantly growing amount of source material compared with only two decades ago but, through the adoption of different theoretical frameworks and an increasing range of applied methods, a variety of different perspectives now being leveraged in the study of this material. This variety of approaches being published side by side surely mirrors the diversity that is characteristic of present-day archaeological practice, with a post-positivistic understanding that many perspectives can contribute in a valuable way to the understanding of the whole. It is striking, though, that this recent period of gathering new insights, especially related to the application of a number of theoretical and methodological approaches, has received rather little attention in terms of theoretical reflection on the aims and the potential of these various different ways of dealing with what is often the same archaeological material.

To gain a better awareness of the variety of existing approaches, we<sup>[1]</sup> will present and analyse a number of studies on human relations with the shore in the Mesolithic of south-eastern Norway, including coastal settlement, the wider use of coastal landscapes and social organisation and networks in coastal areas. We will reflect on differences and similarities with respect to underlying concepts, theory and methodology within these approaches. We will examine which aspects of our topic the different approaches actually shed light on. We will also ask to what degree these approaches might be compatible. A comparative dissection of these approaches can help to clarify the investigatory breadth present in the literature, while also highlighting challenges and limitations pertaining to individual analytical perspectives. This will in turn facilitate ways of better understanding hunter-gatherer lifeways on the Mesolithic coast, potentially through a combination of approaches that have so far been applied separately.

We chose five thematic areas that each of the present authors have worked on in recent years: population

dynamics and radiocarbon dates, settlement patterns and site location, adaptation and choice of place, moving and dwelling, and technology as tradition. These do not necessarily cover the full spectrum of concepts applied on our topic. To compensate for this bias, we will frame each approach by providing a short overview of the current discussion, allowing the reader to assess the broader context of the research.

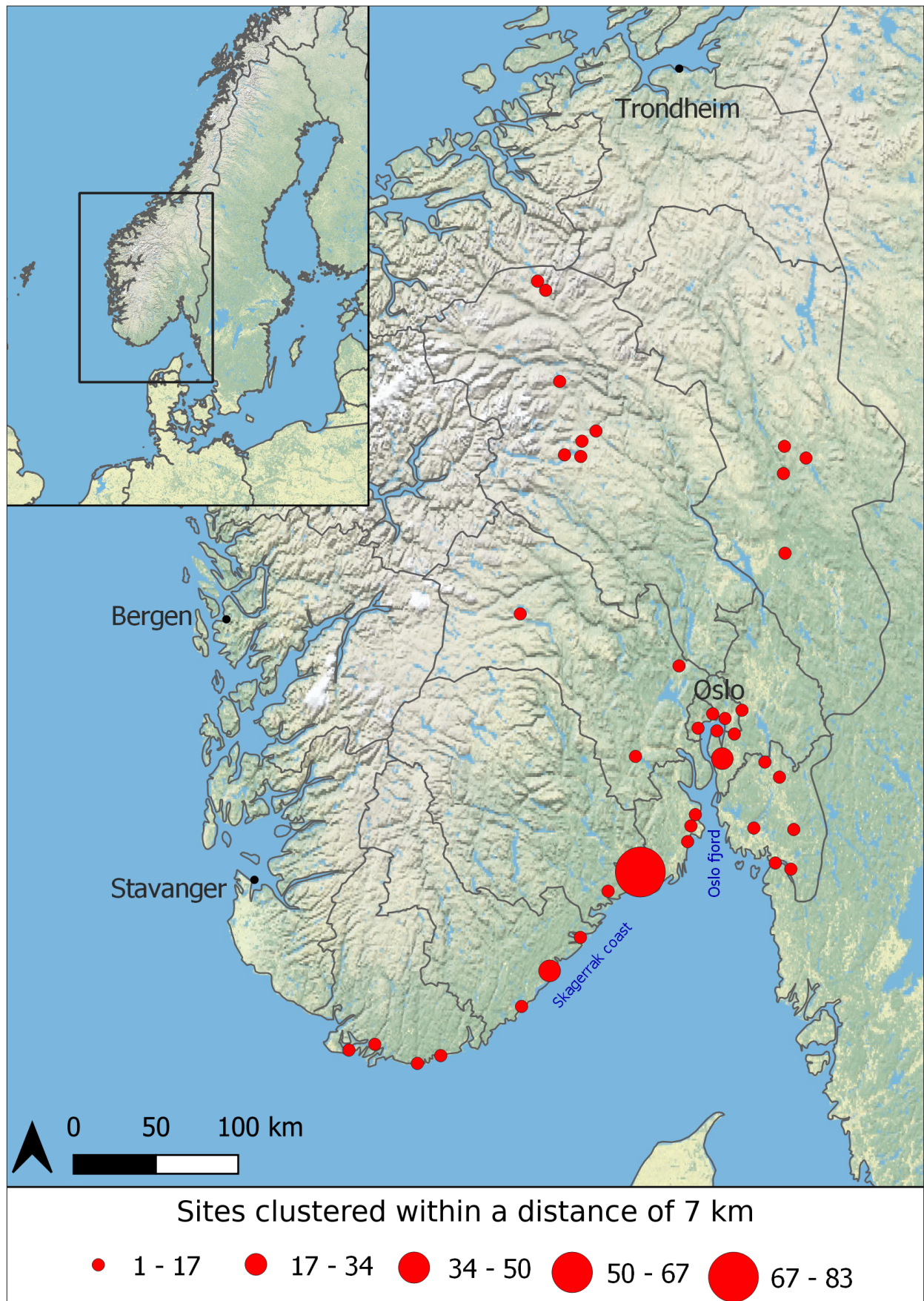
Due to the nature of the archaeological material, mainly lithic artefacts, and the way it is discovered through survey and excavation, all of the approaches presented here study the coastal zone in the Mesolithic period on the basis of the analytical unit of 'the site'. We will, therefore, especially ask how, through which theories, terms, concepts and methods, we have investigated sites to study living in coastal areas in the Mesolithic. We will also explore on which scales we have approached the Mesolithic people behind this work, in terms of e.g. society, groups, communities, populations or individuals, and how the various perspectives in the different studies can contribute to the discussion of hunter-fisher-gatherer social life in a more holistic way.

## 1. BACKGROUND: COASTAL TOPOGRAPHY AND ARCHAEOLOGICAL EVIDENCE

South-eastern Norway has a coastline thousands of kilometres in length, from the Skagerrak coast in the south-west to the Oslo fjord in the north. The modern topographic appearance of the coastal areas is a result of complicated geological processes. Since the last Ice Age, processes of land-uplift connected to isostatic rebound have led to a growth of landmasses throughout the region, especially along the Oslo fjord. Consequently, large parts of the Stone Age shorelines and coastal sites are today found in the wooded hinterland (for details see Berg-Hansen et al., this volume<sup>[2]</sup>).

Around 10 400 Stone Age sites are known and documented in the national database of archaeological sites and monuments. Over the last 15 years, the Museum of Cultural History (MCH) has excavated c. 450 of these sites (Damlien et al., 2021).

A large number of excavations have been conducted in former coastal areas, which is where most modern development is taking place (fig. 1); in historic times and up to today these are also the most densely popu-



**Fig. 1** – South-eastern Norway. The locations of the c. 450 Mesolithic sites excavated in the period 2000–2017 are marked with red dots (archaeological data in Damlien et al., 2021; map I. Roalkvam).

**Fig. 1** – Sud-est de la Norvège. Les emplacements des quelque 450 sites mésolithiques fouillés au cours de la période 2000-2017 sont marqués de points rouges (données archéologiques dans Damlien et al., 2021 ; carte : I. Roalkvam).



lated areas in the region. Most of the excavated Mesolithic sites are interpreted as shore-bound or situated close to the contemporary shoreline during their time of use in the Mesolithic. Combined with the specific geological processes in the Oslo fjord region, this archaeological evidence provides unique opportunities to study long-term development in Mesolithic coastal settlement.

Four concepts closely connected to the specific geological development with constant land uplift have heavily influenced the archaeological picture and thus archaeological studies of Stone Age coastal societies in south-eastern Norway (for more details see Berg-Hansen et al., this volume):

- a) a specific perception of ‘the coast’ which is very much focused on the shoreline;
- b) a specific understanding of a ‘site’ representing a delimited and mainly shore-based settlement;
- c) the so-called shoreline model for dating;
- d) surveying practices with focus on identifying Stone Age coastal sites, as a result of a), b) and c).

Thus, the archaeological picture of Mesolithic sites clustering along the contemporaneous shoreline is reinforced through modern development in these former coastal areas. While it is evident that the coast was the main living arena of hunter-gatherers in the region, the use of the land beyond the coast was presumed in earlier works with ecological perspectives (Mikkelsen, 1977 and 1989; Lindblom, 1984). Also, the mountain areas and the large waterways leading into the mountains were recognised as part of hunter-gatherers’ territories (e.g. Boaz, 1998; Damlien and Solheim, 2018; Mjærum and Mansrud, 2020).

A recent review of the known the Stone Age sites in the region (Damlien et al., 2021) shows that most of the sites consist of lithic scatters, sometimes with structures (mostly hearths), and, more seldomly, sunken floors of huts or remnants of possible tent rings; so far, we know of only one burial. Some deposits (caches) are known. Rock art and stone quarries occur and mark fixed rock outcrops in the landscape. Unlike many other northern European coastal areas, larger human-made shell middens, which usually have good preservation conditions for organic material, are uncommon. Generally, due to the acid soils in the coniferous wood landscapes, relatively little organic material is preserved. This hampers broader studies of human-environment interaction. The limited bone material that has been unearthed in the region is mostly burnt, often coming from sites with sandy/gravelly soils.

Research has activated the archaeological material from the region in novel ways in recent years. Amongst these are the marine orientation of Stone Age settlement and society, with the use of the sea and the coast as a varied biotope, adaptation to climate, diachronic population dynamics, lithic technology, social organisation and perception of surroundings.

