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Where are the Missing Boats? The Pioneer Settlement of Norway as Long-Term History

HÅKON GLØRSTAD

During the last ten years there has been a growing interest in understanding the earliest settlement of northern Europe. In Norway, specialized marine adaptation and high mobility based on traffic with seafaring skin boats are key elements in a new synthesis of the colonization process. This article addresses the process of colonization from a perspective of long-term history, analysing the record in an archaeological retrospective perspective. Such an analysis is intended to challenge and discuss some of the presumptions giving an implicit framework to the current state of knowledge. The main argument is that the long-term structures of Mesolithic settlement and subsistence in Norway are key for understanding the colonization of this landscape. Key elements in such a discussion are the nature of the early Mesolithic transport and communication systems. It is reasonable to question the range of mobility and the seagoing quality of the vessels. The sites preserved show traces of boat production that resembles the rest of the Mesolithic. This touches upon a more fundamental question concerning the status of the archaeological record as source material for understanding human societies and history.

Keywords: Stone Age; settlement; Mesolithic; experimental archaeology; environment; anthropology

In the night, a man was examining the ground under a lamppost. A woman passing asked if he had lost something. 'Yes', the man replied, 'I lost my car keys.' 'Did you lose them here?' the woman asked. 'No', said the man, 'but this was the only place light enough for examination.'

INTRODUCTION

During the last ten years there has been a growing interest in understanding the earliest settlement of northern Europe (overview in Bailey and Spikins 2008). This interest is partially triggered by a considerable rise in

high-quality datasets from development-led excavations in Norway (e.g. Damm *et al.* 1993, Høgestøl *et al.* 1995, Bang-Andersen 2000, Nærøy 2000, Blankholm 2004, Bjerck *et al.* 2008, Hesjedal *et al.* 2009, Fuglestedt 2010, Jakslund in press) and specific research excavations in the Nordic countries (overview in Bergmann *et al.* 2004, Kankaanpää and Rankama 2009, Pedersen 2009, Petersen 2009, Rankama 2011). Thought-provoking models for understanding the colonization process have recently been presented as a synthesis of the last 30 years of research

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(Bjerck 2008a, 2008b, 2009). In Norway, specialized marine adaptation and high mobility based on traffic with seafaring skin boats, similar to the Inuit's *umiak* (Bjerck 2008b, Bang-Andersen 2012, Fuglestad 2012) are key elements in the new synthesis of the colonization process. This process started at the end of the Pleistocene, in a landscape still marked by a harsh arctic environment. The Palaeolithic setting of Continental Europe is the backdrop to this scene.

This article addresses the process of colonization from a long-term history perspective, analysing the record in an archaeological retrospective perspective. Such an analysis is intended to challenge and discuss some of the presumptions giving an implicit framework to the current state of knowledge. The main argument is that the long-term structures of Mesolithic settlement and subsistence in Norway are central for understanding the colonization of this landscape. In this perspective some small but important adjustments can be made to the current model. Key elements in such a discussion are the nature of the early Mesolithic transport and communication systems. It is reasonable to question the range of mobility and the seagoing quality of the vessels. I think the sites preserved show traces of boat production that resembles the rest of the Mesolithic. The whole period can therefore be characterized by small-scale movements by boats with modest seagoing abilities. This touches upon a more fundamental question concerning the status of the archaeological record as source material for understanding human societies and history.

RESEARCH STATUS IN NORWEGIAN PIONEER SETTLEMENT RESEARCH

According to the current state of knowledge there is no evidence for human occupation of the present Norwegian mainland before the Preboreal period of the Holocene (9700 cal. BC). The oldest reliable ¹⁴C datings cover the period 9300–8300 cal. BC (the Fosna/Komsa complex, Fig. 1, Bjerck 1994, 2008a, 2008b, Bang-Andersen 2003, Blankholm 2004), that

is, the first centuries of the Holocene, but very probably after the cold Preboreal Oscillation (PBO) (9400 cal. BC, Björk *et al.* 1997, Bos *et al.* 2007). A few Preboreal sites are found in the mountain areas in Trollheimen and in Rogaland (Gustafson 1988, Bang-Andersen 2003, Svendsen 2007), but the majority of sites are situated close to the ancient shorelines. Thus the whole process of colonization could be interpreted as the commencement of a highly coastal or maritime culture in this part of the world (Bjerck 2009). Of course, this marks a strong contrast to the archaeological record on the Continent, where all the old shorelines have disappeared due to a massive sea-level rise after the Ice Age (discussion in Bailey 2004, Flemming 2004, Bailey and Flemming 2008). There is still an open question as to whether the rising sea submerged equally old and prosperous marine economies, as found in Norway, or if the patterns found north of the Skagerrak mark the very beginning of such a life-form in Europe. Most of the continental evidence points towards a terrestrial economy, yet there are sources that could indicate that the highly marine-oriented life found throughout the Norwegian Stone Age could be traced back in time to the Continent (Schmitt 1995, Cleyet-Merle and Madelaine 1995, Fischer 1996, 2005, Bailey and Milner 2002, Schmitt *et al.* 2006, 2009, Czesla 2007, see also Kindgren 1995, Kabacinski and Sobkowiak-Tabaka 2009 for lacustrine evidence).

The most popular and intuitive explanation for the Norwegian data is that by the end of the glacial period humans had invented or made effective use of a marine technology – boats and fully marine subsistence – enabling them to travel fast along the coast, exploiting the rich ecosystems that were made available to them because of an improved climatic situation after the Ice Age (Bjerck 1994, 1995, Bang-Andersen 2003, 2012). Hence, marine mobility and coastal life are key terms in understanding the colonization of Norway (Fig. 2). The rapid and uniform colonization of the Norwegian coast stands apparently in sharp contrast to the rest of the Mesolithic period, because the

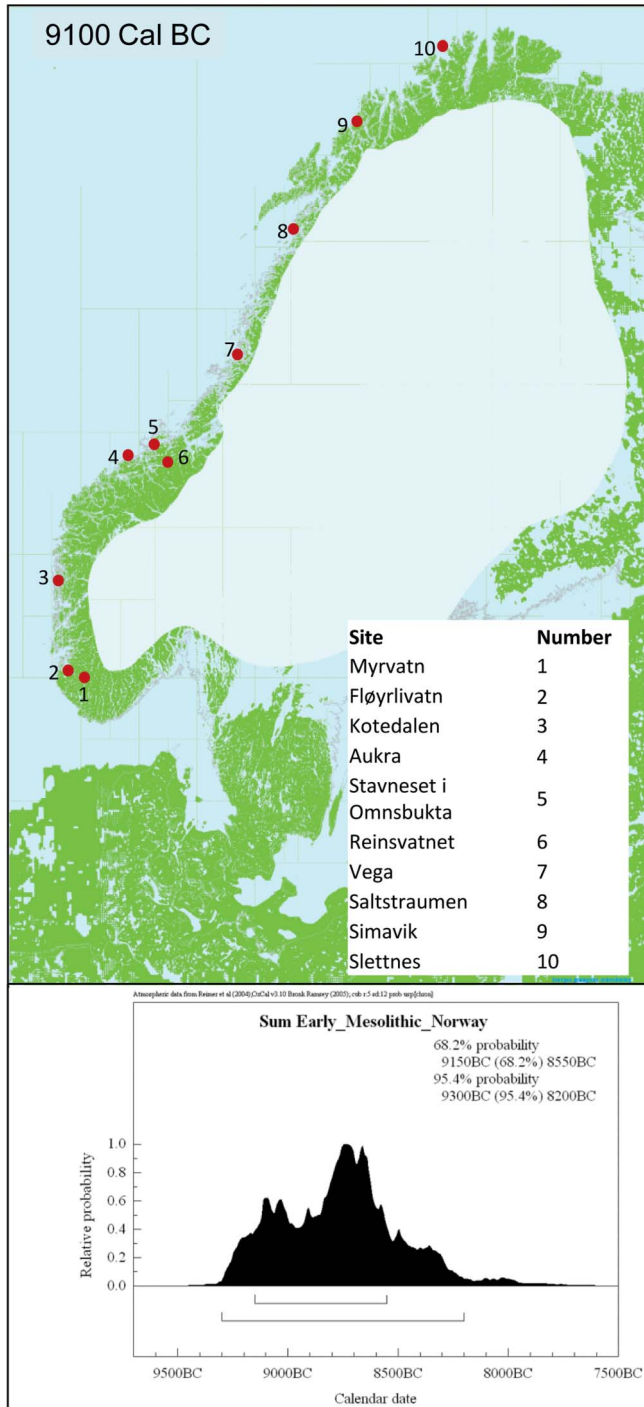


Fig. 1. Sum of Preboreal ^{14}C -datings from Norwegian Stone Age sites (FosnalKomsa). Map from http://www.sgu.selsgulsyl/geologi/geologi_sverigeljordlstrand_intro.htm (Påsse and Andersson 2005) and ^{14}C -datings from Bang-Andersen 1990, 2005, Bjerck 1994, Bjerck et al. 2008, Hesjedal et al. 1993, Olsen 1992, p. 89, Sandmo 1986, pp. 117–118, Svendsen 2007. A dating to 9900–9200 cal. BC (9940 ± 101 BP) from Varanger, Finnmark (Grydeland 2003) is not included because it probably dates driftwood and not the human activity at the site (cp. Bang-Andersen 2012).



Fig. 2. Umiaks and kayaks moving along the coast of western Greenland. Such images are often evoked when discussing the colonization of the Norwegian coast after the Ice Age. Source: Nansen (1891, p. 277).

trajectory throughout the rest of this period seems to be one of increased regionalization and decreased mobility (Larsson 2005).

WHERE ARE THE MISSING MASSES?

In the essay ‘Where are the missing masses?’ Bruno Latour (1992) discusses in a social framework the same phenomenon that has puzzled physics for a long time: there are not enough masses in the universe to balance the accounts that cosmologists make of it. Thus they are seeking the missing masses in order to balance the account. Latour thinks that things that matter in society represent the same enigma. In order to account for the full social universe, human agents and actions are not enough to explain the inertia of a whole *socius*. Only by taking matter into consideration as a social agent or network agent, can social life be properly understood. This kind of argument resembles archaeology in a thought-provoking manner. Most archaeological analyses draw heavily on substance that is not there. As archaeologists, we

presume that most of the full social reality that we intend to reconstruct is lost. The archaeological record is fragmentary and only ever a palimpsest. Hence, we have to confront other sources or our imagination to account for the social life that we intend to study. Ethnography, anthropology and historical sources are frequently used to add substance to the archaeological record (Binford 1978, Hodder 1982, Knutsson 1995). This is also the way social anthropologists stereotypically prefer to think about archaeology and its potential (Shennan 2004, Barth quoted in Neumann 2011, see also Hylland Eriksen 2009). The colonization of Scandinavia is by no means an exception to this type of reason. As far as I know no marine elements whatsoever have been found on any Preboreal archaeological site in Norway. Yet we give the sea the most servile attention in our analyses.

Admittedly, from the younger periods of the Mesolithic there are good indications for heavy dependence on a *marine* subsistence (e.g. Nordqvist 1998, Sellevold and Skar

1999, Bjerck 2007, Schaller-Åhrberg 2007), stretching back to the very transition between the Preboreal and Boreal climate periods (Nordqvist 1999, 2005, cf. also discussion in Mangerud *et al.* 1974 for the period definition). However, the only more or less direct subsistence indicators from the Preboreal period, the human skeleton from Österöd in Bohuslän (Ahlström and Sjögren 2009) and the preserved bones from Almeö in Lake Hornborga (Kindgren 1995), point towards a diet based on *terrestrial* and *lacustrine* resources. My point here is not to reject the possibility of a marine economy and way of life. It is indeed most likely that good evidence for a marine subsistence demonstrated from the Boreal period and onwards is just a continuation of an economy that was well established in the Preboreal. My point here is to stress our overwhelming concern with all that is missing on an archaeological site. The Preboreal sites from Norway are well preserved and thoroughly excavated, an excellent starting point for archaeological analyses. Still we are most preoccupied with everything lost.

Hein Bjerck (2008a, 2008b) elaborates elegantly on this in his discussion of the Preboreal period. According to Bjerck, most analyses of the Norwegian record incorporate only tacitly the most important material agent in the colonizing process – *the boat*. Bjerck demonstrates how the boat structured human life in a fundamental manner, giving size and shape to the sites excavated and enabling the rapid human colonization of the long and harsh Norwegian coast. Thus Bjerck applies directly and indirectly the thinking of Latour, showing us the importance of the boat – as the ‘missing masses’ and as the generative matrix of colonizing life.

It would be tempting to close the case after this – at least it is quite difficult to see how to add any significant new knowledge about the colonization process to the solid and alluring framework that Bjerck has created. He mobilizes his argument by referring to the work of Knut Andreas Bergsvik. Bergsvik (2002) has made a thorough

analysis of coastal settlement in western Norway, where he discusses several consequences and arrangements of a full marine adaptation. The only thing completely left out of that analysis, Bjerck (2008b) remarks, is the boat – the very means of all coastal life. This could be true – still, the reason for Bergsvik’s avoidance of the boat in his analysis is more than obvious: no boats have ever been found from the Norwegian Stone Age. In so far as archaeology is an empirical discipline analyses should be based on what is actually present for examination. In my opinion, Bergsvik has presented significant and well-founded results from his research. But where does this leave the boat as an epistemological problem? Is it lost? Is archaeology forever doomed to a life in the shadows of anthropology and history, begging for all the significant facts that are out of range?

THE EPISTEMOLOGICAL SIGNIFICANCE OF THE ARCHAEOLOGICAL RECORD

Pierre Vogel (2010) has addressed the principal aspects of this debate in a recent book about the Swedish Stone Age (see also Sundström *et al.* 2009 for similar arguments). He discusses precisely the problem raised by Latour and Bjerck, but in quite a different setting. Just like Bjerck he notices that the existing questions of social science or anthropology do not touch upon the archaeological record of the Scandinavian Stone Age. The fundamental social questions, such as the creation of *socius*, hunter and gatherer equality, sharing, shamanism, hunting cosmology and so on, are not taken from *his* discipline – and his data can hardly be said to face these problems. Most archaeologists studying hunters and gatherers therefore use the archaeological data only as an *illustration* of a general social theory and not as source material with weight of its own, Vogel argues. Instead, he wants to reformulate the questions of Stone Age archaeology on hunters and gatherers in such a way that these can directly confront the archaeological record. Because most excavations are made with a primary interest in

spatial relations, Vogel starts his inquiry with the spatial organization of Stone Age sites as an aspect of social constitution. On this basis he tries, not unlike Lewis Binford (1981), to define the fundamental generative structures of these societies (Vogel 2010).