## 2. APPROACHES TO MESOLITHIC HUNTER-GATHERER LIVING IN THE OSLO FJORD REGION, SOUTH-EASTERN NORWAY

### 2.1. Preliminary remarks: From sites to social life

The five approaches to be discussed, and which we authors have worked on respectively (see sections 2.2. to 2.4.), explore Mesolithic hunter-gatherer living in the coastal areas of the Oslo Fjord. The theories or models of Mesolithic worlds behind these approaches are different, depending on the particular research problems. Thus, they activate the archaeological sources – often even the same ones – from different theoretical and methodological angles, applying different analytic scales and, thus, extracting different data, from large- to small-scale analysis and from long- to short-term perspectives.

As mentioned above, the analytical entry point to the archaeological material is usually via ‘the site’. The site is first of all a modern archaeological unit that denotes a place at which archaeological material (artefacts, structures, ecofacts, etc.) has been found and which is registered with a name and/or number and delimited within a defined area (see Berg-Hansen et al., this volume). In Stone Age studies such sites are often equated with e.g. Mesolithic ‘settlements’. However, a site can be composed of diverse traces of human activity, which do not necessarily have to be related to settlement in the literal sense of the word. Through the long-term/repeated use of the same places, for example, material remains of quite different activities might have accumulated over hundreds of years at a site (Solheim, 2013; Schülke, 2020).

Our different approaches study these sites or aspects of them by comparing the presence and/or absence of specific material traits, interconnecting them in time and space and thus detecting continuities and changes. This is done either – from a more distant perspective – in terms of material structures and their function, or – from a more experiential perspective – regarding the lived life embedded in them.

In some of our approaches (see below), the mass material of sites and their finds, such as lithic artefacts or radiocarbon dates, is used to conduct statistical analysis. Quantification is used to standardise variables, which can facilitate synthesis and allows comparisons across a large number of cases, by maintaining analytical structure. In other approaches, the encounter between humans and their surroundings is the focus, exploring topics such as social exchange, experience and perception of the animate and inanimate world.

Furthermore, the contexts or environments of these sites are integrated differently in the studies, with, for example, emphasis on the contemporary shoreline (Roalkvam, 2020; Solheim, 2020), on adaption strategies in a regressing shoreline (Mjærum, 2022), or on approaches to social space including hinterland surroundings (Schülke, 2020). Comparative approaches to cultural transmission



of technological tradition, e.g. regarding stone technology, can form the basis for theories on (coastal) mobility and social density (i.e. social closeness or distance; Berg-Hansen, 2017 and 2018).

Finally, the approaches use different terms to denominate the humans whose traces we study through the sites, such as population, group, community or society, and thus – consciously or unconsciously impart different concepts and perceptions of Mesolithic social life.

## 2.2. Studying population dynamics based on radiocarbon dates

In Norway, as elsewhere, radiocarbon dates are increasingly used as an exploratory tool to investigate change over time among foraging and farming societies (Kelly et al., 2013; Jørgensen, 2018; Arroyo-Kalin and Riris, 2021; Nielsen, 2021; Timpson et al., 2021). The method provides good opportunities to address questions of temporal change in human activity, but the use of radiocarbon dates is not without its drawbacks and there are several challenges to the “dates as data” approach (e.g. Rick, 1987; Williams, 2012; Carleton and Groucutt, 2020). The different methodological pitfalls have been addressed and the method is constantly being developed and improved (e.g. Crema and Shoda, 2021; Timpson et al., 2021; Crema, 2022). Important methodological concerns such as sample size, taphonomic loss, and the combination of sampling error and systematic measurement errors due to calibration or eyeballing of data are discussed elsewhere (e.g. Timpson et al., 2014; Carleton and Groucutt, 2020; Crema, 2022) and will not be addressed here.

An aspect that needs consideration is the premise of using dates as data to infer population dynamics. Originally, J. W. Rick (1987) proposed that the amount of waste that people left behind in a certain area at a certain time corresponds to the number of people. As pointed out by J. Freeman and colleagues (2018), we cannot assume that this is a direct and straightforward relationship. These authors instead propose that radiocarbon dates and the amount of available dateable material reflect variations in energy consumption in a given society at a given time. Importantly, and as discussed by M. Tallavaara and E. K. Jørgensen (2021), the summed radiocarbon probability distributions (SPDs) reflect long-term mean population dynamics and cannot account for short-time fluctuations in population size.

Parallel to the increase in number of excavated sites in south-eastern Norway, the amount of available radiocarbon dates has grown considerably since the early 2000s. Radiocarbon dates are now increasingly used to study long-term processes, e.g. population variation and cultural historical development, rather than just dating events (Jørgensen, 2018; Nielsen et al., 2019; Bergsvik et al., 2021). To date, only a few studies have used SPDs to investigate long-term population variation among Mesolithic marine foragers of south-eastern Norway (Solheim and Persson, 2018; Solheim, 2020; Nielsen, 2021). While

S. V. Nielsen’s paper aims to address migration of foragers into south-eastern Norway in the Late Mesolithic by studying population growth rates, S. Solheim and P. Persson’s studies (2018) set out to investigate variations in population dynamics in the Oslo Fjord region by comparing the radiocarbon data with other proxies, such as site counts (Solheim and Persson 2018; Solheim, 2020).

An adjusted SPD based on S. Solheim’s (2020) study of Mesolithic sites from the coastal region, is shown in figure 2. The SPD consists of 589 dates grouped in 150-year bins at site level fitted to a null model of exponential growth. The SPD demonstrates a long-term growth throughout the Mesolithic disrupted by shorter periods of growth and decline (fig. 2). No severe population crashes are identified. This leads to the conclusion that the population was relatively stable in the Mesolithic on the longer time scale. A possible explanation for this relative stability in population dynamics is an adaptation to the coastal region and continual access to abundant and varied resources (Fossum, 2020; Mjærum and Mansrud, 2020).

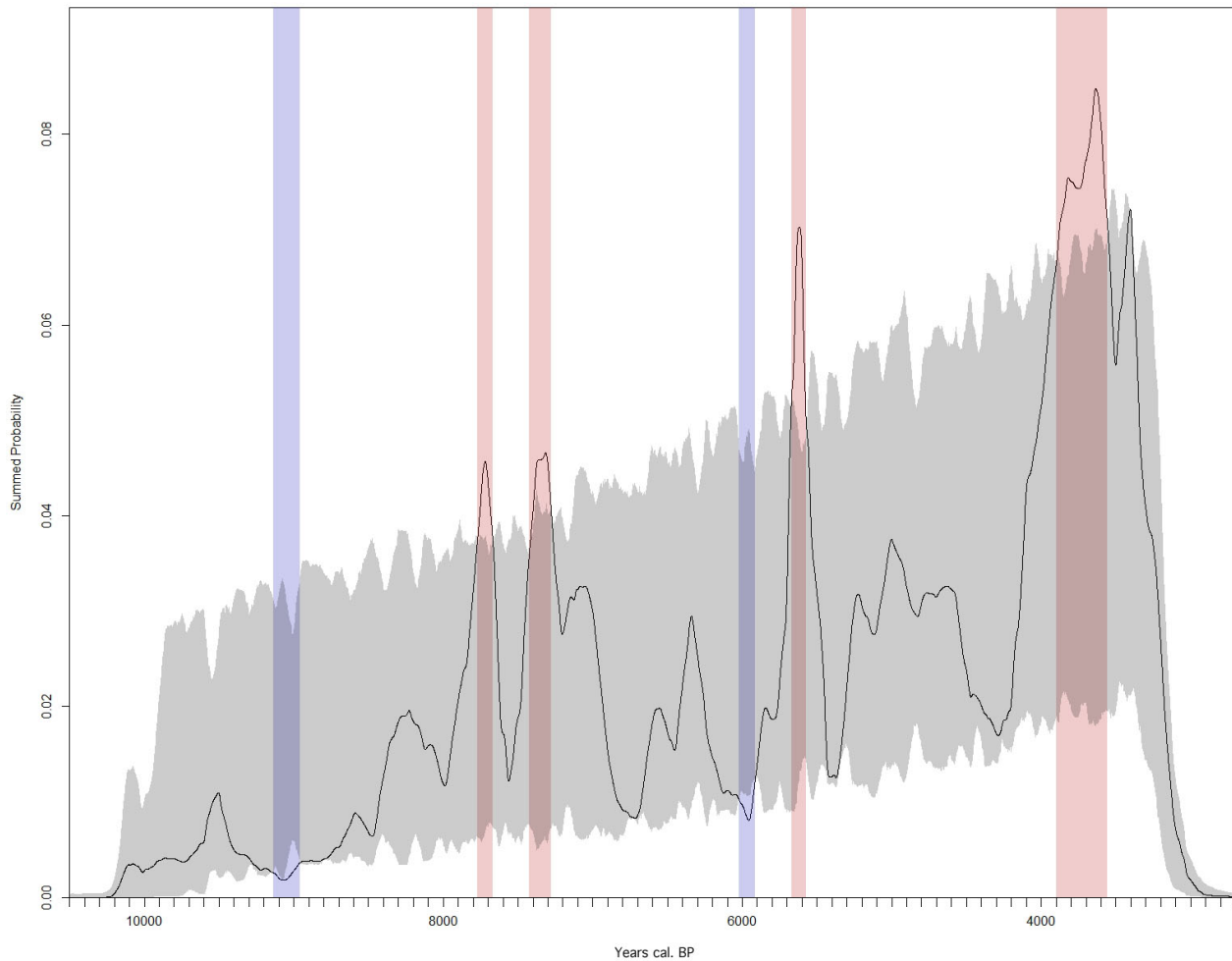
## 2.3. Settlement, choice of place and mobility in coastal areas

Three of the approaches deal in rather different ways with topics regarding human settlement in and inhabitation of coastal environments and hunter-gatherer mobility.

### 2.3.1. Settlement patterns and site location

M. Lake and P. E. Woodman (2003) proposed a tripartite division for the classification of visibility studies in archaeology, categorising them as either informal, statistical or humanistic. This framework offers a useful point of departure for the characterisation of inferential frameworks adopted by studies of settlement patterns and site location in Mesolithic Norway.

Informal inferences pertain to approaches that are not nested in an explicit and comprehensive theoretical or methodological framework. This type of approach has certainly dominated the study of settlement patterns in Norwegian Mesolithic archaeology. These studies have focused on the location of sites relative to geographic factors such as distance to fresh-water, natural harbours or resource patches, the degree of drainage or slope on the site locations, how sheltered these locations are with respect to wind and waves, to what degree they offer commanding views over the surrounding landscape, and whether they are oriented to receive sunlight throughout the day (e.g. Bjerck, 1989; Mikkelsen, 1989; Indrelied, 1994). However, little consideration is typically given to what variables are considered, discarded, found not to be relevant, or precisely where the suggested behavioural relevance of these variables stems from. Instead, their importance appears to be based on an underlying notion of universal relevance to hunter-gatherers and their economic basis (see Berg-Hansen, 2009, p. 37-66). While recent investigations often involve more sophis-



**Fig. 2** – Summed probability distribution (SPD) of 589 dates from 167 Mesolithic sites in the coastal region of south-eastern Norway (dates = 589, sites = 167, bins = 172, simulations = 1000, p-value = 0.02398). Model produced using Rcarbon in Rstudio (Crema and Bevan, 2020). The blue bars demonstrate the negative deviations of the empirical SPD from the growth model, while the red bars show the positive deviations of the empirical SPD from the growth model. These indicate population decline or growth, respectively, within the marked time periods (years cal. BC; graph S. Solheim).

**Fig. 2** – Distribution la somme des probabilités (SPD) de 589 dates provenant de 167 sites mésolithiques de la région côtière du sud-est de la Norvège (dates = 589, sites = 167, bins = 172, simulations = 1000, valeur  $p = 0.02398$ ). Modèle produit à l'aide de Rcarbon dans Rstudio (Crema et Bevan, 2020). Les barres bleues montrent les écarts négatifs du SPD empirique par rapport au modèle de croissance, tandis que les barres rouges montrent les écarts positifs du SPD empirique par rapport au modèle de croissance. Cela indique un déclin ou une croissance de la population au cours des périodes marquées (années cal. BC; graphique S. Solheim).

ticated treatment of the locational factors of interest (e.g. Nyland, 2012a; Breivik, 2014; Darmark et al., 2018; Fossum, 2020, p. 192), their underlying inferential frameworks tend to follow the same logic. In consequence, the issue one might take with these studies is that they offer no comprehensive theoretical justification for what variables were chosen – and by extension not chosen – nor a statistical evaluation of the significance of any detected patterns. Even if most sites in an area are located on islands, are southward facing, or are sheltered from winds, contending that this was of importance to past inhabitants arguably requires an additional step. This can be a statistical assessment to evaluate whether the observed patterns are likely the result of inhabitants actively choosing site locations relative to these variables, as opposed to simply a passive reflection of the landscape. Alternatively, and depending in part on one's

disciplinary convictions, this can be achieved by means of a theoretical justification as to why these factors might have been of importance, even irrespective of any statistical tendencies. The relevance of the considered variables might be immediately and logically appealing, but without further justification is ultimately commonsensical and informal.

Statistical inference frameworks have seen some use in the study of Mesolithic settlement patterns in Norway (e.g. Bergsvik, 1995; Blankholm, 2018; Roalkvam, 2020). They can be considered with reference to the above cases by asking what the probability would be of finding the same settlement characteristics if the analysed sites were randomly distributed in the same landscape instead. Answering this question would allow for a statistical evaluation of the likelihood that the considered variables shaped the location of the sites under study.

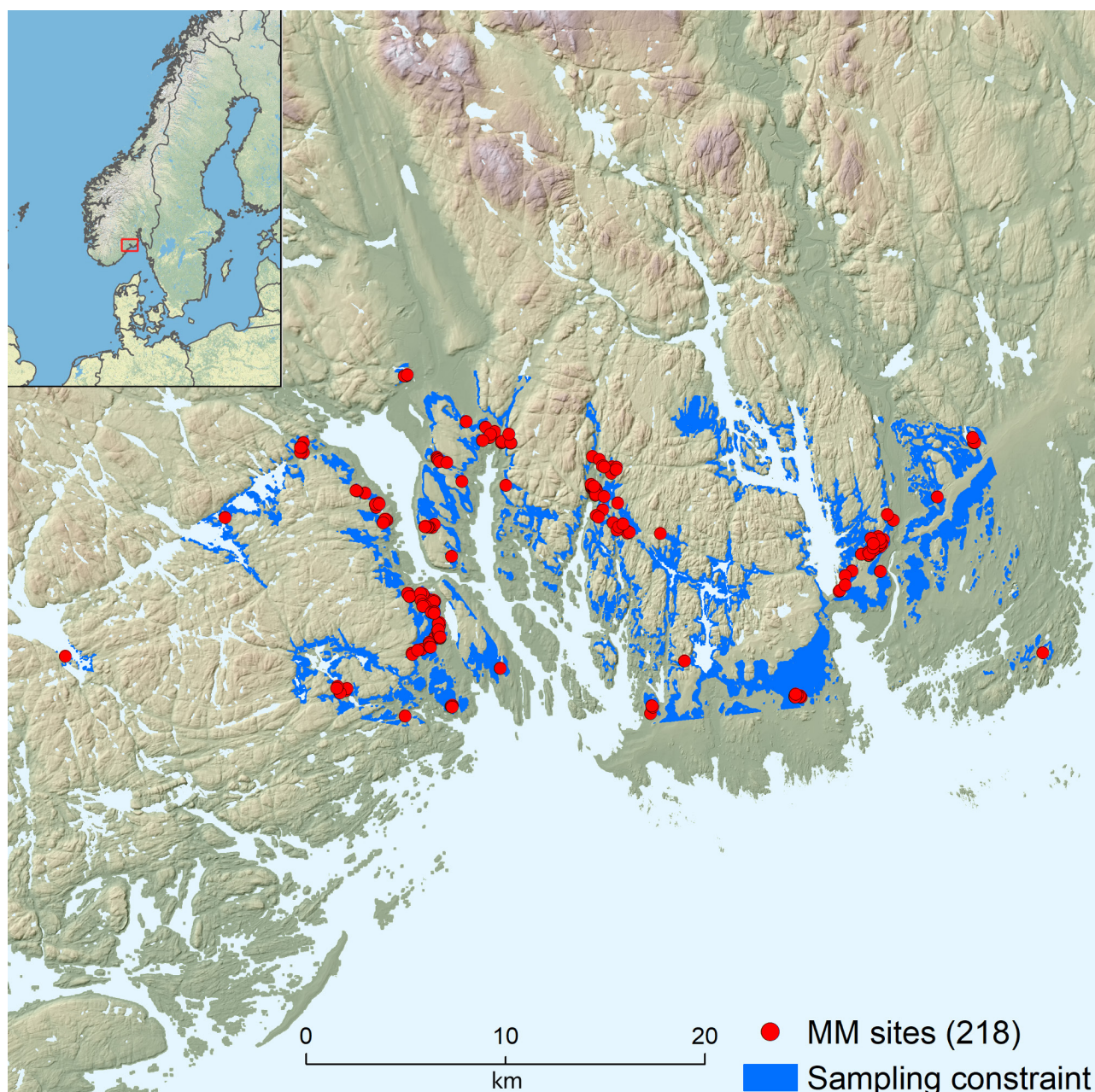


In the study conducted by I. Roalkvam (2020) concerning coastal settlement patterns in south-eastern Norway, this involved drawing a random sample of control points representing assumed non-sites in the landscape surrounding the 462 sites that were analysed (fig. 3).

These random control points were constrained to avoid extremely steep areas where one can reasonably assume that occupation was not desirable, and areas that would not have been located on the coast at the same time as the archaeological sites. The following variables were subsequently measured for both the sites and non-sites: visibility, wind fetch, degree of southward orientation, variability in the surrounding shoreline displacement,

whether they were situated on islands, the size of the islands, and finally the infiltration capacity of the sediments on which they were situated. The data were then statistically compared in an attempt to tell whether the site data could be separated from the random samples based on these variables. The findings indicate that an overview over immediate surroundings and shelter from larger expanses of open sea were the most important factors for choice of site location within the study area throughout the Mesolithic.

What sets studies such as this apart from those termed informal is that they employ a statistical framework to assess the relevance of any observed patterns by evaluat-



**Fig. 3** – Illustration of one of the sampling constraints from which 1000 random points were generated and compared with the location of a subset of 218 sites that were given a shoreline date falling within the Middle Mesolithic (map I. Roalkvam).

*Fig. 3* – Illustration de l'un des cadres d'échantillonnage à partir duquel 1 000 points aléatoires ont été générés et comparés à l'emplacement de 218 sites. La datation des sites a été estimée par le modèle de rivage au Mésolithique moyen (carte I. Roalkvam).



ing the degree to which these could be expected to have occurred by chance, given the characteristics of the surrounding landscape. This is especially pertinent for the study of coastal settlement patterns in Norway, where dramatic changes in the landscape due to sea-level change mean that not accounting for variation in the surrounding landscape makes it impossible to separate changes in settlement patterns due to natural processes from change due to active choices made by past inhabitants. However, the variables chosen for analysis in the statistical studies referenced here are arguably not given any comprehensive theoretical justification. One possible consequence of this could, therefore, be that the identified relevance of any given variable might in reality be caused by another, confounding, variable unless these are otherwise taken into account (e.g. Kohler and Parker, 1986, p. 415). One could for example envisage that an identified relevance of altitude for locational patterns might actually reflect a desire to situate sites relative to tree cover. In the study of I. Roalkvam (2020), for example, the apparent relevance of visibility for locational patterns might, in reality, be a reflection of a tendency to situate sites relative to natural harbours. Other limitations (see, for example, Kohler and Parker, 1986; Verhagen and Whitley, 2012) can arise from the dependency on quantification, which can lead to an over-representation of easily quantifiable environmental variables, as well as a dependency on adequate sample sizes to draw statistical inferences, which can result in an artificial aggregation of site data. While statistical approaches like this are not, therefore, without problems of their own, the framework does offer a clearer inferential framework that dictates when a result should be considered meaningful or not.