It is hard to imagine an archaeology that operates solely inside its own empirical data. In order to interpret the record, some kind of social theory and general anthropology must creatively be added (Flannery 1973). Nonetheless, Vogel's argument deserves close attention. Bjerck scrutinizes the spatial organization of pioneer sites, and he sees a certain pattern repeated on several sites and several times at the same site. This structure is interpreted as traces of boat teams – 'boatholds' – that have sought rest and shelter on dry land for short periods, on their way up and down the Norwegian coast (Bjerck 2008b). His models are taken from arctic ethnography (e.g. Fair 2005) and South America (Bjerck 2009), and, by applying this ethnography, he also makes apparent the shortcomings of archaeology: the archaeological record is but an epiphenomenon of life in boats no longer evident.

Could he have concluded otherwise? Does the archaeological record have *social-historical* inertia of its own? I deem it possible to reorganize the archaeological data of the pioneer settlement, not just according to arctic ethnography, but also in terms of some durable relations in a wider Mesolithic setting. I actually think that the ethnography makes us ignore some of the most significant patterns of the pioneer data (see also Wobst 1978) – *its connection to its future*. To contextualize this argument, the two most common methods for analysing the pioneer settlement of Norway might be presented as a point of departure.

INTERPRETING THE PIONEER SETTLEMENT: ETHNOGRAPHY AND THE PALAEOLITHIC

Most work on pioneer settlement of Norway builds on two pillars: first, as principally

discussed by Vogel, researchers often take the present ethnographical record as the starting point. *Inuit* or circumpolar people recorded in the 19th and 20th century act as relevant analogies to the Preboreal economy and society in Norway, because one thinks that the technological and climatic conditions are roughly similar. Although there seem to be some ecological similarities between the Arctic in the 20th century and Preboreal Scandinavia, the prehistoric climate, at least in the latter part of the period, seems to be more like the present, and decidedly not an Arctic type (Nesje and Dahl 1993, Bjune *et al.* 2005, Nesje *et al.* 2005, Brown *et al.* 2012). It must also be pointed out that Inuit societies, as documented by ethnography and archaeology, are relatively recently established in the Arctic. The Thule culture, commonly considered as the origin of the present Inuit cultures, dates back to the beginning of the second millennium AD (McGhee 2009). Their highly specialized technology, including the kayak and the dog sled (and maybe also the *umiak*), can therefore not be considered as some kind of original gear for arctic survival (Petersen 1986, p. 15, Riede 2007, Morey 2010, pp. 99, 118–128). But there are also principal problems with the use of these kinds of analogy (see discussion and critique in Hood 1995). I am not referring to the grand debate about the epistemological problems with analogical reasoning (e.g. Binford 1967, Hodder 1984, Wylie 1985, Ravn 1993, principal discussion in Østerberg 1982). What I have in mind is that the use of such analogies does not seem to explore the potential in the archaeological record; as Vogel stated, the archaeological evidence is just illustrating the ethnography of recent hunters and fishers.

A second pillar in the understanding of the colonizing process has been *history*. Generally, archaeology favours an historical perspective where the past is used to interpret the present: this way the Palaeolithic is made the starting point for understanding the first Mesolithic societies, and the roots of Norwegian history must be found in the late

Glacial continental scenario. This goes both for researchers who interpret the Norwegian data as a new life form and for those who emphasize continuity back in time (e.g. Odner 1966, Indrelid 1989, Bjerck 1994, Bang-Andersen 1996, Fuglestedt 2001, 2012). It is not difficult to understand why this type of reasoning is attractive. It represents an archaeological and historical mantra: the past represents the platform for future development; hence we need to understand the past to understand the present. But there is also another option available as a tool for historical analysis.

AN ARCHAEOLOGICAL RETROSPECTIVE PERSPECTIVE

In historical research another common method of analysis is to use younger historical phases as a framework for discussing history in older periods (Holmsen 1941, Sandnes 1981). Contrary to analogical thinking (Østerberg 1982, pp. 47ff.), the **historical retrospective method** tries to establish a direct link between the first and the latter case. The weaker this link is the more uncertain is the reasoning. If no connection can be established, one should consider the direct historical approach as a variant of analogue argumentation (Lyman and O'Brien 2001). The historical retrospective method is best classified as a form of inductive reasoning, where similar observations throughout time are generalized. The Annales School of history emphasized the importance of the fundamental social-material structures of history, the long term or *la longue durée* (Braudel 1997). Several scholars of archaeology have acknowledged the importance of this perspective to archaeology and for historical retrospective research, because such structures seem to be especially suitable for long-term historical analysis (e.g. Hodder 1987, Bintliff 1991). A long-term historical perspective could also be useful for a retrospective understanding of the process of colonization. Instead of seeking the answers in the present Arctic or in the

Palaeolithic, the Preboreal material could be interpreted in light of a somewhat younger diachronic setting. In fact there are many aspects of the colonizing situation that do *not* look fundamentally different from the rest of the Mesolithic.

DETERMINING THE BOATS OF MESOLITHIC SCANDINAVIA

Let me return to the problems of the missing boats. What do we actually know about boats in the Mesolithic? What light can this knowledge shed on the colonization of Norway? Fig. 3 shows the distribution of all known finds of the most common late Mesolithic core axe in eastern Norway, the Nøstvet axe (Glørstad 2010). **As can be seen from the map, the axes are mainly found along the coast, but also along the major rivers and lakes of the upland. Because of their coast-bound distribution, many researchers have concluded that they must have something specific to do with coastal life** (Indrelid 1994, p. 287, Nordqvist 1995, Kindgren 1996, Boaz 1999, Berg 2003). Most probably they were used for working wood and other rather hard organic materials. The shape of the axe and the edge design indicate that the axes were very suitable for gouging and **a popular hypothesis has been that they were used for making dugout canoes** (Mikkelsen 1975, Alsaker 1987, Østmo 1995, Berg 1997, Jakslund 2005, Glørstad 2010). This does not entirely exclude other functions, but as Einar Østmo (1995) points out, the dugout canoe was probably one of the largest and most complicated wooden structures made by the people of the Nøstvet phase (cf. Ames 2002). **No dugout canoes or any other vessels have actually been found in the area of the Nøstvet complex, so the hypothesis is strictly unproven. However, since all the vessels known from late Mesolithic southern Scandinavia are dugout canoes (Christensen 1997, p. 284, Crumlin-Pedersen and Trakadas 2003, p. 218), and were therefore common immediately south of the Nøstvet complex, it is a hypothesis that remains attractive.**

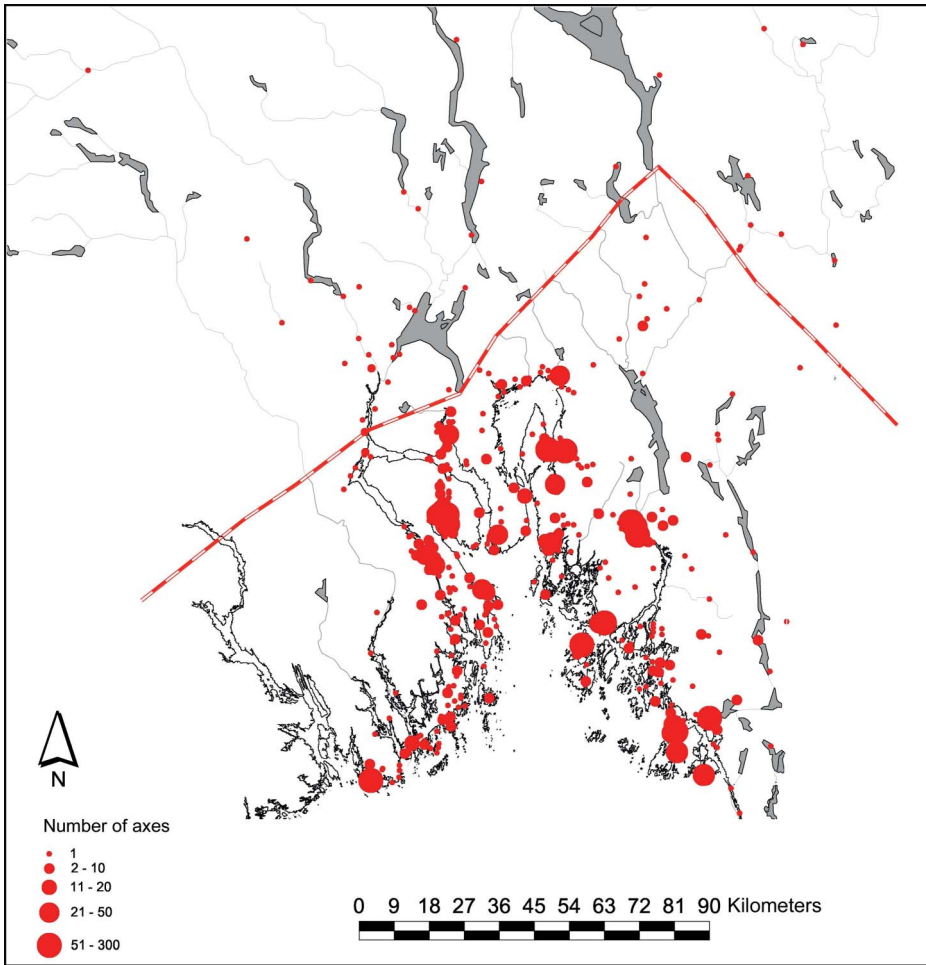


Fig. 3. The distribution of late Mesolithic Nøstvet axes in the Oslo fjord area and the Atlantic extension of linden (*Tilia* sp.). Sources: Hoeg (1997) and Glørstad (2010)

With only few exceptions, all the dugouts of southern Scandinavia are made of linden (*Tilia* spp.) (Christensen 1997, p. 284). Linden is very soft and easy to shape and was common in the second half of the Atlantic period (Hafsten 1956, p. 79, Danielsen 1970, p. 97), when the Nøstvet axes were in use. It could be found south of a line drawn from the estuary of Lake Mjøsa in Hedmark, to the estuary of Lake Tyrifjorden and to Lake Nordsjø in Telemark (Høeg 1997, p. 16). This corresponds well with the northern limits for almost all Nøstvet axes so far identified (Glørstad 2010).

This may be indirect support, but it does point towards a connection between dugout canoes and Nøstvet axes (Glørstad 2002, Jakslund 2005). It may also be significant that some of the largest concentrations of axes are found in landscape settings where logs suitable for making dugouts would have been readily available.

Of particular interest to my argumentation is that, although the distribution of Nøstvet axes is coast bound, they are not present in areas outside sheltered water. It is in the protected archipelagos, in the fjords and the sounds, that these axes are found. The axes

as well as the late Mesolithic sites in the area are most likely part of a small-scale coastal network for transportation of goods and people. This interpretation is also enhanced by the widespread use of local raw materials for axe production: stones and blanks collected close to the settlement sites (Glørstad 2010).

MARITIME COLONIZATION IN THE EARLY MESOLITHIC: THE EVIDENCE OF FLAKE AXES

With this scenario in mind, I want to return to the maritime colonization of Norway in the early Mesolithic, because there seems to be a striking similarity between the late and the early Mesolithic axe distribution.

According to most typological and chronological schemes, flake axes are in use only in the Preboreal period in Norway (Fig. 4). Bjerck has shown that the distribution of flake axes follows the whole Norwegian coast. In the few areas where such axes are not found, he has demonstrated that this is due to the Tapes transgression that has re-deposited sediments over the older sites or permanently submerged the early Holocene coastlines (Bjerck 1994, 1995). He remarks that almost all axes are found close to the sea (Bjerck 1994). On Preboreal sites from the mountain and upland areas, axes are absent or very rare (Bjerck 1994, Fuglestad 2001, Bang-Andersen 2003). The affinity between coastlines and flake axes was the object of a large debate between Carl Cullberg and Stig Welinder in the 1970s. The dispute concerned the chronology of the western Swedish Mesolithic. According to Cullberg, flake axes were part of the early Mesolithic Hensbacka culture, because they were found along Preboreal sea levels, higher than any other coastal sites in this part of Sweden. Welinder (1974), taking the continental or southern Scandinavian perspective, could not accept Cullberg's (1974) claim that flake axes were part of the Preboreal inventory. Most likely this was because he had no southern Scandinavian or continental coastal sites for examination, because all the Preboreal

coastlines are submerged in this part of the world. He therefore based his chronology on inland sites where the axes are absent or rare. Subsequent research has been in favour of Cullberg's view (Sjögren 1991, Schmitt 1995, 1999, Kindgren 1996, Nordqvist 1998) and shoreline dating is still considered to be a useful chronological tool in areas with strong land rise.

The close connection between axes and the sea makes it likely that the flake axes, just like the Nøstvet axes, must be related to coastal life (Kindgren 1996, Bang-Andersen 2003). Although the shape and the edge design on axes vary throughout the Mesolithic, one of the most stable patterns throughout the whole Mesolithic of Norway is the geographical distribution of these tools: there is a remarkably close connection between coastlines and large waterways and the distribution of axes. Apparently in disfavour of this claim, Rune Hermansson and Stig Welinder (1997) have published an overview of pecked core axes of stone from the Mälär Valley area in Sweden. It is, however, well known that these axes cannot exclusively be dated to the Mesolithic (Hinsch 1955, p. 39, Welinder 1985, Hermansson and Welinder 1997, pp. 21–22). Hence, the inland distribution of this axe type could very well represent Neolithic settlements or communication along the large waterways in this area during the Stone Age. The strong land rise in eastern Sweden must also be taken into consideration. In the Mesolithic, large parts of the Mälär valley were part of a fjord system (Påsse 1996, Åkerlund 1996) and the Mesolithic axes must have been deposited close to the sea.

There are therefore good reasons to state that, in all Mesolithic periods, axes are rare in the inland of central Scandinavia. When axes are found away from the coast, they are almost always found in connection to large rivers and lakes. The most obvious explanation for this is, in my opinion, that axes of stone are bound to some sort of marine activity. This activity must also be connected to transport; it is therefore only the waterways navigable by means of transportation that generally have finds of axes.