Humanistic analyses of settlement and habitation, which is to say studies that explicitly leverage a humanistically informed inferential strategy, are set apart from the studies mentioned so far in that the justification for how the material is approached is instead nested in an understanding of how humans interact with, respond to and/or perceive and assign meaning to the environments/surroundings that they inhabit, and how this in turn influences and is influenced by their interaction with and movement in these landscapes. The following two approaches can be assigned to this category.

### *2.3.2. Adaptation and choice of place in changing environments*

Present-day global warming has enormous consequences both for individuals and on a larger scale. However, environmental changes also affected people's everyday lives in the past. In a new study, contemporary adaptation strategies to shore level changes were applied to gain a better understanding of Mesolithic coastal adaptation, both on a site level and on a regional scale (Mjærum, 2022). The author of this study discusses four main adaptation strategies to such changes; to accommodate, relocate, protect or not respond to the changing environment (Diaz, 2016; Oppenheimer et al., 2019; here: fig. 4a).

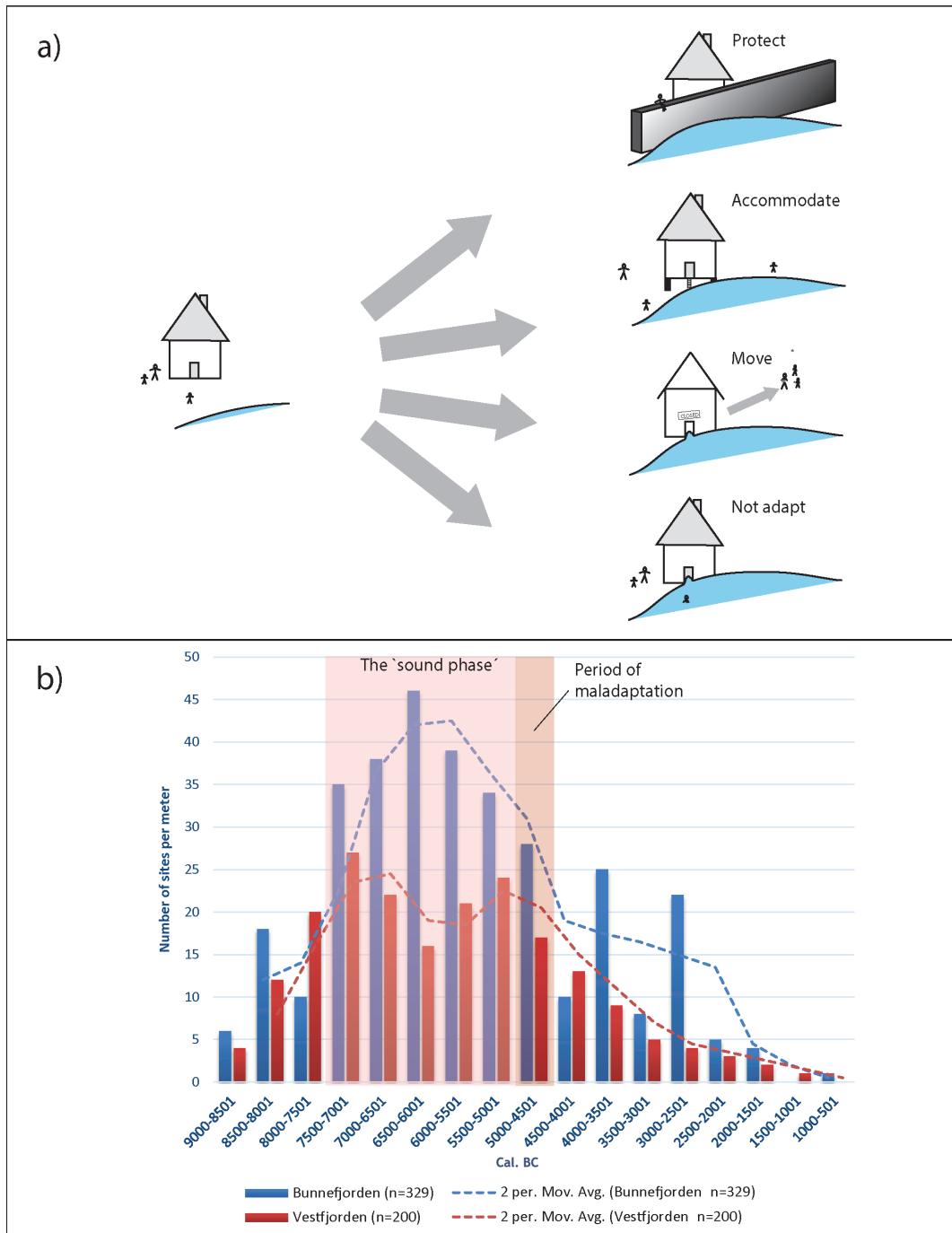
Over a period of 2500 years (c. 7500-5000 cal. BC), a bountiful system of straits existed in the inner Oslo Fjord area. The large and intensively used settlement area of Havsjødalen was centrally positioned in this fjord system. Extensive excavations in 2015 offered an opportunity to gain detailed information on the correlation between radiocarbon dated and typologically dated sites, shore level displacements and local landscape changes (Mjærum, 2022). Supported by studies in other parts of the region (e.g. Breivik et al., 2018; Fossum, 2020; Solheim, 2020), it is argued that some settlements were systematically adapted by moving the activity to lower terrain, in line with the regressing shores. In most other cases, activity was relocated when the distance to the shores increased. This result confirms the widespread assumption that a large part of the settlements were in fact closely linked to former seashores and that, consequently, many of them can be precisely dated based on shore level displacement curves and their height above present sea level (see however Berg-Hansen et al., this volume, for a discussion of the approach).

The latter study also discusses adaption strategies on a regional scale, related to environmental changes in the course of the closing of a sound due to land-upheaval processes. Based on the conclusion that shore level datings are relatively precise in most cases, 529 sites positioned between 195 and 18 m above present sea level were included in a study of regional developments before, during and after the 'sound phase' in the inner Oslo Fjord (fig. 4b). These site counts point towards a significant increase in the number of sites in the 'sound phase', and consequently a larger population (Manninen et al., 2018; Solheim and Persson, 2018; Fossum, 2020; Jørgensen et al., 2020). However, when sea level changes closed the fjord system around 5000 cal. BC, an ecological crisis occurred. The society does not seem to have responded adequately. Instead of decreasing activity in the area, site counts strongly indicate that a main part of the population chose to stay. The subsequent sharp drop in the number of sites is interpreted as a direct consequence of hundreds of years of maladaptation, which resulted in a regional population collapse (fig. 4b).

The region's population dynamics reveal some of the larger-scale problems that can occur when societies face environmental crises that demand great societal changes. In such a way, the situation is similar to what humanity faces today: humans adapt well on a small scale but struggle to take action when they meet environmental crises of large proportions.

### *2.3.3. Moving and dwelling in landscapes*

How Mesolithic people who lived in the coastal zone might have dwelled in, moved in and perceived their surroundings is the subject of a number of recent studies on the region. These explore human encounters and experience, including the physical, social and mental. They understand prehistoric humans as embedded in a world with a social and cosmological dimension, including



**Fig. 4 – a)** In general, people choose one or more of four strategies when they adapt to changing sea levels: they protect, they accommodate, they leave the area, or they continue their activities without any form of adaptation. **b)** The bar chart displays the number of sites in Bunnefjorden and the nearby Vestfjorden (both parts of the inner Oslo fjord) before, during and after the 'sound phase', distributed in 500-year intervals. Site counts show a significant increase in population during the time when the sound still was open (the 'sound phase'), followed by a period of maladaptation and population collapse after the sound was closed due to land upheaval. Vestfjorden went through less dramatic landscape changes during the Mesolithic, which probably explain the more stable population in this region. The dashed lines represent the changes in form of two period moving averages (2 per. Mov. Avg.; illustration and graph A. Mjærum).

**Fig. 4 – a)** En général lorsqu'ils s'adaptent à la modification du niveau de la mer, les individus choisissent une ou plusieurs des quatre stratégies suivantes : ils se protègent, ils s'adaptent, ils quittent la région ou ils poursuivent leurs activités sans aucune forme d'adaptation. **b)** Le diagramme à barres montre le nombre de sites dans le Bunnefjorden et dans le Vestfjorden voisin (deux parties du fjord intérieur d'Oslo) avant, pendant et après la « phase du détroit », distribué en intervalles de 500 ans. Le décompte des sites montre une augmentation significative de la population pendant la période où le détroit était encore ouvert (« phase du détroit »), suivie d'une période d'inadaptation, puis d'un effondrement de la population après la fermeture du détroit, en raison d'un rebond isostatique. Vestfjorden a connu des changements de paysage moins drastiques pendant le Mésolithique, ce qui explique probablement la population plus stable dans cette région. Les lignes pointillées présentent les évolutions sous forme de moyennes mobiles sur deux périodes (2 per. Mov. Avg.; illustration et graphique A. Mjærum).

both the animate and inanimate, which is to say human beings, animals, plants, water, land formations and so on. Using specific material phenomena as a starting point for analysis, these studies aim to lift the material into a human dimension by applying, for example, theories of phenomenology (e.g. M. Merleau-Ponty), the concept of the taskscape (Ingold, 1993) or by using ethno-archaeological examples. Topics that have been discussed from such perspectives include: the encounter of the first Early Mesolithic pioneers, who arrived by boat, with the unknown environment (Fuglestedt, 2009); the recurrent quarrying of lithic raw materials at rock formations both at the coast and in the mountains, which can be seen as persistent places (Nyland, 2016 and 2020); the handling and perception of abandoned places of settlement (Mansrud and Eymundsson, 2016); or the discussion of cosmological dimensions of the coastal zone (Bergsvik, 2009; Mansrud, 2017a and 2017b). Such studies operate within specific theoretical frames, often on the basis of fewer finds/find contexts within larger chronological and spatial frames, which are not statistically relevant but which are noticeable from a comparative perspective. They can contribute to changing the traditional perception of e.g. a mainly economic explanation of human use of the coastal zone in the Mesolithic.

A. Schülke (2020) combines the aspect of human movement and experience with an empiric approach, which as a starting point analyses site location and its possible meaning. The aim is to better understand hunter-gatherer social space by integrating the land in between sites into the analysis, including the topography and communication potential of the respective landscape space. Her study puts the use of the coastal hinterland through Mesolithic people more explicitly on the agenda. The above-mentioned focus on Mesolithic coastal sites in our region has, to a certain extent, biased our idea of hunter-gatherer communities' use of the environment beyond simply the coastal strip, which might have masked the relevance of the hinterland for Mesolithic coastal communities. While the hunter-gatherer use of the mountain areas and the waterways leading into the mountains is well known, the areas in-between the coast, the mountains and the large waterways, namely the woods in the coastal hinterland, have received very little attention (but see the recent Wiekowska-Lüth et al., 2018; Mjærum, 2019).

A. Schülke's (2020) study (further developed in Schülke, forthcoming) argues that hitherto disregarded 14C dates found in certain contexts in hearths on topologically/technologically dated Early and Middle Mesolithic coastal settlement sites, which date from later in the Mesolithic than the artefact material indicate a use of these earlier coastal site locations after they had become hinterland ones in later Mesolithic times. GIS reconstruction of the topography of these sites at the time of the later Mesolithic radiocarbon dates, using the shoreline model, revealed that most of these sites exhibit a similar topographic placement: in elevated positions in the coastal hinterland, at or very close to an excellent view-

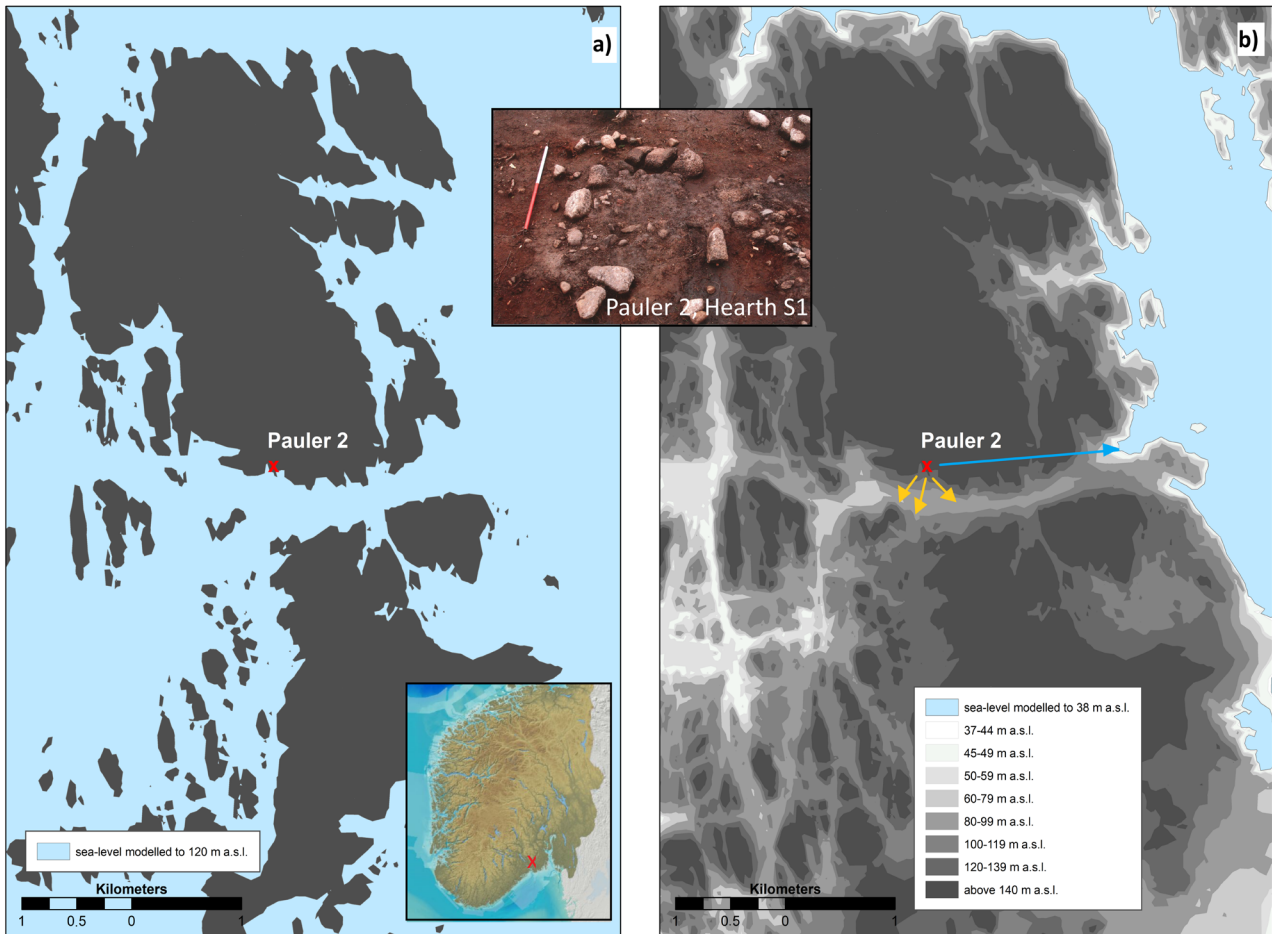
point overlooking a valley, a conjunction of valleys or a watercourse. The combination of later, but still Mesolithic, dates from a secure context and the similar topographic positioning of the locations of the hearths greatly strengthens the hypothesis that the locations of the earlier coastal sites were reused in later times. By this time, they were located strategically well at observation spots overlooking valleys and watercourses in the hinterland (figure 5 shows one example; for a list of other relevant sites, their placement and datings see Schülke, 2020 and Schülke, forthcoming). The identification of the lighting of fire in hearths at such strategic locations with good overviews stresses the importance of the hinterland for coastal hunter-gatherer communities. They used these areas for resource acquisition, movement and as a social arena, not least to observe the surroundings including humans and animals. Such evidence also raises the question of whether these places were known or recognised as specific ancient (= former coastal) places, e.g. because lithic scatters or even existing fireplaces were identified as former human occupation. They might have had important significance as ancient places or anchor points in the world of these hunter-gatherers.

A. Schülke's (2020) approach is based on sites that exhibit similar features (late 14C dates, type of structures, topography). That the locations had good views when they were used in later times, was determined through visual map analysis and experience in the field. The study's potential to help us understand hinterland use could be further enhanced by integrating this approach into a broader topographic analysis by using a GIS-based analysis of not only the views from the sites in question but from the region as a whole to perform viewshed analysis. This would compare, for example, places with good views but no signs of human activity with those where evidence of such activity has been found.

#### **2.4. Social networks and communication: technology as tradition**

The social structure and organisation of Mesolithic coastal societies has been a central issue in Norwegian archaeology, mainly concentrating on settlement site variation and dwelling structures, and economic adaption and organisation, while purely typological studies are also common (e.g. Nærøy, 2000; Bjerck, 2008 and 2009; Fuglestedt, 2009; Glørstad, 2010; Bergsvik et al., 2016; Fretheim, 2017; Darmark et al., 2018; Viken, 2018). Recently, focus has been directed towards the roles of tradition, social networks and communication in such societies, where the coast plays a decisive role. In particular, *chaîne opératoire*-based approaches to technological studies have provided new perspectives on this topic, offering a potential for deeper insights into prehistoric social processes compared with typologically based studies (e.g. Apel, 2001; Sørensen, 2006; Dugstad, 2010; Eigeland, 2015; Damlien, 2016; Berg-Hansen, 2017 and 2018; Mansrud, 2017b). Building on theory from sociology and pedagogy, topics such as mobility and social