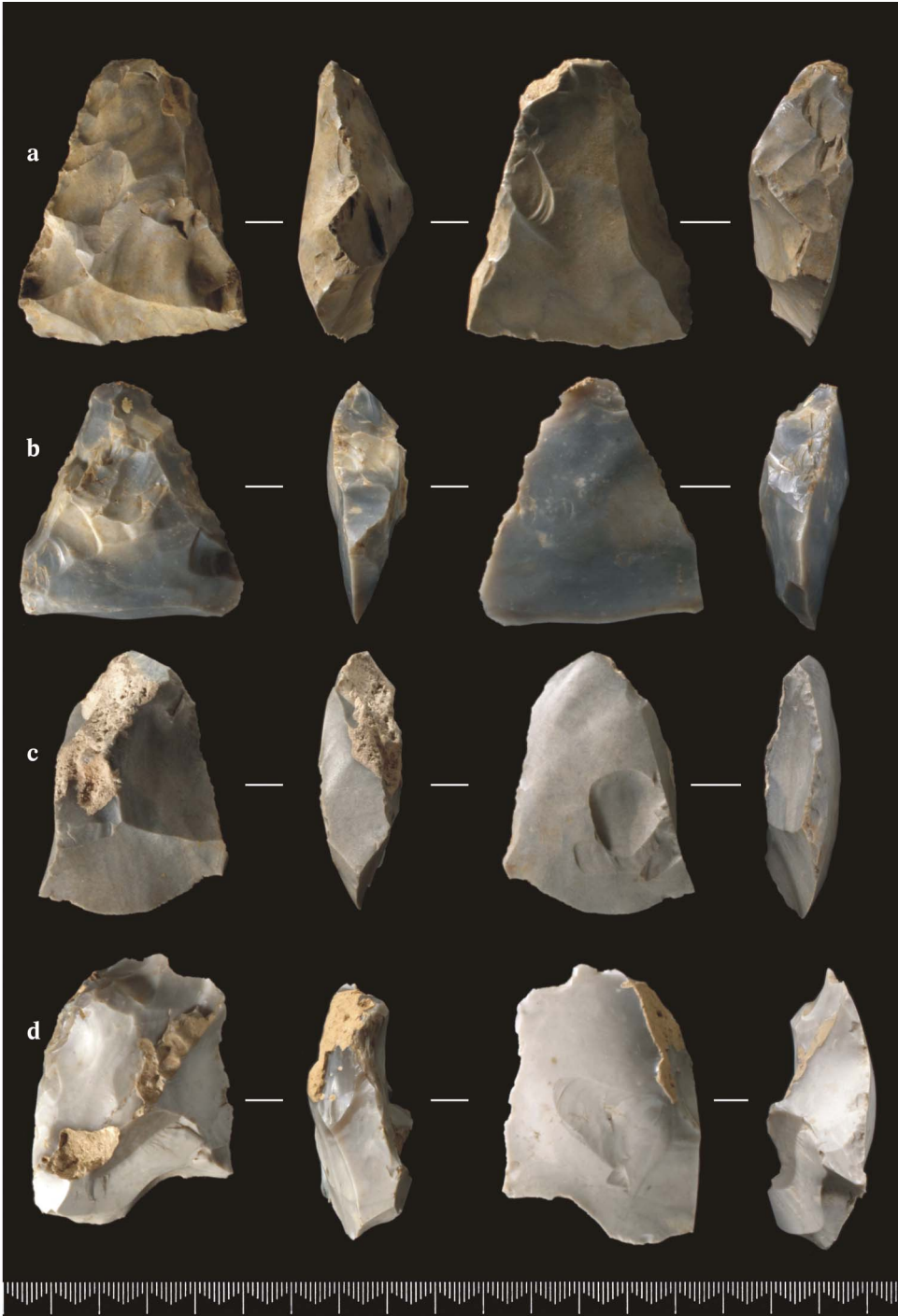


Fig. 4. Flake axes of flint from the Preboreal site Pauler 4, Vestfold, Norway. Photo and copyright Museum of Cultural History, University of Oslo.

The Preboreal flake and core axes are not so commonly found as the Nøstvet axe, but their close connection to the coast makes it likely that this artefact also has something to do with the production of transportation means – most likely boats. The almost total lack of flake axes on the *late Glacial* and *earliest Preboreal* inland sites in Scandinavia (Petersen 1993, p. 94, Bjerck 1994, Bang-Andersen 2003, Sørensen and Sternke 2004) makes it unlikely that they were in frequent use in the production of sled runners, skis or other means of winter transportation.

We do not know what type of boat was in use in the Preboreal period. Most Norwegian researchers have suggested skin boats. Although this is not unlikely, it is important to remember that the climatic conditions were favourable and coniferous forests were established on the continent, at least in the latter part of the Preboreal period (after the PBO (Björk *et al.* 1997, Starkel 1991, Bos *et al.* 2007, cf. Prösch-Danielsen 1993, Bang-Andersen 1996 for Norway). Finds from Norway also indicate that a luxuriant flora was established very early (Bang-Andersen 2000). This makes the presence of another boat type likely, namely the log boat.

EARLY EVIDENCE FOR BOAT PRODUCTION: LOGS, AXES AND THE GENERATION OF FOREST

From the Netherlands and Great Britain logs of pine (*Pinus*) shaped into unfinished boats or very large coffins or troughs are known (Fig. 5). The object from Pesse in the Netherlands is dated to the beginning of the Boreal period (Lanting 1998). The concavities in the wood are made by fire (Burov 1996); hence, a significantly different production technique compared to the late Mesolithic material. These finds demonstrate the *availability* of logs of sufficient size for the making of log boats, and that the *technology for making such canoes was known* at latest at the beginning of the Boreal period.

It is plausible that the hollowed pine log from the Netherlands was intended as a boat, judging from its size and shape (see principal discussion in McGrail 1987, p. 57, Lanting 1998). From France three dugouts of pine are known. They are only slightly younger than the vessel from Pesse; consequently, the Pesse boat is not unique in a northern European context (see also Rieck and Crumlin-Pedersen 1988, p. 13 concerning early Danish evidence). Lanting (1998) has



Fig. 5. The log boat from Pesse, Netherlands, approximately 3 metres long. The oldest known boat from Europe. Photo and copyright Drents museum, Assen, Netherlands.

emphasized that these vessels must be considered as part of the same north-western European tradition of dugout production that is recorded in late Mesolithic southern Scandinavia. The finds from the Netherlands and France demonstrate that this tradition stretches back in time at least to the beginning of the Boreal period. Bengt Nordqvist has interpreted fragments of resin or tar from the site Huseby klev in Bohuslän as traces of repair or impregnation of dugouts. Fibres of wood preserved in the resin are from aspen (*Populus* spp.), a soft tree very suitable for making log boats (Hernek and Nordqvist 1995, p. 134, cf. Christensen 1997). The tar is dated to the first part of the Boreal period (Nordqvist 1998, p. 108). This could be weak evidence for the presence of log boats in central Scandinavia approximately contemporary to the find from Pesse.

Some scholars have emphasized, in favour of the theory that skin or bark boats preceded the dugouts, that paddles are documented in archaeological contexts at a much earlier stage than log boats. This argument is, however, not well founded. According to Lanting (1998), the oldest paddles from Denmark are from the Boreal Holmegaard and Ulkestrup sites. They are not older than the Pesse vessel and, as stated by Lanting, they can be considered as part of the same transport technological tradition or complex (Fig. 6). Even when paddles from the rest of northern Europe are included, there are few reliable datings older than the transition between the Preboreal and Boreal periods (Burov 1996, Lanting 1998). None of these finds can therefore be considered much older than the log boat tradition.

Other arguments in favour of prehistoric skin and bark boats from Europe are weak. The antler piece from Husum in Schleswig that is interpreted as part of a late Palaeolithic skin-boat frame (Ellmers 1980, 1984, Tromnau 1987) is rejected by maritime archaeologists (Rieck and Crumlin-Pedersen 1988) and the object has recently been dated to the late Mesolithic (Weber *et al.* 2011).

Bark boats cannot be older than the appearance of forest. It is demonstrated that the occurrence of such vessels in the northern hemisphere is very dependent on the presence of white birch (*Betula papyrifera* Marsh.), a tree found to be native in North America only (Ritzenthaler 1950, McGrail 2001). There is only a small, oral tradition for bark boats in northern Scandinavia and no finds are documented (Westerdahl 2010). It is therefore tempting to support the suggestion of Peter Vang Petersen (1993, p. 13) that dugout canoes were a common vessel also in the Preboreal period.

When mature forest is present and sufficient trunks are available, log boats seem to have been a popular vessel for everyday transport all over the world (Hornell 1970, p. 189, McGrail 2001, Christensen 2004, p. 118). Easy maintenance and robustness, compared to skin and bark boats, are among their assets. A crucial factor for the presence of dugout canoes in the Preboreal period is therefore the generation of forest after the Ice Age.

Submerged pine forest found in the Baltic countries is dated back to approximately 9300 cal. BC (Žulkus 2012). Large trunks are known, suitable for log-boat production. Sea-level rise in this part of the Baltic Sea must have contributed to a rich supply of driftwood, transported with the Baltic and Gulf stream along the Norwegian coast. The same process was probably also operating close to the outlets of the continental rivers and on the shores of the Atlantic Ocean. Driftwood was therefore presumably present all along the Norwegian coast, securing sufficient supply for boat production. There are actually strong indications for the presence of driftwood all the way up to Finnmark in northern Norway: at a trial excavation of an early Mesolithic site in Karlebotn, Finnmark, a charcoal sample of pine was dated to 9940±101 BP (9900–9200 cal. BC) (Grydeland 2003). As Sveinung Bang-Andersen (2012) has pointed out, pine forests were not established before approximately 7000 cal. BC in Finnmark; it is therefore

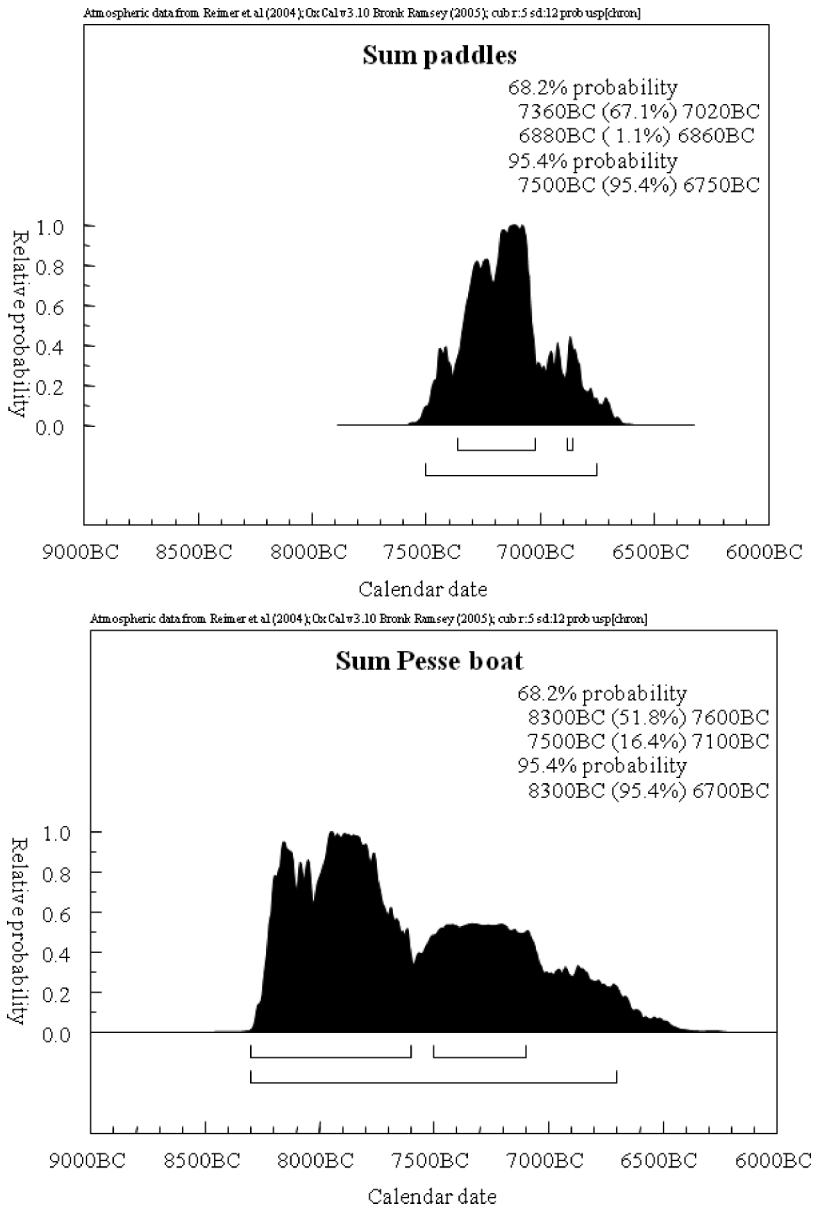


Fig. 6. The dating of the oldest dated paddles from Denmark (top) and the log boat from Pesse, Netherlands (below). As can be seen, the log boat tradition cannot be considered much younger than the presence of paddles. On the contrary, the dugout seems to be slightly older. Source: Lanting (1998).

very likely that the sample is taken from driftwood.

The northern European evidence indicates that the oldest log boats were made of pine, most likely because pine is the first species

available for making dugouts in this part of the world (Lanting 1998). There is also evidence for a different production technique for this type of wood compared to the production of boats from deciduous trees, because fire

seems to have been used to make the cavities (Burov 1996, cf. Rieck and Crumlin-Pedersen 1988, p. 13). *The flake axe could have been a tool in such a production process.* It would have been suited to shaping the logs (Forsström and Holberg 1998, cf. McGrail 1987, p. 64), maybe in combination with fire. Hence, the edge did not need the same qualities as that on Nøstvet axes or other core axes from the late Mesolithic. Additionally, antler axes could also have been used to hollow the log. This was actually demonstrated experimentally in 1986. A log from a lime tree (*Tilia* spp.) was shaped into an elegant boat by the use of flake and antler axes at the Djurslands Museum in Denmark (E. Kannegaard, pers. comm., 5 September 2012). It could also *sensu lato* be mentioned that the felling of pine trees and the making of log boats with axes similar to the Preboreal flake axes are actually documented in ethnographic sources (Champlain 1613 in Fowler 1975). It is also widely demonstrated ethnographically that log boats of pine are hollowed by use of fire in combination with axes.

It is therefore interesting to note that *approximately at the same time as the Norwegian coast is colonized, flake and core axes start to appear on lake sites in Denmark, as does mature forest* (Petersen 1993, Aaby 1993, Sørensen and Sternke 2004, cf. Fuglestedt 2001, p. 104). The claim that the Norwegian axes are older than the Maglemose 0 phase or the so-called epi-Ahrensburg (what we in Norway would call Fosna sites) cannot be sustained by available ^{14}C datings (Fig. 7, cf. Terberger 2004). The datings actually indicate that the Norwegian axes should not be considered much older than the first axes found south of the Skagerrak.

Keeping in mind that the axes were probably used in combination with marine life and communication, an interpretation of the flake axes could also be that they were used to flange the hide of sea mammals for skin-boat building. Another recent hypothesis is that the axes were used for extracting seal blubber, the raw material used to waterproof the skin boats (Schmitt 2013, see also Schmitt 1995).

There have been few use-wear analyses of flake axes from Scandinavia. They were all carried out at an early stage in the development of use-wear analysis in Scandinavia and should therefore be treated with caution (H. Knutsson, pers. comm.). *One such analysis on axes from the Atlantic period indicated that the tools were used mainly on soft materials, as some kind of scraper or flange knife (Knutsson 1982, p. 90), but they could also have been used as adzes for chopping wood* (Knutsson 1982, Forsström and Holberg 1998). A small use-wear study of flake axes from a Preboreal site in western Sweden also indicates that these axes were used as scrapers on skin but also on harder materials (Thorsberg 1985). Use-wear analyses from the axes from Skateholm site, dated to the late Mesolithic, revealed a varied use of the axes, including butchering activities and woodworking (Jensen 1988). The axes used in the log-boat production at Djursland Museum were also examined for use wear. The wear on these axes matched use wear from axes of the Ertebølle complex (E. Kannegaard, pers. comm., 5 September 2012). There is therefore evidence in favour of a functional connection between flake axes and skin preparation. Evidence for woodworking is, however, at least equally strong. In favour of the latter interpretation is also the *simultaneous appearance of forest and axes in Scandinavia*. If the axes were used primarily for hide working and butchering this synchronous appearance should not be expected. The results from the use-wear studies do not, however, give any decisive conclusions concerning the prehistoric use of flake axes.

THE LENGTH OF THE COLONIZATION PHASE AND CONSEQUENCES FOR THE LEVEL OF TRANSPORT

Whatever flake axes were used for, they were no doubt important artefacts in the rather rapid colonization of the Norwegian coast (Bjerck 1994, Bang-Andersen 2003). *The question is, however, how speed can be measured by archaeological means (cf. Blankholm 2004).*

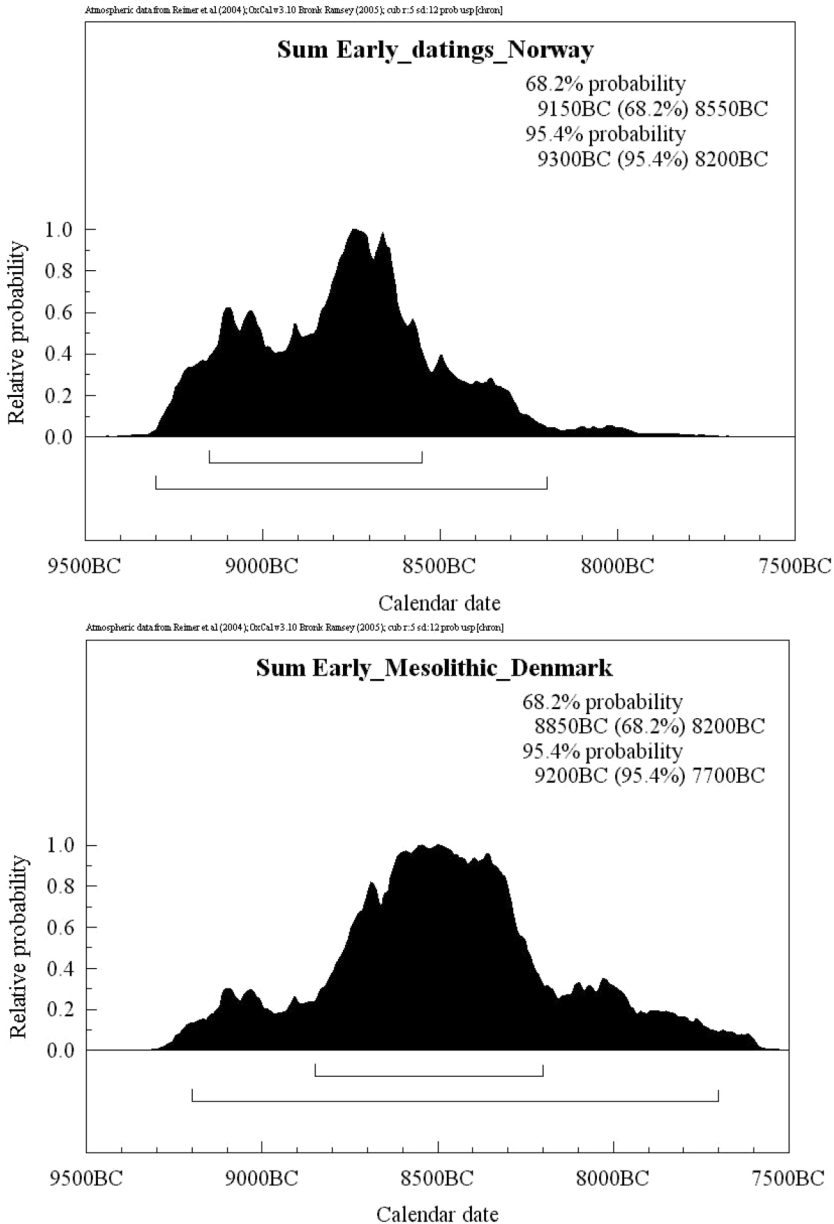


Fig. 7. The sum of Preboreal datings of Stone Age Fosna/Komsa sites in Norway and ^{14}C dating from early Mesolithic sites in Denmark. Source: for Norwegian datings see Fig. 1, for Danish datings, Sørensen and Sternke (2004).

Contemporary datings can represent several hundred years of human settlement. This must be emphasized for the Preboreal period because the calibration curve for ^{14}C corrections is

particularly flat in this period, giving a very wide dating frame (Reimer *et al.* 2009). The colonization process could have taken around 300 years (Bjerck 1994), maybe even more.

judging from available ^{14}C datings. On the scale of a human lifespan this is quite a considerable time. Along the coast, it is demonstrated that the use of raw materials for tool production varies (e.g. Woodman 1993, Hood 1995, Blankholm 2004). This heterogeneous collection of raw material, taken from local sources, indicates that *the colonization process did not proceed at a very high speed and with high human mobility*. Adjustment to local raw materials is normally interpreted as indicating the presence of a stationary population (e.g. Binford 1979, Fitzhugh 2004, see also Andrefsky 1994 for discussion). If people had regularly undertaken rapid long-distance movements along the coast, one would expect a more homogeneous distribution of raw materials in use. *The adoption of a local raw material strategy is a very significant pattern of Mesolithic Norway* (A.B. Olsen 1992, B. Olsen 1994, Glørstad 2010). This does not imply that transportation of raw materials did not occur throughout this period (e.g. Alsaker and Olsen 1984, Hood 1994), but my point is that such a distribution was within a limited geographical range such as social territories or areas for foraging. Hence, the pioneer situation does not differ significantly from the rest of the period.

The use of local raw materials for tool production in areas where flint nodules were rare enhances the idea of a semi-stationary settlement system, with more limited communication than is normally considered for the early Mesolithic. Communication with log boats fits well into such a scenario. If skin boats were in use, the local raw material profiles could imply that these boats were not much better for sea travel than log boats – or that there was no need for or tradition of long-distance travel. As far as I can see, it is not necessary to postulate a fundamentally different pattern of transportation in the early Mesolithic compared to the later Mesolithic periods in order to explain the archaeological record. Inside the time interval that the ^{14}C datings represent, the whole

coastline could have been settled without any regular long-distance travelling. The strong pattern of chronological continuity concerning site location along the coast as well as the stable sea-axe affinity throughout the Mesolithic could be interpreted as a basic historical structure of economy and communication. Axes, boats and marine life were always connected as a fundamental part of the coastal life form.

MOBILITY: EVIDENCE FROM RAW MATERIALS AND TECHNOLOGICAL CHANGES

Emphasizing the local contextualization of the raw-material profile might look a bit contradictory to the observant reader, because several scholars have noticed that in the early Mesolithic the situation is actually the opposite. In western Norway in this period there is a demonstrably higher frequency of flint use than in later periods. Flint is normally considered an exotic raw material in this part of the country. Bjerck (2008b, p. 553) has, however, given a plausible reason for the early Mesolithic situation: in his opinion, flint was a local raw material in western Norway at that time because this part of Norway was exposed to the stream distributing sediments throughout the Norwegian Trench in the Ice Age (cf. Andersen 2000, pp. 32–33). Later on in prehistory this area was not affected by sedimentation originating in the Baltic Sea/Lake. So, in this early period of the Mesolithic flint was an available local raw material in the western part of Norway too. In the rest of southern Norway flint is in common use along the coast in large parts of the Mesolithic.

This model is actually also confirmed by the much disputed Blomvåg find, situated close to Bergen in western Norway. The find is dated to the Bølling period (Lie 1990) and consists of a mix of marine and terrestrial species and flint pebbles, therefore considered as traces of a human

settlement site. A re-examination of the material by Bjerck (1994) concluded that the assemblage was a natural deposition. This was confirmed by two independent analyses of the presumed artefact material from the site (Eigeland 2012, Fischer 2012). Of importance, however, is the relatively abundant presence of flint at the site. This demonstrates that flint nodules were naturally transported to western Norway in the late Glacial period and can therefore be considered as a locally available raw material in the first part of the Holocene.

A further objection to the argument of local distribution and small-scale movements has also been raised on a technological basis. Several scholars have noted a remarkable similarity in technological profiles of the Norwegian early Mesolithic (e.g. Fuglestad 2001, 2012, Waraas 2001, Bjerck 2008a). This is taken as a strong indication of a very mobile population. This is of course an important point. The problem with the argument, however, is that it is only outstanding when presented in isolation. Again, things look different if the whole Mesolithic period is taken into consideration – not that it is wrong to state that there are technological similarities in a large geographical area in the early Mesolithic, but similar evidence for widespread technologies can also be found at later stages, even in periods marked by a strong regionalization. The handle core tradition, for instance, is introduced at the transition to the late Mesolithic in an area actually much larger than where the early Mesolithic Fosna/Komsa-sites can be found. This tradition spread at a high speed and, noticeably, in societies commonly considered regionally anchored (Forsberg 1996, Knutsson 2005a, Manninen and Knutsson 2011). Consequently, the presence of a widespread technology in the early Mesolithic need not indicate a very high mobility. Instead, it could indicate sufficient networks of contact were established at an early stage. Actually, clear breaks and leaps in the distributional patterns

could be an equal or even better indication for mobility.

EVIDENCE FOR OVERSEAS TRAVEL AND THE SIGNIFICANCE OF THE NORTH SEA CONTINENT

A second case study from archaeology could take the retrospective argumentation further. Moving to the end of the Stone Age, around 2400 cal. bc the systems of communication are totally altered. Throughout the Mesolithic and the Neolithic, almost all sea traffic is coast bound. At the transition to the late Neolithic, this pattern changes dramatically. From this period on there is good evidence for overseas traffic directly across the Skagerrak basin (Apel 2001, Østmo 2005, 2011, Kvalø 2007, Prescott 2011). Distances of more than 160 kilometres of open water were crossed. During the journey, land must have been out of sight for several hours. Many scholars have concluded that the beginning of overseas travelling is connected to a new way of making boats, enabling journeys under tougher conditions. Such boats could have been sewn plank boats in principle not very different from the Hjortspring vessel of the early Iron Age (Crumlin-Pedersen and Trakadas 2003). Access to copper and bronze tools in the late Neolithic made the production of planks easier. It is therefore claimed that the first seafaring vessels in this part of the world were plank built boats, manufactured by early metal-using societies in Denmark and Norway (Østmo 2011).

In my opinion the late Neolithic source material is the oldest really convincing evidence for overseas traffic in Scandinavia, demonstrating regular sea voyaging in prehistory. This is the only Stone Age assemblage in Norway where the ¹⁴C datings, the material record and the distributional patterns of artefacts clearly mark a break in the historical development, with a new route of communication (Prescott 2009, 2011). The strong Bell Beaker influences in western Norway from the transition to the late Neolithic can best be

explained by overseas traffic between Jutland and Rogaland/Lista – a route of communication that did not exist earlier (Prieto-Martínez 2008, Prescott and Melheim 2009).

This is a very different system of communication compared to the Mesolithic situation of small-scale movements. The latter pattern, however, fits well with the observation recently made by Bjerck that the Preboreal route of communication closely followed the present Norwegian coast. Therefore, according to Bjerck, the Bohuslän area of Sweden was the foothold for the colonization of coastal Norway (Bjerck 2008a, p. 86, see also Waraas 2001, Schmitt *et al.* 2006, Bang-Andersen 2012). He has therefore changed his original hypothesis, where he presumed that the now submerged landscape between Great Britain and Denmark, the North Sea Continent, was the original base for colonization of the Norwegian coast (see also Bjerck 1989, Indrelid 1989, Bang-Andersen 1996, 2003, Fuglestedt 2001). Bjerck's new model is also much more in line with the record of southern Scandinavia where early human settlement shows a marked easterly orientation in the late Pleistocene and early Holocene (Jensen 2001, Pedersen 2009), presumably due to much better ecological conditions for human survival in these areas (Fischer Mortensen *et al.* 2008, Fischer Mortensen 2011).

These data point towards an easterly immigration route into Norway, via the Swedish west coast. From this perspective it is interesting to note that it is not before a sheltered archipelago is established in the Oslo fjord that the first settlements appear along the Norwegian coast (Fig. 8, see also Pässe 1996, Pässe and Andersson 2005; for background research, see Sørensen 1979, R. Sørensen *et al.* in press). Even though the west coast was ice free and inhabitable from the Allerød (Wishman 1979) *it is when sheltered passages are established between present Norway and Sweden that humans seem first to colonize the Norwegian coast.* This is a strong indication for colonization through small-scale sea

traffic closely following the coast. This communication line along the Swedish west coast to the Oslo fjord is very durable. Before the transition to the late Neolithic, it appears as though almost all communication with southern Scandinavia followed this corridor (Glørstad 2011). Still, I think the North Sea Continent must be taken into consideration from another angle. Admittedly, there is nothing in the Norwegian archaeological record that can be explained only by reference to human activity at the present continental shelf (Bjerck 1994, 1995). But the presence of a huge land ridge between Britain and Denmark created a different meteorological and hydrographical situation in the Preboreal period than in the present (Coles 1998, 1999, Wishman 1979). This land must have created a much more sheltered maritime environment, at least in southern Norway, than for the rest of the Stone Age. Thus it is interesting that some scholars have noticed that regionalization and local developments accelerated parallel with the overflowing of the North Sea Continent in the late Boreal period (Price 1991, Olsen 1992, Larsson 2005). The enhanced regionalization could be due to a more oceanic climate and landscapes with a more dominating ocean presence (Glørstad 2010, cf. Wishman 1979, p. 124). With the less favourable conditions for sheltered traffic that developed parallel to the diminishing land ridge between Denmark and Great Britain, the range of communication could also have diminished because the open sea made travelling more difficult and time consuming. This again, could have led to increased regionalization.