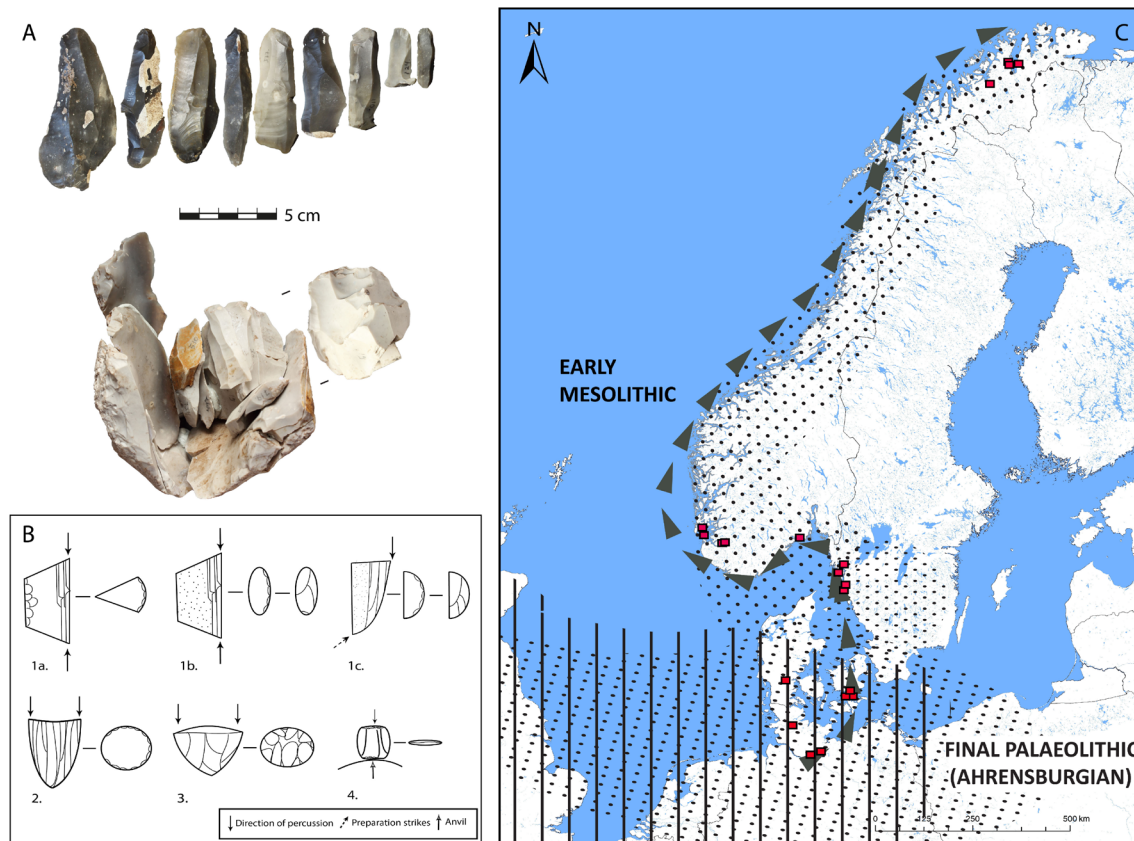


**Fig. 5** – Example of the location of an Early Mesolithic coastal site (a) that was most likely reused in the Late Mesolithic after it had become a hinterland site overlooking a valley (b). The site of Pauler 2 was frequented in the Early Mesolithic period (9150-8850 cal. BC) according to the typology/technology of 3 708 lithic artefacts (Nyland, 2012b), at a time when the site was placed in a sheltered bay at the southern coast of an island (see a, to the left). Two 14C dates (on charred hazelnut: Beta-234403 6910 ± 40 BP, 5880-5720 cal. BC and on charcoal: Beta-234404 6990 ± 40, 5980-5720 cal. BC) from hearth S1 located on the site suggest that the site was reused in the Late Mesolithic, at a time when the former coastal site was located around 2 km from the coast and overlooking a valley (see b, to the right; Schülke, 2020; illustration A. Schülke based on a landscape model by G. Steinskog, MCH, UiO and on the photograph of hearth S1 by A. Nyland for MCH, UiO; Nyland, 2012b).

**Fig. 5** – Exemple d'un site côtier du Mésolithique ancien (a), qui a très probablement été réutilisé au Mésolithique récent après s'être transformé en site d'arrière-pays surplombant une vallée (b). Le site de Pauler 2 a été fréquenté au Mésolithique ancien (9150-8850 cal. BC), selon la typo-technologie des 3 708 artefacts lithiques (Nyland, 2012b), à une époque où il était situé dans une baie abritée, sur la côte sud d'une île (voir a, à gauche). Deux dates 14C (sur noisette carbonisée : Beta-234403 6910 ± 40 BP, 5880-5720 cal. BC, et sur charbon de bois : Beta-234404 6990 ± 40, 5980-5720 cal. BC) provenant du foyer S1 suggèrent que le site a été réutilisé au Mésolithique final, à une époque où le rivage était à environ 2 km et surplombait une vallée (voir b, à droite ; Schülke, 2020 ; illustration A. Schülke, d'après un modèle de paysage de G. Steinskog, MCH, UiO, et d'après la photo du foyer S1 par A. Nyland, MCH, UiO ; Nyland 2012b).

organisation have been discussed within this approach. In particular, combinations of detailed dynamic-technological studies and attribute analyses offer great potential to clarify these issues through the mapping of behavioural patterns and handicraft traditions on various levels. From such empirical investigations, it is possible to study the actions and choices of Mesolithic people. In combining the identification of technological traditions with theories of social knowledge transmission and societal density (Mauss, 1973 [1935]; Boyd and Richerson, 1985; Cavalli-Sforza, 1986; Guglielmino et al., 1995; Durkheim, 1989 [1893]), we are not only able to discuss individual

actions, but also the structure and social organisation within a society as well as the level of communication within and between societies. We can thereby connect the level of agency and small-scale short-term events with the societal level and large-scale long-term sociocultural processes, enabling the understanding of local and regional developments in a larger social frame (Berg-Hansen 2017 and 2018; Damlien et al., 2018; Berg-Hansen et al., 2019a and 2019 b). This provides the opportunity to study the way of life in specific geographic and historical landscapes from an overall social perspective.



**Fig. 6** – A detailed study of blade technology from the period 10900-8300 cal. BC in north-western Europe shows that the same methods and techniques were used for production of blade blanks and tools (A and B). This demonstrates that a common tradition of blank and tool production was maintained throughout the area for more than two and a half thousand years, during which there were large environmental changes and the first immigration to the Scandinavian Peninsula from the south took place, following the coast. It also implicates a continuity of the population from the Final Palaeolithic to the Early Mesolithic. The study reveals a society with conservative knowledge transmission mechanisms and technological tradition, but also regular contact within the area and well organised communication in which boats must have played a decisive role (Berg-Hansen, 2017 and 2018). A shows an example from the Early Mesolithic south-Norwegian site Pauler 2 of typical blades made by direct percussion, and a refitting of a sequence of core preparation and blade production from a one-sided single-platform core. B presents the common production methods illustrated by schematic drawings of the four different core types that occur (1a-c: variations of one-sided dual- and single-platform cores; 2: sub-circular production on conical core with smooth, concave platform; 3: sub-circular production on sub-conical core with prepared, convex platform; 4: bipolar production on anvil). Method 1a-c and 2 dominate the Final Palaeolithic Ahrensburgian technology in the south, continuing throughout the Early Mesolithic and spreading with the pioneer settlement of the Scandinavian Peninsula. Method 3 occurs in the Early Mesolithic in the whole area, while method 4 is found in assemblages from the Scandinavian Peninsula. C illustrates the distribution of the Final Palaeolithic (hatched) and Early Mesolithic (dotted) settlement, respectively. Red squares mark the location of the 20 excavated open-air settlement sites included in the study. The arrowed line indicates the direction of the spread of the settlement in the Early Mesolithic (illustration I. M. Berg-Hansen).

**Fig. 6** – Une étude technologique détaillée des lames durant la période 10900-8300 cal. BC en Europe du Nord-Ouest montre que les mêmes méthodes et techniques étaient utilisées pour la production d'ébauches de lames et d'outils (A et B). Cela indique qu'une tradition commune de production d'ébauches et d'outils s'est maintenue dans toute la région pendant plus de deux mille cinq cents ans, alors que d'importants changements environnementaux se sont produits et que la première immigration vers la péninsule scandinave en provenance du sud a eu lieu, en suivant la côte (C). Cela implique également une continuité de la population du Paléolithique final au Mésolithique ancien. L'étude révèle une société avec des mécanismes de transmission des connaissances et une tradition technologique conservatrice, mais aussi des contacts réguliers dans la région et une communication bien organisée dans laquelle le bateau a dû jouer un rôle décisif (Berg-Hansen, 2017 et 2018). A) Mésolithique ancien du sud de la Norvège, Pauler 2 : exemples de lames typiques fabriquées par percussion directe, ainsi qu'un réaménagement d'une séquence de préparation d'un nucleus unipolaire à table unique destiné à une production laminaire. B) Illustration schématique des méthodes de production des quatre types de nucleus les plus courants (1a-c : exemple de nucleus à double et à simple plan de frappe ; 2 : production sub-circulaire sur nucleus conique, avec plan de frappe lisse et concave ; 3 : production sub-circulaire sur nucleus sub-conique, avec plan de frappe aménagé convexe ; 4 : production bipolaire sur enclume). Les méthodes 1a-c et 2 sont dominantes dans la technologie ahrensbourgeoise du Paléolithique final dans le sud et se poursuivent tout au long du Mésolithique ancien en se propageant avec le peuplement pionnier de la péninsule scandinave. La méthode 3 est présente au Mésolithique ancien dans l'ensemble de la région, tandis que la méthode 4 se retrouve dans les assemblages de la péninsule scandinave. C) Distribution des peuplements du Paléolithique final (hachuré) et du Mésolithique ancien (en pointillés). Les carrés rouges marquent l'emplacement des 20 sites de plein air fouillés inclus dans l'étude, et la ligne fléchée indique la direction de la propagation du peuplement au Mésolithique ancien (illustration I. M. Berg-Hansen).

In general, lithic technology assemblages are better suited than others for comparative studies on both regional and cross-regional scales, due to poor preservation of organic materials. The potential drawback of only focusing on one technology, however, is the lack of opportunities to compare different technologies, possibly creating biased data. Nevertheless, as with all other technologies, lithic technology is a part of the cultural systems of any Stone Age society, being expressed through and carried by traditional technological actions and techniques.

Our example of such an approach focuses on the pioneer settlement on the Scandinavian Peninsula, including south-east Norway, after the Ice Age (Berg-Hansen, 2017 and 2018). In the Early Mesolithic (9300-8300 cal. BC) after the retreat of the Fennoscandian Ice Sheet, the coast of the Scandinavian Peninsula was rapidly settled from the south (Bjerck, 2009; Bang-Andersen, 2012; Berg-Hansen, 2017). A comparative analysis of 20 lithic assemblages from excavated sites in north-west Europe, dated to the Final Palaeolithic and Early Mesolithic (10900-8300 cal. BC), sheds light on the social background and advancement of this settlement (fig. 6). The similarities in lithic craft traditions demonstrate the level of social density, i.e. the frequency and quality of communication and the degree of interconnection in social networks. The results show that coastal mobility and social connectivity played a central role in the societal development of the pioneer settlement of the Scandinavian Peninsula.