TRAVEL BY LOG BOATS

When discussing log boats many researchers have claimed that they were not suitable for open sea voyages (e.g. McGrail 2001, p. 172). For some reason, several Norwegian researchers seem to have, more or less implicitly from this statement, concluded that it would have been impossible to travel along the Norwegian coast

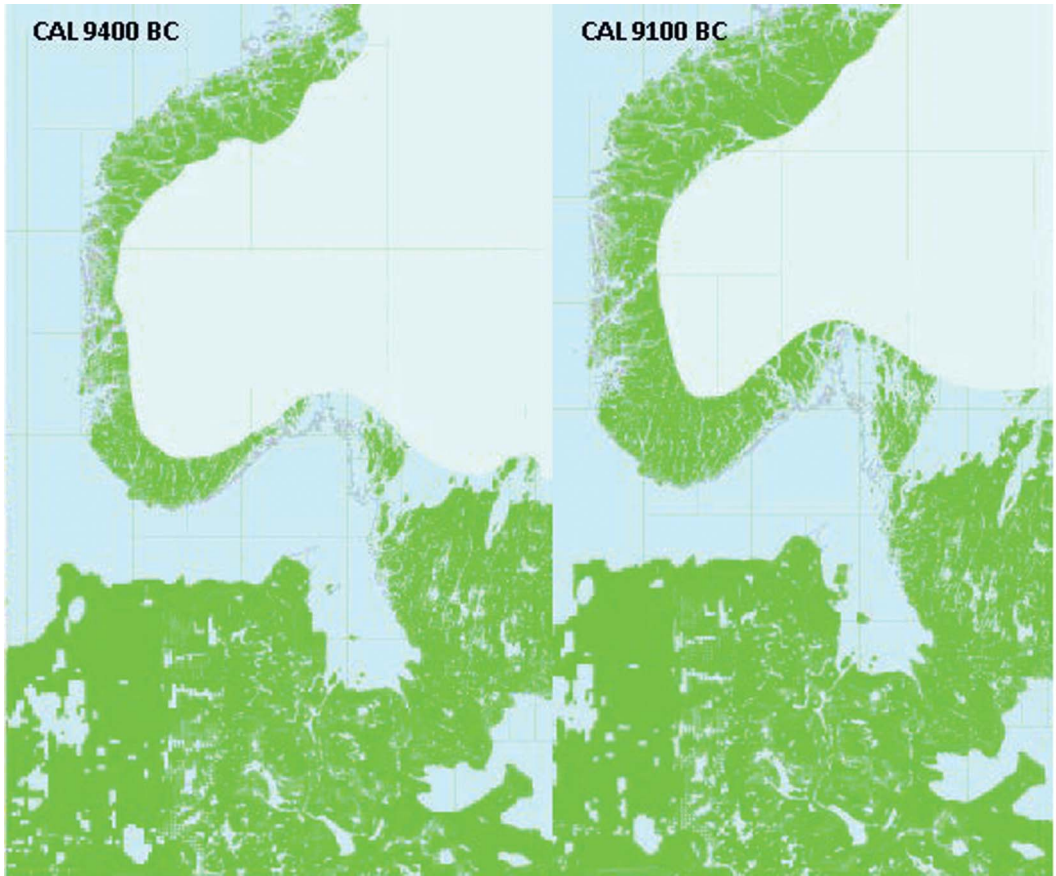


Fig. 8. *The relations between land, sea and glacier 9400 and 9100 cal. bc in southern and central Scandinavia. Note how a sheltered passage is opened through the Oslo fjord area around 9200–9100 cal. BC, giving access to the Norwegian coast via the Swedish west coast. Map from www.sgu.se/sgulsv/geologi/geologi_sverigeljordstrand_intro.htm (Påsse and Andersson 2005).*

in the Preboreal period with such vessels. The presence of Fosna sites on exposed islands is taken as an evidence for a seafaring technology superseding the log boats. There are several questionable elements in this conclusion. It is certainly true that log boats are not the best vessels for overseas travel. Still there are quite strong indications that daring journeys were taken by log boats. In the Neolithic distances of 50 kilometres of open water were crossed (S. Österholm 1988, I. Österholm 1989, Malmer 2002, Lindström 2003) with vessels that most likely were dugouts. At least we do

not know other types of boats from the Scandinavian early and middle Neolithic (Crumlin-Pedersen and Trakadas 2003). Fredrik Hallgren (2008, p. 53) has pointed to a find from Helsinki in Finland. This boat is interpreted as an extended dugout, also known from historical sources. The find is dated by pollen analysis as older than the late Neolithic. It is also suggested that similar techniques were applied in the production of some of the large, late Mesolithic log boats from the Ertebølle complex (Crumlin-Pedersen and Trakadas 2003). These finds appear as interesting, yet only indicative

evidence. Nevertheless, the Neolithic material strongly indicates that quite hazardous voyages could have taken place in Scandinavia by means of log boats. Replicas of dugouts have been used for crossing the strait between Öland and Gotland in the Baltic Sea and the Öresund strait between Sweden and Denmark. The voyage to Gotland was so long that land was out of sight for a few hours of paddling (Österholm 1988). These voyages are, however, not comparable to the overseas journeys in the late Neolithic. Crossing the Skagerrak implies distances of open water for more than 160 kilometres.

Although long voyages occurred in the Neolithic – up to 50 kilometres can be documented in Scandinavia – one cannot conclude that all kinds of waters were easily mastered by the available boat technology. These journeys were rare and daring enterprises (cf. Lindström 2003). Bergsvik (2005) has demonstrated this. Studying ethnic groupings and boundaries along the Norwegian west coast by means of distribution of artefact groups, technology and raw materials he recognizes the cape Stad as a very stable and significant boundary in the late Mesolithic and particularly in the Neolithic. Even today the Stad Sea is considered as difficult water to cross for quite large ships. It must have been even worse in the Stone Age given their means of transport. It is quite obvious to me that the difficulties in passing stimulated the creation of the ethnic and cultural border at this particular place (cf. Bergsvik 2005, p. 20). If the boats of the Neolithic in Scandinavia represented a full overseas boat technology, or truly seagoing vessels, this cape should not have caused this kind of threshold. In my opinion, the distribution of archaeological materials on the Norwegian west coast therefore demonstrates the coast-bound small-scale character of the communication technology in the Neolithic. Voyages to Gotland or across Kattegat were the absolute limits for this coastal traffic.

Crossing long distances of open water seems to be even rarer in the Mesolithic. All Mesolithic sites known in Norway are, for

instance, reachable by coastal navigation. They are therefore also reachable by dugouts insofar as the journey is carried out under certain conditions. This was demonstrated by the experimental crossing of the Öresund strait: the *clue was to be patient and wait on land until the weather was calm enough for paddling* (Christensen *et al.* 1979). Judging from the distribution of Mesolithic sites, people very seldom travelled distances longer than 10 or at most 20 kilometres of open water. The chances should therefore have been quite good for relatively predictable travel.

The island Vega in Nordland County is situated at the outer coast of northern Norway. Here, a few Preboreal sites are known (Bjerck 1990). Vega is a good example of the exposed situation of some of the Preboreal sites. At that time the distance between Vega and the mainland was 16 kilometres. Judging from present performance, this distance could have been paddled in a few hours. Even in such an exposed setting there are enough days with calm weather, enabling crossing of open water in simple vessels. Of importance, however, is the possibility of *waiting* for good paddling conditions. Hence, on Vega several hut sites are interpreted as boat stations where the hunters and fishermen could take shelter in stormy weather (Bjerck 1990, pp. 17–18). It is tempting to think that similar systems existed all along the exposed parts of the Norwegian coast, making coastal travel more comfortable and secure. The presence of Preboreal sites at islands such as Vega need not imply, however, that boat technology was superior to the Mesolithic boats so far known.

Although the log boats did not match the seaworthiness and security of the means of water transport that is documented ethnographically for instance in the Thule culture, this does not mean that they were totally unsuitable for coastal traffic, fishing and hunting. Solidity, robustness and easy maintenance would have been among their assets. In everyday life these are qualities that should not be underestimated. This touches upon one

important point in the discussion of ancient coastal traffic. This is the context and reason for travelling on the sea. Scholars regularly point to modern voyages made by kayaks, where for instance the whole Norwegian coast is covered in only a few weeks (e.g. Bengtsson 2003). This is taken as an indication of high mobility in the Mesolithic, because the modern journeys are made by relatively primitive vessels and powered by human muscle alone. There are, however, several reservations that must be made regarding this conclusion. As already emphasized, the kayak cannot be considered a very ancient means of transport. The distances covered with such a boat can therefore not make up a measure for Mesolithic journeys. Second, the modern context of these long-distance journeys is very different from a prehistoric one. The modern infrastructure allows for a more risk-willing attitude towards the weather and the sea without dramatically reducing the odds for survival. Third, time is an underestimated risk factor. When performing the modern high-speed journeys the chances of travelling in rough weather are high. Consequently the seaworthiness of the vessels seems to be a much more important factor than if time is of little importance during the journey. If the ambitions concerning speed and average distance per day are less demanding, more modest vessels can be used with relatively high security. Taking the suggested time span for the colonization of the Norwegian coast into consideration, that is at least 300 years, it is, as already emphasized, not necessary to base opinions on seaworthiness on present high-speed performances. Finally, it has actually been demonstrated that throughout all of Norwegian history fatal accidents regularly occurred during coastal journeys because the boats could not master the harsh weather. It is very reasonable to think that this was the case in the Stone Age too. Although patience and care were the guiding lines for coastal movements, it is realistic to think that accidents regularly happened. In historical times this did not prevent

people from travelling. There is no reason to think it otherwise in prehistory. I have discussed elsewhere (Glørstad 2008) that even in modern colonizing history knowledge and the availability of superior technology for safe and secure travel need not imply that this technology is actually adopted. Other factors, such as tradition, prestige, culture and economy greatly affect the choice of travelling equipment. Therefore, our knowledge of the great Thule transport technology does not by necessity imply that this was common knowledge or means in the Preboreal period.

LONG-DISTANCE TRAVEL IN THE EARLY AND MIDDLE MESOLITHIC

The hypothesis of small-scale movements along the Norwegian coast in the Preboreal period fits well with possible evidence for long-distance travel in the first part of the Mesolithic. The **Sujala site from northern Finland** is dated to the transition between the Preboreal and Boreal period (Rankama and Kankaanpää 2008, Kankaanpää and Rankama 2009, 2011). Here, evidence for a blade technology based on a highly elaborated pressure technique, connects this site to archaeological techno-complexes in Estonia and, more decisively, in Russia (Kriiska 2001, Rankama and Kankaanpää 2008, Kankaanpää and Rankama 2009, 2011, Takala 2009). **Most likely the Sujala site demonstrates the presence of eastern pioneers travelling fast on land in the winter. Skis and/or sleds could have been used as means for fast travel** (M. Sørensen *et al.* in press).

In Sweden, Finland, the Baltic countries and Russia, several sled runners and skis are dated to the Stone Age (Manker 1971, Burov 1988, 1996, Naskali 1999, Zvelebil 2006). A Neolithic sled runner found in Finland seems to have been made of pine that grew east of the Ural Mountains (Edgren 1993, p. 67). **This provides striking evidence of long-distance contacts and travel on land in this phase of prehistory. The oldest sled runner from Finland is dated to the beginning of the**

Boreal period (8250–7680 cal. BC, 8850±90 BP, National Museum of Helsinki), indicating that winter transportation technology was present at least at the transition between the Preboreal and Boreal period.

Jan Apel and Kim Darmark have demonstrated the far-reaching channels of communication integrating Eurasia from the end of the Preboreal period. Important technologies such as bifacial reduction strategies (Apel and Darmark 2007, Apel 2011), dog hunting (Riede 2011) and pottery production (Hallgren 2005) are distributed along these channels by hunter-gatherers.

An equally far-reaching channel of communication seems not to have been established on sea until the late Neolithic in Scandinavia. I think that the combination of a new progressive metal technology that facilitated the construction of complex gear and the rise of expanding European elites probably made seafaring boats possible and attractive at the end of the Stone Age (Kristiansen and Larsson 2005).

CONCLUDING REMARKS

The marked coastal distribution of early Mesolithic axes and sites is puzzling when it is studied in isolation or with a Palaeolithic backdrop. Inside a broader Mesolithic time horizon however, this pattern fits well with established trends. The general understanding of Mesolithic coastal life is equally relevant to the initial phase as to the rest of the period. The stable pattern throughout the period of coastal sites with axes is most likely the reminiscences of small-scale sea traffic in boats with only moderate seagoing abilities. My hypothesis is that these vessels were log boats, but they could also have been simple skin boats, maybe similar to the American bull-boats (Mason 1889). In favour of the log boat hypothesis is certainly the early appearance of *such* boats in north-western Europe long before other types of vessels are known, the synchronous presence of available mature forest and of the first humans in post-Glacial

Norway, and finally the presence of such boats as means for coastal traffic throughout the rest of the Mesolithic period.

Discussing the Preboreal colonization phase of northern Europe, parallels from present or recent Arctic hunter and gatherer societies are often used as analogies (see discussion in Hood 1995, Riede 2007). Inuit societies, as documented by ethnography and archaeology, are, however, relatively recently established in the Arctic. Their highly specialized technology can therefore not be considered as some kind of original gear for arctic survival. As far as we know from archaeological sources, man-pulled sleds and skis were the most efficient fast transport technology for the (Pre)boreal pioneers. Attempts to connect *umiak*-like skin boats to Norwegian prehistory by comparing their silhouette to boats on north Norwegian rock carvings (e.g. Gjessing 1936, Brøgger and Shetelig 1951, Marstrander 1963) is clearly somewhat speculative and does not contribute decisively to the argument discussed here. To draw on equal sources from ethnography, the same silhouettes can for instance be found on dugouts from North America (e.g. McGrail 2001, p. 425). What these pictures actually show is that such open boats were more than sufficient for performing the coastal life we know from the Scandinavian Mesolithic.

This life, as shown many years ago by Johan Alin (1935), was dependent on the forest. In their marine adventures, they still were a forest people. At the late Mesolithic site Rottjärnslid in Bohuslän a shell midden, indeed dominated by marine species, also had terrestrial mammals preserved in the shape of tools used for harvesting the sea. The large mammals of the forest were the precondition for marine subsistence. Rottjärnslid is only one example among many. The Almeö site from Lake Hornborga shows us that the pioneers on the Scandinavian Peninsula were living in a forested landscape, hunting forest animals such as wild boar, beaver, elk, deer, aurochs and bear (Kindgren 1995). Not only were the forest animals a

precondition for marine foraging, to me it appears that the forest itself, in the shape of log boats, bore the colonization process. From this perspective it is no surprise that the different deer species, the elk as the most outstanding figure (Lindqvist 1994), are the favourite motif of the hunter's rock carvings. This great animal and its forest were the backbone of the coastal way of life throughout the Mesolithic.