The study documents striking similarities in the methods and techniques for lithic blade blank production across both a very long time span and a huge geographical area. These similarities demonstrate a conservative tradition of lithic tool production that would require a well-connected society to support it. Assuming the population of hunter-gatherers was small implies there were specific organisational traits, such as small social groups managing the main traditional knowledge as well as regular contact and communication between these groups for the vital exchange and maintenance of the technological traditions and knowledge (Berg-Hansen, 2017 and 2018).

This result supports previous arguments for the significance of mobility and efficient travelling. On the Scandinavian Peninsula, the Early Mesolithic sites are mainly found along the coast, and many are located on islands in an almost continuous archipelago (Nyland, 2012a; Svendsen, 2018). Although walking on ice in the wintertime, or possibly travelling by sledge, would have made it possible to hunt on the ice and reach islands close to the mainland (Bjerck, 2021), mastering advanced boat technology would have been necessary to reach islands far out at sea and to live along this coast in the summer months (Berg-Hansen, 2017; Gjerde, 2021). Boats must have been part of daily life, making transportation of people, equipment and raw materials much easier than moving on dry land. The significance of boat travel and transportation has previously been emphasised, and it is pointed out that boats not only played an important role in the exploitation of marine resources, but also influenced people's perception

of their world and worked as a structuring element for the social organisation (Bjerck, 2008 and 2009; Svendsen, 2018; Gjerde, 2021). Additionally, efficient travel along the coast was also a necessity for maintaining common knowledge and tradition through cultural transmission during social interaction in both individual meetings and larger gatherings, thus sustaining the community itself.

### 3. DISCUSSION – LANDSCAPES OF PRACTICE

The five approaches presented above explore different aspects of living in coastal areas in the Oslo Fjord region in the Mesolithic, operating against the backdrop of diverse research traditions and methods. In the following discussion, we would like to reflect on the ways they could complement each other and how a more active interconnection among them could be useful for developing more holistic and reflective research on coastal hunter-fisher-gatherers. This can activate the potential of each specific approach in new ways and might also help to alleviate the limitations inherent to each of them. We would like to highlight the following topics, which are important for understanding Mesolithic life, and which all of these approaches directly or indirectly touch upon 1. Time and temporality, 2. Site and settlement, 3. Social life and networks, 4. Mobility.

These four thematic areas are closely intertwined, exploring how Mesolithic people lived in their respective social and environmental surroundings through studies on different scales (small scale – large scale, e.g. from site to region) and within different time spans (looking at a certain time/moment/event, or over a certain period).

#### 3.1. Time and temporality

Time and chronology is one of the structuring principles in archaeology. The Mesolithic period in south-eastern Norway (c. 9300-3900 cal. BC) encompasses more than 4000 years. Even though the number of archaeologically investigated sites is relatively high (with around 250 in the last two decades), this is still too few to gain fuller descriptions of Mesolithic living and social organisation. In our interpretations, we are dependent on binding together archaeologically traceable prehistoric activity and events, which are spread in time and space. The identification of cultural/technological and temporal sub-phases (e.g. the Early, Middle and Late Mesolithic) can help to bind observations together with a narrative, but we are still faced with serious challenges regarding time and temporality. Amongst these are insights, such as that a substantial agglomeration of artefacts might represent a knapping sequence that took surprisingly little time to produce. However, the question remains of how to understand the individual and their lifetime without having substantial traces of actual Mesolithic humans and how to grasp the archaeological void between sites



and the events/activities that they represent. Combining approaches that work on different scales can help us to reflect on these challenges, and thus to integrate them into research. While large-scale analysis in time and/or space on e.g. energy/population development (S. Solheim), the development of the placement of settlements within a region (A. Mjærum), or on lithic technology (I. M. Berg-Hansen) show general trends, smaller-scale investigations give more detailed insights into single events such as lithic artefact production (I. M. Berg-Hansen) or the reuse of ancient places by lighting a fire (A. Schülke). The analysis of places and their continuous or repeated use can further reveal deep-time use of sites or areas (A. Schülke, A. Mjærum). Taking our approaches together we can better discuss diverse levels of temporality: cultural time, human lifetime, time of an event, etc.

### 3.2. Site and settlement

The site is the starting point for most archaeological interpretation (see also Berg-Hansen et al., this volume). From such a spot, which is marked ‘positively’ through archaeological finds, the different interpretations unfold, encompassing many different levels. Sites are interpreted as important places in Mesolithic landscapes and thus people’s lives, can be interpreted and explained in manifold ways. Integrating diverse perspectives can lead to more holistic and reflective insights on the Mesolithic meaning and function of these materially marked places in their wider landscape context. These perspectives include – from statistical and thus more general points of view – the choice of topographic/geographic qualities (I. Roalkvam), or sites as containers of ‘energy’ in the form of radiocarbon samples and dates or as relative numbers (site counts; S. Solheim). Furthermore, looking at the qualities of the sites (materially marked places of stay) can indicate the importance of the concrete environmental conditions in the form of biomass/ecology in the decision of people to stay at a place (A. Mjærum). Sites’ (shifting) topographic conditions can help us to understand the human use of places in different situations, in different social and economic contexts, indicating the overlap of tasks and meanings of a specific location (A. Schülke). The location of a site can be an arena for both agency and cultural transmission of tradition (I. M. Berg-Hansen), through which intra-site analysis, events, practices, and areas of (different) social activity can be explored.

We observe that the notions of site and settlement are often used as a kind of substitute for human groups rather than as material evidence of diverse human activities, which occupy places along the coast in a more general mode of ‘settling’. However, the understanding of what settling, or dwelling is, should be explored more critically comparing and combining our approaches. What does it mean to ‘settle’ in a social sense, and from diverse hunter-fisher-gatherer perspectives? In future, we need to further stress the differences in types of material expressions on the sites to understand the practices, life ways

and events that have happened, and also to ask to what extent the notion of ‘settling’ is actually appropriate, which leads us to the next point.

### 3.3. Social life and networks

How do we actually understand and envision hunter-fisher-gatherer social life? Comparing our approaches we find an array of perceptions: resource and food management are seen as a central driving force, and a very good knowledge and reading of environments is seen as crucial. Social life is thus highly connected to adaption to the environment and to the ability to cope or not to cope with crisis (A. Mjærum). Social life is on a more general level and rather indirectly represented in population growth or decline, which is archaeologically approached through energy expressed in radiocarbon dates (S. Solheim). Studies of settlement patterns address social life indirectly and not explicitly, as represented in the placement of site locations along the coast (I. Roalkvam). For example, the topic of view(shed) analysis has a huge potential to further explore social communication and visual contact. When understanding sites in their wider social and environmental context and from an experiential perspective, the exploration of the social is closer to the (possible) perception of the individual, which of course is always daring from a modern archaeologist’s perspective. It can, however, bring in aspects of social life as contextual, with diverse temporalities, and always taking place within and in contrast with the social and environmental surroundings, the animate and the inanimate (A. Schülke). Putting the communicating, moving, cautious and curious individual or group on the agenda is necessary so as to include the human perspective in studies of Mesolithic social life, but needs to be constantly challenged. Another way of bringing in individuals, groups and, not least, societies is to study social life through technology, which can enable us to grasp aspects such as learning, copying, communicating, socially organising, networking and bridging or creating distances (I. M. Berg-Hansen).

What we are presently lacking, and what we could integrate more purposefully into our interpretations, are studies of how hunter-gatherer groups actually live, work, move and are social together in their respective surroundings, including the cosmological perspective. In our region there is no evidence of and thus no records from recent hunter-fisher-gatherers. Even though ethnographic studies have been a part of Norwegian Stone Age Archaeology for a long time (e.g. Gjessing, 1944 and 1977 with further refs.), an enhanced focus on ethnographic and ethnoarchaeological work is much needed in our region. Since the 1980s, ethnological records (Binford, 1980; Grøn et al., 2008; Kelly, 2013) have been applied to discuss site formation processes (e.g. Boaz, 1998) and settlement systems for the Middle and Late Mesolithic (e.g. Mjærum, 2019). In more recent years, ethnographical perspectives have been most commonly applied in studies of the region’s Early Mesolithic pioneers. Anal-

ogies from both the Arctic and the southernmost part of America (Tierra del Fuego) have been used in studies of the process of colonisation, social organisation, economy, and technology (Bjerck, 2009; Glørstad, 2013; Fretheim et al., 2016). They have also been more generally applied in studies on human-animal relations, especially as related to hunting practices (e.g. Fuglestad, 2009 and 2018). However, there is a need for in-depth analyses that target a more holistic and deeper understanding of the more complex societies in the later part of the Mesolithic in this region. These should include not only isolated aspects of hunter-gatherer studies such as settlement or hunting, but also the complexity and various aspects of the living worlds and networks of these communities with each other and with and as part of environments, which have important cosmological dimensions.

### 3.4. Mobility

A central question in hunter-gatherer studies is the extent and characteristics of their mobility patterns. Through our approaches, we touch on a number of relevant aspects. These include small-scale mobility through time with a relocation of settlements following the shoreline, making a novel focus on the people who relocate the sites (A. Mjærum) rather than on the more frequently used abstract notions of sites that ‘followed’ the shoreline. This latter approach presupposes that the people who used the sites were familiar with, and very bound to, specific regions. Furthermore, settlement patterns that study regional developments might indicate long-term stability (I. Roalkvam), as do to some extent the continuities in population development according to radiocarbon dates (S. Solheim). However, other studies pinpoint long-distance mobility, including pioneering along the coast (I. M. Berg-Hansen) and daily/regular mobility or observation/scouting into the woods beyond the coast, binding coast and hinterland together (A. Schülke).