It is never easy to obtain an encompassing view on archaeological interpretations. Different perspectives certainly give different conclusions. The ethnographical, Arctic analogies and the Palaeolithic perspective can indeed lead to several important viewpoints and conclusions about the early Mesolithic. My point is, however, that such assets can also be found by using archaeological retrospective analysis. Certainly this method also has its obstacles and limitations. However in the Preboreal setting this perspective can in fact shed light on some critical structures of the Norwegian Stone Age usually left out of the discussion. Instead of analysing the pioneer phase in

Scandinavia as merely a purported illustration of an ethnographic present or with reference to some kind of analogue, the significance of the archaeological record itself could be invoked in new ways. By taking the long-term retrospective into consideration, the patterns of *continuity* in the Mesolithic are made relevant. Importantly, significant aspects of the boat-building tradition seem to be stable throughout the Mesolithic. There are good reasons to believe that the boats were mainly vessels for coastal traffic in sheltered water. With the development of a more Atlantic hydrography and climate, regionalization therefore increases. The great change in the Scandinavian history of communication comes with the late Neolithic, plank built boats, metal craft and elite networks throughout Europe. This is an historical watershed (Prescott and Glørstad 2011). It is therefore tempting to claim that the process of colonization was only an interlude in a long tradition for a certain way of life (cf. Schmitt 1995, Bailey and Milner 2002, Fischer 2005, Schmitt *et al.* 2006, 2009, Larsson 2009,

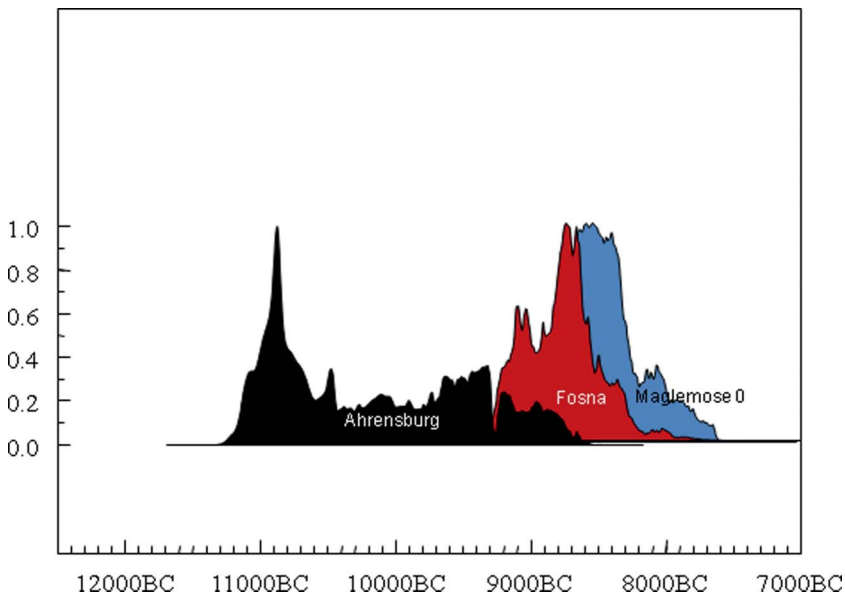


Fig. 9. Sum of datings of the Ahrensburg, Fosna and early Maglemose complexes. Datings of the Ahrensburg complex taken from Weber *et al.* (2011); for Fosna, see Fig. 1, for Maglemose, see Fig. 4. As indicated by the figure, the Fosna sites define a transition from the late Ahrensburgian to the early Maglemose datings and hence also the beginning of the early Mesolithic of northern Europe. Calibrations done in Oxcal 3.10.

Nordqvist 2009). Consequently, the Norwegian material need not be unique, but rather represent the preserved source material of a common European life form. The claim that the earliest Mesolithic in northern Europe is poorly documented and understood (Pedersen 2009) can only be due to ignorance of the source material available. The early Mesolithic in this area is well documented in the form of the Fosna/Komsa complex (Fig. 9, Bjerck 2008b, cf. Schmitt 1999, Schmitt *et al.* 2009).

Do we need the missing masses for our archaeological analyses? The example of the missing boat in a way underlines the seemingly inferior position of archaeology in relation to sociology and anthropology, which have full access to human societies; as archaeologists we can only illustrate the superiority of their data by our fragmented archaeological record. This servile attitude concerning the significance of archaeology to social research also echoes the old archaeological desire for the key site and the key find that will shed sharp light on prehistory (Glørstad 2006). Implicit in this view is that most sites and findings are of little interest to research. To me, such a perspective takes advantage neither of the actual potential of the archaeological record that is available nor the potential for *mutual* interdisciplinary perspectives. Archaeology *can* make significant contributions to the understanding of human history and societies. **The boats are not missing in the prehistoric record if we look at the sites actually enlightened by means of archaeology. Their presence defines something significant in early European**

history – a social conjuncture that gave shape and direction to the western Mesolithic world.

ACKNOWLEDGEMENTS

I would like to thank Fredrik Hallgren and Felix Riede for their thorough and stimulating comments as peer reviewers. I would also like to thank the editorial board of the *Norwegian Archaeological Review* for several interesting viewpoints and suggestions for how to improve the manuscript. I am very grateful to Susan Braovac who reviewed the English usage. I have discussed this paper with Per Persson, Helena and Kjell Knutsson, Jan Apel, Lars Sundström and Zanette Tsigaridas Glørstad. This has certainly provided a fuller and more balanced presentation of this area of research. Thanks to Esben Kannegaard who told me about the experimental production of the log boat. I am also grateful to Tore Pässe for allowing me to use his models for deglaciation and land rise. Finally, I would like to thank Sheila Coulson for generously providing me with her knowledge about the dugouts of North America and the experiments performed at Djursland museum. The Norwegian pioneer network, the Nordic Blade Technology network and the SPLASH-COS network for research on submerged sites and landscapes at the Continental shelf have been the stimulating context for developing the idea for this article. I am therefore grateful to my colleagues for their generous sharing of knowledge and viewpoints.

Comments on Håkon Glørstad: 'Where are the Missing Boats?'

MISSING BOATS – OR LACKING THOUGHTS?

SVEINUNG BANG-ANDERSEN

At the Wenner-Gren Supper Conference held at Harvard University on 6 November 1953, the British archaeologist Christopher Hawkes described a four-step 'ladder' of inductive reasoning. The lowest and most easily accessible level is to infer from the archaeological phenomena the techniques producing them. The next and more laborious is to infer the subsistence-economics of the human groups concerned. To arrive at former social/political conditions is generally more difficult, and to infer religious/spiritual factors by archaeological methods alone is the hardest of all (Hawkes 1954). To me, this ladder still stands upright and deserves to be remembered even sixty years later.

Since there are more alternatives than we realize in archaeology, we need to have imagination and an open mind when we examine evidence, if any, to avoid becoming stuck in orthodoxy. Accordingly, Håkon Glørstad in his article 'Where are the missing boats?' starts by investigating and partly deconstructing three established archaeological agreements in Norway, which are also relevant within most other parts of the world:

- drawing inferences and arguing from negative evidence
- actualism: that the present situation is a key to the past
- use of the past to understand later historical processes.

Glørstad, who has earlier climbed the higher steps of the ladder of inference remarkably

well, takes up the challenge to investigate a level of another order than those outlined by Professor Hawkes: situations where 'the critical mass' – the object itself – is considered to be totally absent. The discussion of boat types and economy in the early Preboreal which Glørstad now revitalizes is highly welcome, as most earlier research has more or less axiomatically proclaimed sea-worthy craft to be an absolute presupposition for a rapid colonization of the south-west Swedish and the long western and northern Norwegian coastlines in the course of the first few centuries, or human generations, around and after the Pleistocene/Holocene transition (e.g. Gjessing 1945, Bjerck 1994, 2008b, 2009, Schmitt 1994, 2013, Bang-Andersen 2003, 2012, Fuglestad 2012).

Glørstad's main concerns are, as always, clearly presented, well problematized, rather easy to follow despite some short cuts and short circuits which I will return to later. However, they are not always easy to agree with. In particular, by questioning the actual importance of boats during the early Preboreal and proclaiming that dugout canoes were a far more likely boat type than skin boats along the coasts, he navigates into waters which are both very exposed and tricky. It seems impracticable within the frame of a short discussant paper to meet with all the claims which could be commented on. I will concentrate on three major points which are especially critical to the discussion:

- 1) the coastal environment in Norway during the early Preboreal (before c. 8800 cal. bc)
- 2) the former function of the flake axes in typical coastal/marine environments

- 3) log boats versus skin boats as man-made objects and seagoing craft

Environment and economy. The natural environment prevailing during the first two or three centuries after the **Pleistocene/Holocene transition (9500 cal. BC)** is, as Glørstad also admits, essential as background to understanding a way of life that includes the modes of sea communication. Despite this, to a large extent he uses the climatic and vegetational situation in the last part of the Preboreal, and partly also in the Boreal and early Atlantic in south-east Norway and south Scandinavia to describe the possibilities and human challenges which existed along the 3500km-long Norwegian outer coast 1000 years earlier. By so doing he transfers almost ‘paradisiac conditions’ with a mild climate, calm waters, sprouting vegetation and sedentary populations. I find this rather speculative and difficult to accept. Even though air temperatures radically improved compared with the cold conditions prevailing during the earliest phase of the Older Dryas, the Norwegian coast still seems to have been covered by a pioneer-type, mixed *Betula* dominated, brushwood vegetation. Regular forests first developed during the *Corylus* rise c. 8800 cal. BC (Paus 1989, Sørensen 2005).

With the sea partly filled with ice-bergs calved from valley glaciers and affected by sudden changes in currents and by katabatic winds from the inland, humans living along the coasts of west and north Norway certainly faced great logistical challenges (Bjerck 2008b, 2009). Unpredictable natural settings seem to have existed in this early stage also in the Bohuslän and outer Oslo-fjord archipelagos (Schmitt *et al.* 2006, 2009). Conditions along the open sea of the western coast of Norway can scarcely have been less demanding. **Indeed, it seems to me that a comparison between early Postglacial western Norway and present-day central west Greenland is far more relevant than what Glørstad seems to believe.**

The fake axe lead. Glørstad attaches a vital importance to the distribution and use of flake

axes in his discussion of what type of boat was most likely used during the colonization of the Norwegian coast, and during later periods, by postulating that this widely occurring artefact type is a special tool for felling timber and hollowing out log boats. **His allegation that these axes have been found all along the coast and were used only in the Preboreal is only partly correct,** considering that flake axes are missing in certain areas in west Norway, e.g. along the 200km-long stretch of coast between the Sula islands and the Stadt promontory. In addition at least some of the axes, such as *S 5740* found 1931 in the Egersund area, are doubtless of later Ertebølle types.

Glørstad interprets all of them to have been wood-working tools, despite use-wear analyses indicating that these objects, at least in some areas, were mainly used during the late Preboreal as scrapers on dry hide (Kindgren 1995). The flake axes have also been given other interpretations on which he does not comment seriously. **According to a well-founded and highly likely theory the flake axes, at least the wide-edged variant, have functioned as Inuit *ulus*; flenses or knives for removing seal blubber which was later processed into oil for impregnating skin boats** (Schmitt *et al.* 2009, Schmitt in press). Far less convincingly, the flake axes have been interpreted as clubs used from boats to kill (hypothetically) reindeer while swimming across narrow straits along the Norwegian west coast (Fuglestad 2012).

Given that the axes could be used to fell and dig out tree trunks into boats – a premise which seems unlikely to me, Glørstad faced another problem: as stated above, forests with trees long and wide enough for log boats hardly existed in the relevant areas during this early stage. Glørstad, however, tries to solve the problem by taking a U-turn and towing in driftwood, which normally appears twisted, salty and age-hardened, to add buoyancy to his axe/boat theory.

So, how were the boats? Demanding environmental conditions on a year-round basis, seen

together with the actual geographical setting of the human subsistence activities during the early Pre-Boreal – on islets in the outer skerries and on islands, on promontories and at fjord heads in inshore waters, clearly demonstrate the necessity for sea-worthy vessels and ultimate seamanship along the Norwegian coast. A total, or almost complete, lack of wood in the shape of long-boled, at least 70–80 cm wide, straight and more and less knotless *Quercus*, *Pinus* or *Populus* trunks on the Norwegian coasts during the colonizing phase makes, as far as I can see, the production of log boats, as claimed by Glørstad, totally unlikely.

The only logical explanation is what he rejects: a widespread use of relatively short (c. 5–8 m long) *umiak*-like rib-framed skin boats, which are light-weight, easy to manoeuvre, sea-stable and dynamic in waves (Gjessing 1942, Ames 2002, Bjerck 2008b, Schmitt in press). All the materials needed for building these vessels: framework, ribs, sinews, seal skins and waterproofing were at hand – everywhere. I do not at all follow Glørstad's way of reasoning when he rejects the use of such boats during the Mesolithic by stressing that *umiaks* are not proved to have existed earlier than the Thule culture. Daily life and population movements in the high arctic during both later and prehistoric times simply presupposes crafts with far higher seagoing efficiencies and safety margins than log boats which, when compared with skin-framed counterparts, are more or less floating, unstable logs. This is confirmed by experimental use of replicas of Danish Mesolithic dugouts (Christensen 1990).

A 'critical mass' which contributes to deepening our understanding of the missing boats *de facto* exists: Stone Age rock carvings in central and north Norway depicting exactly what researchers for a long time have interpreted as *umiak*-like skin boats (Gjessing 1936, 1942, Clark 1952). It is difficult to

understand why Glørstad, in his article, does not take this expressive source category into account for serious consideration.

Though I disagree with a number of the premises put forward by Glørstad, and accordingly doubt the validity of some of the main conclusions, I welcome his fresh initiative and the unorthodox discussions he initiates by turning some of the pillars of Norwegian Stone Age research upside-down, and thereby awakening old elephants. My main objection applies to his claim that the situation during the colonizing phase in the early Preboreal can easily be compared with, and explained by, the situation during the rest of the Mesolithic. On the contrary, I would say: the challenges presented to the pioneer populations along the weather-beaten east Atlantic and Barents Sea coasts, may not, and should not, be understood in the light of the totally different climatic, floristic and faunal conditions prevailing alongside the calm in-shore waters and rivers in east Norway and south Scandinavia several thousand years later. Even today one must ask one self, what would I chose if I want to paddle along the outer coast of Norway – a log boat or an *umiak*?

LOOKING WITH BOTH EYES

HEIN B. BJERCK

During the CCCP/US race for space, the first two humans who experienced the world beyond the blue sky above us produced an interesting pair of statements:

Yuri Gagarin: I saw no God

John Glenn: God was there all the time

God may or may not be with me, but I am confident that past worlds were more than the objects that survived to be included in our

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God may or may not be with me, but I am confident that past worlds were more than the objects that survived to be included in our

archaeological record. In his paper, Glørstad has taken the Gagarin position: ‘As far as I know, no marine elements whatsoever are found on any Preboreal site in Norway.’ To me, asking ‘Where are the missing boats?’ is like asking for missing shoes when observing footprints in a layer of snow, and I will argue that there is ample evidence for the boats that allowed for the early Mesolithic colonization of Norway.

In his search for clues to the earliest seafaring in Norway, Glørstad finds it more reasonable to focus on a log boat from Pesse, 1000 km distant and more than 1500 years younger, found in velvet waterways of the continental plains, in a completely different environmental setting. In addition to this, under the banner of an ‘archaeological retrospect perspective’, the paper dismisses actor-network theory and other thing-theory, as well as ethnographical comparisons and historical sources, in order to free ‘archaeology from a life in the shadows of anthropology and history, begging for all the significant facts that are out of range’.

Glørstad introduces his paper with a joke that ridicules searching for your keys in the illuminated areas only. After reading the paper one may wonder if he missed the point of his own joke. Anyway, it seems just as unwise to restrict your search to the dark areas – keys may also be found in the illuminated areas. Why deprive yourself of tools that are specially designed to shed light on the dark areas, that focus and enhance the subtle connections inherent in the archaeological record? Why shut out the light of a wide world of ethnographical information that may contextualize functions and capabilities concerning how things may have worked in a past reality that decided life or death for our early settlers? Why try to see the archaeological record with one eye only?

Boats may be traced in a multitude of internal relations between the positioning of settlements, lithic assemblages, ambient conditions, landscape and seascape. It is our challenge to inject contrasting fluid into this network; to trace, explore and interpret the connections

that emerge. This will reveal things that are no longer visible to the naked eye – like boats – not only their presence, but also information about character, function and capabilities.

Imprints of boats. The sheer number of early Mesolithic coastal sites evidences a marine lifestyle that reaches far beyond occasional crossings of open sea (e.g. Kindgren 1995, Nærøy 2000, Bang-Andersen 2003, Schmitt *et al.* 2006, Bjerck *et al.* 2008, Jaksland in press). As demonstrated by Frode Svendsen (2007, p. 71), 80 of the 86 early Mesolithic sites documented in north-west Norway are found in the coastal region, 77 are positioned in the outer archipelagos bordering the open ocean, and 72 of the settlements were established on islands. Boats were needed not only to reach islands, but also to move along a coast riddled with deep fiords and a criss-cross of channels. Boats are also evident in the affinities of settlements with places where sheltered beaches existed along raised shorelines, ideal for safe boat landings. And the sites themselves, small and uniform, are seemingly reflective of short-lived occupations by basic social groups arriving and departing in boats that were carefully designed for the number of individuals in the cohabiting group and a standardized set of equipment and activities (Bjerck *et al.* 2008, pp. 565ff, Bjerck in press).

As it was impossible to move by walking in the seascapes they settled, the pioneers needed to transport *all* people by boat. Very likely, this means that boats were designed to carry all members of the basic social units, probably family groups of five to ten persons. The lack of settlements that can qualify as base camps and the expedient character of settlements imply that boats also contained a large portion of the tools and equipment they routinely relied on, perhaps a tent as well. All in all, boats with a carrying capacity of less than 500kg were probably not applicable.

Ambient conditions inform us about cold water and the positioning of site locations indicating that stretches of several kilometres were frequently exceeded. In this setting, not

only the largest crossings were dangerous. If something happened, especially in the cold season, having to swim some hundred metres was probably fatal. In this calculation, time is as critical as distance, as cold water will soon paralyse muscles, and let a human being sink to the worlds beneath.

It is argued that one could wait for a calm day before crossings, as to reach Vega. Waiting for better conditions was probably often practised, but, if boats were for calm days only, there would be safe landings everywhere and no need to seek up natural harbours. The fact that settlements demonstrate a clear affinity to protected landing places indicates that boats were also used on normal days.

Most important is Glørstad's neglect to mention the fact that the boats were more than a floating device between destinations. What did the early settlers do after arriving safely at B from A? Wait for another sunny afternoon for their return? The marine lifestyle given by the patterning of the settlements demonstrates that boats, above all, were floating work platforms in a marine subsistence cycle, mobile sites in the chasing and hunting of birds, seals, fish and probably most other things the settlers depended on. This means a need to be out there, not at all times, but certainly more often than a limited number of calm days.

Log boats and skin boats. In line with his self-inflicted handicap, Glørstad omits to explore the extensive ethnographic records concerning log boats. This is most unfortunate in that this information would have supported his log-boat thesis. Evidently, log boats are more than carved out logs, and there are many ways to improve their weak points. Instability may be reduced by pontoons, ballast, expanding sides by hot-water softening of the wood or adjusting the outer shape of the hull. To provide more protection from waves one can add partial coverings, extend sides by extra planks and add a higher bow (and stern) pieces (e.g. Arima

2002, Sanger 2009). The same sources inform us about properties and capabilities that are decisive in evaluating functional parameters in relation to the challenges found in a natural setting. For instance, the total carrying capacity of the 690 cm long, 110 cm wide and 60 cm deep white-oak Ringler dugout canoe (Brose and Greber 1982) is calculated to be 1078 kg, or 680 kg with a freeboard of 10 cm. The weight, based on specific weight of oak, is calculated to 320 kg, which is somewhat less than the water-logged state when in active use.

The same sources also provide for a rough idea about the size of trunks needed for boats that might meet the demands in the settings where they were needed. The seagoing dugout canoes along the American north-west coast are praised for their capabilities, but their beam size is reported to be around 2 m (Ames 2002, p. 27). Even the smallest vessels, used on rivers, dimensioned for one person, need beams larger than 0.5 m.

As far as I know, and in agreement with Glørstad's references (see also Birks and Van Dinter 2010, Krüger *et al.* 2011), trunks (of any tree) large enough for the log vessels mentioned were not growing anywhere near the Scandinavian seascapes at the time of colonization. That forests were established in the 'latter part of the Preboreal period' was of meagre help for boat builders in the early part of the period. Driftwood is mentioned; clearly an important supply for wood implements and fuel, but, given the scope of boating that the number and location of sites demonstrate, it seems unrealistic that the making of boats could possibly rely on occasional stranded trunks from continental rivers. And would the water-logged, salt-saturated logs, partly rotten, partly dried and cracked be suitable to support the need for vessels?

The main reason why most scholars point to skin boats for the colonizers of Scandinavian seascapes is the availability of construction materials – as well as the convincing ethnographic evidence of skin-boat properties in the

sea. Boats similar to arctic *umiaks* are often mentioned, but see Chappelle (2007, pp. 176ff) for a comparison with the Irish *curragh*. The *umiak* comparison is also criticized in the paper, as the documented *umiaks* are fairly recent and thus claimed to be irrelevant for evaluating 'the original gear for arctic survival'. Obviously, the retrospective long-term perspective is not applicable in Greenland. Nevertheless, I would claim that age, younger or older, does not disqualify that which might be useful in illustrating construction methods and capabilities.

Perhaps the most instructive lessons from ethnographical sources are the problems inherent in all skin boats: a complex and fragile construction that needs a high level of maintenance. The 6–10 m or more long and 1.5–2 m wide boat frame is compiled of more than 100 carefully shaped and fitted wooden parts from split driftwood, lashings and the procurement of up to 30 seal skins to cover the frame (Petersen 1986, Chappelle 2007). The frames were constructed from split driftwood, but did not rely on whole lengths, as wooden parts were joined with pegs and lashings.

However, a skin boat is a demanding companion. During active use, there is frequent need for drying and greasing and the tightening of lashes (Ames 2002). It is also vulnerable: damages that occur in open sea would be fatal and landings are always risky. Although a frame can survive several changes of skin covers, a skin boat is much shorter lived than a wooden boat. But they perform well, as their widespread use also indicates. Reports on carrying capacity are dominated by the large numbers (e.g. the two boats carrying 25 individuals, a ton of cargo, 16 dogs in harness and only half submerged in the water at the time), but a normal load for a 6–10 m long 'household canoe' is reported to be 10–15 persons with their gear (Ames 2002).

To conclude, all of the above does not exclude the fact that log boats were a perfect match for calm waterways, lakes and

sheltered shores; this is in line with where they are found in the archaeological record – both in Norway and elsewhere. They are robust, long-lived and not too hard to obtain, given that logs are available that meet the demands of quality and size. In a setting where shores are nearby, without waves or tidal difference, the apparent disadvantages of log boats are unimportant. At sea, where we have a considerably less predictable context and more risky for the humans, the problems are accentuated. As a cornerstone in marine foraging, boats also had to withstand many hours at sea and have speed for an eventual 'chase'. A lighter, larger and more stable construction, far better than that provided by a simple log boat, is needed. The light skin boats match these challenges. A modern *umiak* of 7.3m is reported to weigh only 68kg (Wikipedia 2013), i.e. only 20 per cent of the similar-sized Ringler canoe. More buoyancy reduces the hazards from waves, adds freeboard, carrying capacity and stability, and permits the crew to lift the vessel above the high-tide level.

Is it fair to assume that people ignored these basic parameters in their relation to seafaring? Was fear for one's own life and care for fellow human beings not on the early Mesolithic agenda? Did they lack fundamental abilities to interact with the affordances and constraints in their world, to think ahead? Was it a life of many yesterdays and no tomorrows? Of course not, and very likely their vessels included measures that would minimize risks and maximize opportunities – a point not in favour of log boats, I am afraid.

Waiting for the late Neolithic 'historical watershed'? Why suggest a boat made of materials that were most certainly marginalized, if not purely outside the reach of our seascape colonizers – and, even more important, why a boat type that borders on uselessness in relation to the conditions for which it was needed?

At the end of the paper, I see contours of reason. In the concluding remarks, Glørstad

admits that 'they could have been simple skin boats'. His main point is that the boats were 'simple', and had 'only moderate seagoing qualities' and that their use was restricted to 'small-scale sea traffic'.

Evidently, the long-term history perspective needs to cool down the Mesolithic, to enhance the contrast to 'the great change in the Scandinavian history of communication', with the late Neolithic 'plank built boats, metal craft and elite networks throughout Europe'. With reference to Prescott and Glørstad (2011), this is claimed to be an 'historical watershed'. In the need for a better profile in the long-term cultural trajectory, the Mesolithic needs some flattening, to be rendered more basic and primitive, a hand-to-mouth, barely-making-it lifestyle. In the world according to Glørstad, the colonizers are left with vessels that he most certainly would not recommend for himself or his immediate family, not even on calm days, perhaps not even for his worst cousin.

The connection between 'plank-built boats' and the 'historical watershed' is turned on its head. I also believe that overseas travels (like crossing the North Sea) did not occur until late Neolithic/Bronze Age. But overseas seafaring was hardly a *result* of new boat-building techniques. Quite the opposite, it was the need for travels as a strategy in a new political and social regime, it was the urge for objects, alliances, warfare that followed in the wake of long sea journeys that carved out a need for the bigger boats that could make this happen. Thus, there is no need (or any archaeological clues) to 'reserve' this technological development for the 'big watershed'.

Quite to the contrary, plank boats may just as well have considerable longer traditions. The polished or pecked gouges of basaltic rock, including the local Nøstvet adzes in the Oslo region, were a new development in parallel with the emergence of the Boreal forests. As demonstrated by Sanger (2009), there is no

clear-cut relation between gouges and dugout canoes like Glørstad suggests. These gouges could also have been involved in a wood-splitting and plank-procurement industry, making seaworthy vessels for the coastal regions of Scandinavia throughout the millennia of marine foraging societies.

Without reducing the importance of the late Neolithic achievements, it seems timely to hint at the often experienced fact that 'historical watersheds' tend to coincide with focuses of interest. Is there any reason to claim that the development of marine foraging and the colonizing of Scandinavian seascapes are achievements of lesser grandeur and cultural importance?

BOATS AND PIONEER SETTLEMENT: THE SCOTTISH DIMENSION

CLIVE BONSTALL, CATRIONA PICKARD AND
PETER GROOM

The paper by Håkon Glørstad offers an interesting and thought-provoking perspective in which boats are seen as the limiting factor in the post-glacial colonization of the Norwegian coast and trees the limiting factor in boat building. Glørstad argues that colonization of the Norway coast would not have been possible until trees were present to enable the building of log boats (dugouts). This hypothesis rests on the presence of heavy woodworking equipment (flake axes) in the earliest Mesolithic sites, a proven (late) Mesolithic tradition of log-boat building in the Baltic region, the apparent synchrony between the earliest coastal settlement and afforestation of western Norway, and the assumption that skin boats were a more recent, Arctic (Inuit-Yupik) tradition.

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The paper by Håkon Glørstad offers an interesting and thought-provoking perspective in which boats are seen as the limiting factor in the post-glacial colonization of the Norwegian coast and trees the limiting factor in boat building. Glørstad argues that colonization of the Norway coast would not have been possible until trees were present to enable the building of log boats (dugouts). This hypothesis rests on the presence of heavy woodworking equipment (flake axes) in the earliest Mesolithic sites, a proven (late) Mesolithic tradition of log-boat building in the Baltic region, the apparent synchrony between the earliest coastal settlement and afforestation of western Norway, and the assumption that skin boats were a more recent, Arctic (Inuit-Yupik) tradition.

We claim no specialized knowledge of the Norwegian Mesolithic. We are, however, familiar with the evidence from western

Scotland, a region that bears some similarities to south-west Norway in terms of climate, physical features and the general coastal environment. Both regions have a mountainous coastline with fjords and offshore islands, were heavily glaciated in the late Pleistocene and show similar patterns of post-glacial sea-level change. Thus the first post-glacial settlers of the Atlantic seaboard of Scotland likely had to confront a similar environment and similar logistical problems as their counterparts in Norway. On present evidence large areas of western Scotland, like Norway, were ice free and available for colonization before the beginning of the Holocene (Ballantyne and Stone 2012).

The exploitation of coastal resources does not require boats *per se*. Our experimental studies of Mesolithic fishing practices have shown that fish, crustaceans and marine molluscs whose remains are found in Mesolithic shell middens in Scotland, including some 'deep water' species, can all be taken from the shore without the use of boats. Boats are an efficient means of transporting people and heavy loads; in particular they shorten distances along indented coastlines – put simply, it is quicker to cross a fjord by boat than to walk around the shoreline. That boats were used in the Scottish Mesolithic is not in doubt. A number of islands off the northern and western coasts of Scotland were occupied during the Mesolithic and could only have been accessed by boat (Fig. 10). People had reached the Outer Hebrides by 6600 cal. BC (Gregory *et al.* 2005), which would have involved a sea crossing of at least 22 km (from the island of Skye).

What kinds of boats were used? Although both dugouts and skin boats are documented in historical times, there are no unequivocal finds of Mesolithic watercraft from Scotland or elsewhere in Britain. The pine 'log boat' from the River Tay at Friarton, often assumed to be Mesolithic, was never dated and is no longer available for study (Smith 1992), while the Preboreal birch-wood 'paddle' from Star Carr has been reinterpreted as

a digging tool by Darvill (1987) or a ski pole by Burov (1996). In Ireland the use of dugouts can be traced back to the late Mesolithic (Breen and Forsythe 2004) and skin boats to the Iron Age (Forsythe and Gregory 2007). Taphonomic bias may account for the rarity of skin boats in the archaeological record. Log boats, being relatively heavy, were probably moored offshore; they may even have been kept submerged when not in use to prevent drying and splitting of the wood (e.g. Malm 1995). Skin boats, being much lighter, could more easily have been hauled up on shore, which would tend to reduce the chances of archaeological preservation.