Thus, there is the view of population and settlement as representing a kind of continuous organism, but at the same time, there are observations that lead to the suggestion of different types of human mobility on different scales, both linear in time and more circular/recurring, intertwined and adjusted to the animate and inanimate surroundings. Narratives of more experiential aspects, such as crossing the woods and visiting hinterland sites, would gain from e.g. corrections from statistical analysis of geographic factors. Furthermore, the more generalising terms under which the latter work would gain from including variables encompass more experiential aspects of movement and change – in a contemporary or a diachronic perspective – most importantly including more targeted in-depth ethnographic studies of mobility in hunter-fisher-gatherer communities.

## CONCLUSION

In the light of the above, possible future avenues for exploring hunter-gatherer living, settling, mobility and economy in the coastal areas of the study region should include the following.

- To activate the volume (the mere number) of the archaeological sites and material, together with the diversity of long-term development of varied and compartmentalised coastal areas, against the backdrop of geological data, in order to perform large- and small-scale analyses.
- To challenge the rather static beach model by developing more nuanced interpretative frameworks to include a wider spatial/landscape perspective.
- To understand the diversity of social activity that is embedded in the ambiguous site material and to include it in an analysis of practices along and beyond the coast.
- To broaden perspectives on humans in their environment (from sites to social life), as the lack of organic material hampers studies of human-environment relations and ritual (related to e.g. mortuary practice, economy, etc.), by including more purposeful ethnographic and ethnoarchaeological frameworks.
- To reflect on the respective frames of interpretation applied in a study, in terms of theory and methodology, and their limitations and possibilities. We need to reflect on how the terminology that we use actually shapes the narrative that we develop, e.g. in terms of how we address Mesolithic people and their social organisation.
- To use more targeted and in-depth ethnographical studies to better understand the archaeological record.

This will lead to a more holistic understanding of hunter-fisher-gatherer living in terms of e.g. social organisation, mobility, enculturation, communication, settling, economy and cosmology in the relatively stable coastal environments of south-eastern Norway.

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## NOTES

- (1) The authors are part of the International Research Network (IRN) PrehCOAST and all based at the University of Oslo. This article is the outcome of regular discussion-groups within the local PrehCOAST research group at the Museum of Cultural History, University of Oslo.
- (2) Berg-Hansen I., Mjærum A., Roalkvam I., Solheim S., Schülke A. (this volume) – Coast-concepts in Norwegian Stone Age Archaeology.

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## **Archaeology of Neolithic Island Networks: Diachronic and Paleo-Economic Approaches to Island Occupations through the Contribution of Ceramic Analysis**

### ***L'archéologie des réseaux insulaires néolithiques : contribution de l'analyse de la céramique à une approche diachronique et paléo-économique des occupations insulaires***

Benjamin GEHRES

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**Abstract:** The study of economic systems is a central theme of anthropological and archaeological research. At the intersection of questions on human behaviour and issues related to material culture, this discipline opens up theoretical perspectives for reflection that can link artefacts, individuals and processes, such as changes in livelihoods or the intensification or impoverishment of relationships. This communication focuses on the development and adaptation of existing economic models to the diachronic and territorial issues of our research, focused on the islands of Brittany (western France), through the petrographic and chemical analysis of the raw materials of pottery. It is a question of observing the evolution of the island's economic and production system over a long period of time during the Neolithic period. These environments are in fact strongly influenced by the ocean, the exploitation of the marine environment, both for food and for the production of goods, and also by displacement by cabotage or open sea shipping. These populations were therefore able to develop economic, production and distribution systems that were different from those of their fully continental neighbours. The question is whether existing economic models are suitable for these populations and whether new models adapted to more accurate data, and directly attributable to these groups, are likely to emerge.

**Keywords:** Neolithic, Brittany, islands, ceramic analysis, socio-economic models.

**Résumé :** L'étude des systèmes économiques est un thème central de la recherche anthropologique et archéologique. À l'intersection des questions sur les comportements humains et des problématiques liées à la culture matérielle, cette discipline ouvre des perspectives de réflexion théoriques permettant de relier les artefacts, les individus et les processus tels que les changements de moyens de subsistance, l'intensification des relations ou leur appauvrissement. Cet article porte sur le développement et l'adaptation des modèles économiques existants aux enjeux diachroniques et territoriaux de notre recherche, centrée sur les îles de Bretagne (ouest de la France), à travers l'analyse pétrographique et chimique des matières premières de la poterie. Il s'agira d'observer sur une longue période de temps l'évolution du système économique et productif insulaire au Néolithique. Ce milieu est en effet fortement influencé par l'océan et l'exploitation du milieu marin, tant pour l'alimentation que pour la production de biens, mais aussi par le déplacement par cabotage ou par la navigation en haute mer. Ces populations ont donc pu développer des systèmes économiques de production et de distribution différents de leurs voisins entièrement continentaux. La question est de savoir si les modèles économiques existants sont recevables pour ces populations et si de nouveaux modèles adaptés à des données plus précises, et directement attribuables à ces groupes, sont susceptibles d'émerger.

**Mots-clés :** Néolithique, Bretagne, îles, analyse céramique, modèle socio-économique.

## INTRODUCTION

The study of the socio-economic organisation of human groups is a central theme in anthropological and archaeological research. At the intersection of questions about human behaviour and issues of material culture, this discipline opens up theoretical perspectives for thinking about linking artefacts, individuals and processes such as changes in livelihoods, intensification of relationships or their impoverishment. For example, anthropological studies suggest that the unpredictability of food supply is correlated with extensive reciprocal exchange systems. Reciprocity is more common among hunters, fishers and farmers than among gatherers and pastoralists who exploit relatively predictable resources (Pryor, 1977). Where then does this leave island populations who are heavily dependent on fisheries resources? Their environments strongly influence their lifestyles, through their subsistence strategies, but also through their movements, which are necessarily carried out by boat (coastal or high seas).

To examine this, we will focus on the island populations of the Atlantic coast and their socio-economic organisations during the Neolithic. What were the relationships and structures of island societies? What types of economic systems existed between the islands and with the mainland? Can we observe differences with continental groups? The islands of Brittany are very good laboratories for exploring these issues (fig. 1). Indeed, they are characterised by a diversity of forms and settlements, from large, isolated islands such as Groix, to archipelagos such as the Molène or Glénan. They thus allow us to put into perspective the socio-economic relations of the populations with the morphology and the surface of the islands.

The approach we will use here is based on ceramics, from the origin of their raw materials to the technical traditions of preparation and treatment of the clay used in their production process. These everyday objects allow us to carry out analyses at the micro-territorial and macro-regional levels, in order to examine the functioning of domestic units and their exchanges. The use of ceramics in everyday life, in all communities and over time, makes it an excellent diachronic thread for looking at many aspects of the domestic and economic life of populations. Ceramics can be examined from different angles, such as the characterisation of anthropic actions on the raw materials, the organisation of production, and its distribution. Like all craft products, ceramics are not only material objects made of a raw material and shaped according to a technique. Ceramics also represent cognitive knowledge and motor habits that follow the potters throughout their lives (Arnold, 1985; Bril, 2002; Roux, 2010). The mechanisms of transmission of the technical traditions used by a potter are the result of a learning process ‘of actions observed within a social group’ (Roux, 2010, p. 6), which limit the possibilities of potters modifying by themselves the concepts and

actions of the *chaîne opératoire* they will have learned (Bril 2002; Roux 2010). It is then possible to establish links between the actions of the *chaîne opératoire* and ‘communities of practice’ (Stark, 1998; Roux, 2010, p. 6), bringing to light the limits of extension of different technical traditions (Gosselain, 2008; Roux, 2010). The identification of these ‘ways of doing’ and the processes of transmission is therefore a gateway to social groups, their extensions, their interactions and their evolution over time.

## 1. METHODOLOGY

The approach developed in this research consisted in determining the origin of the raw materials of the ceramics discovered on island sites: local or exogenous. It is then possible to identify the degrees of openness and withdrawal of the occupations, and the links that may have existed between islands and with continental communities. These approaches are based on multiscale analyses. Firstly, following the typo-technological studies, a macroscopic sorting of the pastes is made in order to carry out petrographic studies on the ceramics. These analyses are conducted by observing thin sections of the pottery under a polarising microscope and involve identifying not only the nature of the non-plastic inclusions within the clay matrix, but also the modifications made by the potters (addition of degreaser, purification of the paste, grinding of the clay, etc.). Greater detail on these approaches can be found in reference works dealing with this subject (Echallier, 1984; Rice, 1987; Convertini and Querré, 1998; Quinn, 2009 and 2013).

In order to accurately determine the origin of the granitic inclusion clays, chemical point analyses were performed by plasma mass spectrometry coupled with a laser ablation sampling system (LA-ICP-MS; Gehres and Querré, 2018). A plasma source quadrupole mass spectrometer (Agilent Technologies, 7700 Series), coupled to a 213 nm Nd:YAG laser ablation system (Cetac Technologies, LSX-213, G2) was used. The instrument was calibrated using international geological standards: DR-N, DT-N, UB-N (Govindaraju and Roelandts, 1989) and MICA-Fe (Govindaraju and Roelandts, 1988). In total, 46 elements were determined: Na, Mg, Al, Si, K, Ca, Ti, Mn, Fe, Li, Sc, V, Cr, Co, Ni, Cu, Zn, As, Rb, Sr, Y, Zr, Nb, Cd, Sb, Ba, La, Ce, Pr, Nd, Sm, Eu, Gd, Tb, Dy, Ho, Er, Tm, Yb, Lu, Hf, Ta, Tl, Pb, Th and U. The aim of using this approach was to compare the chemical signature of one or more mineral species contained in the ceramic pastes and within the regional granites. We were able to demonstrate that biotite tablets allow the precise determination of the origin of clays with granitic inclusions (Gehres and Querré, 2018). Based on these approaches, it was possible not only to identify the geological and geographical origin of the raw clays, but also to characterise the technical traditions used by the potters during ceramic production.