It is often assumed that the colonization of the Scottish islands and Ireland was accomplished using skin boats, based on the historically documented tradition of skin-boat building (coracles and currachs) in areas surrounding the Irish Sea basin (e.g. Smith 1992, p. 140). There is also a general perception (derived from ethnographic observations) that skin boats are more stable in rough water and open seas than dugouts (e.g. Burov 1996). Peacock *et al.* (2010) discussed the relative performance of log boats and skin boats in maritime contexts. Experiments with replica log boats in the Mediterranean and Atlantic have shown that it is possible to cover distances of 30 km or more at one stretch. With a payload (paddlers plus cargo) of *c.* 1000 kg they were able to cope with gale force winds and 2 m-high waves. On the other hand, as Peacock *et al.* (2010) acknowledged, skin boats are lighter and better suited to landing on rocky coastlines.

The widespread occurrence of skin-working tools and the lack of woodworking technology in the Scottish Mesolithic may seem to argue against the production of log boats and in favour of skin boats (cf. Smith 1992). Although stone axes appear not to have been part of the Mesolithic toolkit in western Scotland, axes ('mattocks') made from red-deer antler have occasionally been found, and antler axes have been shown to be very effective in the experimental construction of dugout canoes of oak (Poissonnier and Rouzo 2007).



Fig. 10. Earliest settlement evidence from offshore islands in Scotland plotted against the 8500 BP (7550 cal. BC) isochrones for elm and oak pollen. Data from Birks (1989), Morrison and Bonsall (1989), Edwards and Whittington (1997), Ashmore (2003), Ballin and Saville (2003), Saville (2003) and Wickham-Jones and Downes (2013).

As Glørstad has emphasized, construction of log boats requires suitable trees. Oak was the preferred species for dugouts from the Neolithic onwards in the British Isles,

although other species (alder, pine and poplar) were sometimes used. Following deglaciation, early tree colonizers along the west Scottish coast were species such as

juniper (*Juniperus communis*), birch (*Betula* spp.), willow (*Salix* spp.) and hazel (*Corylus avellana*), which are generally unsuitable for dugouts. The major tree species arrived later (Birks 1989, see also Edwards and Whittington 1997): elm (*Ulmus glabra*) spread along the mainland coast and islands between 8000 and 7000 cal. BC; oak (*Quercus* spp.) had reached the southern part of the west coast and inner islands by 7000 cal. BC and thereafter spread slowly north and west reaching Skye by 5000 cal. BC; pine (*Pinus sylvestris*), it seems, was never a major component of late glacial or Holocene woodland along the west coast, except perhaps locally in the north-west after 5000 cal. BC.

On this evidence, at 7600 cal. BC (the earliest secure date for human occupation of an offshore island) elm would have been present in woodlands along the west coast, but oak, pine and other major tree species were likely either rare or absent. If islands along the west coast of Scotland were colonized before 7600 cal. BC, as suggested by the small number of sites with 'early Mesolithic' and 'final Palaeolithic' technologies (Fig. 10), then trees suitable for the construction of log boats may have been unavailable to the very first settlers, although use of driftwood and sourcing of boats (or tree trunks) outside the region are also possibilities.

On the other hand, materials necessary for making skin boats (animal hides and 'whippy' growth (branches) from birch, willow and hazel trees) would have been available from the beginning of the Holocene and at times during the late glacial. Although there is no demonstrable *Mesolithic* skin-boat tradition, it should be borne in mind that the basic methods and wood materials involved in constructing the frames of skin boats are similar to those used for manufacturing certain kinds of (portable) fish trap, a tradition that can be traced back to at least the late Mesolithic in many areas of northern Europe. In fact,

hunter-gatherers familiar with simple weaving techniques applicable to cordage, textiles, baskets and portable fish traps would possess the skills to 'weave' a skin-boat frame, as the technologies are transferable.

We thank the editors of *Norwegian Archaeological Review* for inviting us to comment on Håkon Glørstad's paper. Although we can offer no firm evidence of the types of boats used by the final Palaeolithic or early Mesolithic groups who colonized the Atlantic coasts of Scotland and Norway at the end of the last Ice Age, we hope nevertheless that our observations and ideas will be seen as a positive contribution to the recurrent debate surrounding the earliest post-glacial settlement of northern Europe.

THE MARITIME IDENTITIES OF COMMUNITIES COLONIZING NORWAY

VICKI CUMMINGS

The colonization of the northernmost parts of Europe is one of the most exciting periods of prehistory to consider. This was a time when previously inhospitable ecozones were opening up, new forms of flora and fauna were becoming established and people were encountering new and unoccupied landscapes (Spikins 2008). While the people involved almost certainly had a different view on this process from ourselves, nevertheless they would have known that they were moving into hitherto unknown worlds (cf. Riede 2007). In his paper Glørstad considers one element of this process: the boats that we know must have been involved in the colonization process but which are nevertheless missing from the archaeological record. While the focus of the paper is boats, in actual fact this discussion could be about many components of the archaeological record: much of

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the material culture that people used no longer survives. The question addressed here, and of course in many spheres of discussion, is how we deal with a partial and incomplete record.

The first issue discussed here is that of analogy. There are no modern parallels for the colonization processes that took place in the distant past, as Glørstad points out, and so instead Glørstad argues we must rely on parallels with other areas (as opposed to ethnographic analogies with the Inuit, for example). Glørstad makes a strong case for the use of log boats in the colonization process, but skin boats could equally have been used, and we should not assume an either/or scenario. While colonization was a relatively quick process, we must not assume that it was a single, homogenous group of people colonizing the Norwegian coast, and therefore there was presumably considerable variation in the types of technology utilized, possibly connected to different ways of moving, or, as argued by Glørstad, related to 'tradition, prestige, culture or economy'. For archaeologists, the colonization of the Norwegian coasts was swift, but for the people involved it took place over many generations (up to ten potentially: Bjerck 2008a). Here, then, there is much to consider in terms of the logistics and social implications of such short, but sustained, colonization processes.

Glørstad is particularly keen on the idea of log boats as being the key piece of technology required to colonize Norway. I would argue that it was other factors that were of more significance than the particular type of vessel being used. Knowledge of tides, weather and potentially hazardous marine conditions would have been key in navigating coastal zones (as discussed by Robinson 2007, for example). Glørstad's interpretation of the archaeological data is very much in keeping with this. Glørstad also discusses the relative risks involved in these kinds of sea crossings. We should also not assume that people were put off by risky journeys *per se*: risk, while obviously potentially endangering life, would also have been an opportunity to acquire prestige within society and may have been an

important way of gaining social standing within society (see Richards 2013 for a detailed discussion on risk). Successfully undertaking a risky sea voyage may have increased status within this period, and we could envisage voyaging to unknown lands as a crucial defining principle of social identity at this time. Certainly there are other cultures in the world for whom voyaging is a fundamental part of their identity and belief system.

One of the points discussed in the paper is the supposed 'inferior position of archaeology in relation to sociology and anthropology', of which the missing boats are highlighted as one example. I would argue that this really depends on the kinds of question you are asking. The anthropological record is very good at illustrating particular things: the exploitation of particular ecological niches, the construction of society (including kin and gender relations) and technological adaptations to specific environments (see, for example, Cummings 2013 for a summary). An understanding of maritime technology can be explored within modern ethnographic contexts, and specific vessels can be studied. Archaeology, however, offers a much better perspective on long-term histories and developments, the colonization of Norway being a prime example of this. We do not need the boats themselves to know that colonization took place nor do they help us understand the nature of society at that time. This must be explored in the archaeological record and understood in its own right, without either importing wholesale ideas from anthropology or assuming similarities with preceding periods. This important point is made by Glørstad throughout.

The most interesting element of this paper for me was the exploration of the ideas presented from an archaeological 'retrospective perspective'. Here Glørstad highlights a method of analysis used in historical research whereby younger historical phases are used as a framework for discussing the history of older periods. Glørstad argues that, 'instead of seeking the answers in the present Arctic or in the

Palaeolithic, the Preboreal material could be interpreted in light of a somewhat younger diachronic setting. In fact there are many aspects of the colonizing situation that do *not* look fundamentally different from the rest of the Mesolithic.' This offers a good way into the archaeological record as material from a broader chronological spread can be examined. Indeed, Glørstad focuses particularly on axes (some of which to my eye bear a striking resemblance to boats), but much more can be examined. The maritime origin of the peoples of Scandinavia may have become one of the key defining metaphors, drawn on throughout the Mesolithic and beyond. This origin myth, based in historical reality, may have been referenced in many different types of material culture, structures and landscape occupations, and intimately connected with identity. Thus the coastal focus of the subsequent periods of occupation in Scandinavia may not just have been related to the economic exploitation of coastal resources, but a broader reference to social and cultural meaning and identity. This coastal colonization and affiliation must have shaped worldviews as much as it shaped boats (Bjerck 2008a, p. 67). This seems to have been part of a wider Holocene adaptation and utilization of the coast, which seems to have resonated not just with Scandinavian populations but with peoples all around the globe (see Wickham Jones 2013).

LOOKING FOR FACTS. . .STILL MISSING THE BOATS!

BERIT VALENTIN ERIKSEN

Archaeology is the search for fact . . . not truth. If it is truth you are looking for, Dr. Tyree's philosophy class is right down the hall. (*Indiana Jones and the Last Crusade*, Lucasfilm, 1989)

Even a light film such as *Indiana Jones and the Last Crusade* may present a surprisingly accurate scientific statement. Indeed, the truth in the sense of 'exactly what happened when in prehistory' is hardly ever available to the archaeologist. We build our knowledge about the past on facts in the form of data and observations resulting from archaeological excavations and various scientific analyses. So, what do we do when the archaeological evidence is scarce or missing?

In the present paper Håkon Glørstad provides a most refreshing and inspiring contribution to the ongoing discussion on how and when Norway was settled following the retreat of the Weichselian glacier, and most importantly also to the methodological-theoretical discussion of how we approach the often fragmentary and inadequately preserved archaeological data from the period in question. The latter problem is particularly manifest in the Palaeolithic and Mesolithic periods, where – for taphonomic reasons – the amount of preserved manifestations of prehistoric behaviour becomes increasingly fragmented the further back in time we direct our attention. By introducing the archaeological retrospective method Glørstad tackles this problem elegantly, although not entirely consistently. Thus, when discussing the Neolithic voyages it is stated that the vessels used most likely were dugouts. The argument is based on the observation that no other types of boats are known from the Scandinavian early and middle Neolithic. However, from an archaeological retrospective point of view one could also argue differently. Moreover, based on the affluence of polished axes from the earliest Neolithic onwards I would presume that carpentry and woodwork crafts were flourishing within the sedentary agriculturalist societies of the Neolithic by comparison to the preceding mobile hunter-gatherer societies of the

Palaeolithic, the Preboreal material could be interpreted in light of a somewhat younger diachronic setting. In fact there are many aspects of the colonizing situation that do *not* look fundamentally different from the rest of the Mesolithic.’ This offers a good way into the archaeological record as material from a broader chronological spread can be examined. Indeed, Glørstad focuses particularly on axes (some of which to my eye bear a striking resemblance to boats), but much more can be examined. The maritime origin of the peoples of Scandinavia may have become one of the key defining metaphors, drawn on throughout the Mesolithic and beyond. This origin myth, based in historical reality, may have been referenced in many different types of material culture, structures and landscape occupations, and intimately connected with identity. Thus the coastal focus of the subsequent periods of occupation in Scandinavia may not just have been related to the economic exploitation of coastal resources, but a broader reference to social and cultural meaning and identity. This coastal colonization and affiliation must have shaped worldviews as much as it shaped boats (Bjerck 2008a, p. 67). This seems to have been part of a wider Holocene adaptation and utilization of the coast, which seems to have resonated not just with Scandinavian populations but with peoples all around the globe (see Wickham Jones 2013).

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Mesolithic. Accordingly, a more advanced boat-building technology than the one needed for producing simple log boats would fit in well from the early Neolithic onwards. Thus, already during this time period we might add in the presence of the first prototypes of the later plank-built boats. Being sedentary does not mean that you can renounce mobility – it is all a matter of scale and timing.

When reading Håkon Glørstad's paper, two seminal works relevant to the methodological-theoretical discussion immediately crossed my mind: Kent V. Flannery's (1973) 'Archaeology with a capital "S"' (duly cited by Glørstad and always worth a re-read) and, not least, Karl R. Popper's (1963) *Conjectures and Refutations*.

Karl Popper was the father of critical rationalism and famous for introducing empirical falsification into science theory. According to Popper 'the criterion of the scientific status of a theory is its falsifiability, or refutability, or testability' (1963, p. 36), and in order to meet the criteria for proper science we are encouraged to advance only the boldest hypotheses which may then be refuted by fairly simple means. This approach is readily applicable to archaeology and neatly illustrated by Glørstad's paper: we can strengthen the hypothesis by adding more observations (in the present case by more finds of Preboreal log boats) or we can falsify it (by producing even older remains of skin boats or other seagoing vessels). To many the true fascination of archaeology is that you never really know what the next excavation has in store for you. In this respect, Glørstad would probably be equally happy if this was a Preboreal log boat or an equally old skin boat loaded with Helgoland flints. Both finds would be immensely interesting.

However, according to Popper the problem with Glørstad's hypothesis would be that it is quite likely impossible to falsify, as the type of skin boats needed for sea travels would hardly be preserved from late Pleistocene or early Holocene Scandinavian contexts. Thus, *sensu* Popper the hypothesis

proposed is problematic from an epistemological point of view in the sense that it does not actually allow for any scientific progress by comparison to, e.g., the model put forward earlier by Hein B. Bjerck. We may hope for evidence that strengthens its likelihood, but it can neither be verified nor very likely falsified. We are left at another full stop – which is not to say that I disagree with Glørstad, but the boats are still missing.

Nonetheless, I find Glørstad's paper not just refreshing, but also very commendable. This is not least due to his sound arguments refuting the far too common use of an unsubstantiated Doggerland settlement serving as a generalized black box model for explaining the colonization of Scandinavia, in particular Norway and western Sweden, while bypassing the Danish evidence. Evidently Doggerland was not void of people in the early Holocene, but the exact premises for the settlement, including its precise dating and location, remain a research desideratum.

Still, there is at least one issue that I would have liked Glørstad to follow-up on. In my opinion it is very important that, when discussing the colonization process as well as the following early Holocene settlement of Scandinavia, we are most likely dealing with very few people spread out over an awful lot of land (Åkerlund 2002 may serve as a source of inspiration for this discussion). In this respect the comparison with dispersed hunter-gatherer groups of the arctic actually seems quite reasonable. The question remains whether the early Holocene settlements were indeed few and far between and spread out evenly over the Scandinavian Peninsula or whether they did cluster on a spatio-temporal scale.

Unfortunately, Glørstad's Fig. 1 does not really clarify the situation. Even from an archaeological retrospective point of view the time span covered is comprehensive, and to someone not intimately familiar with the Norwegian pioneer settlements it would have been useful to know if this cumulative graph might be hiding a more meaningful

spatio-temporal resolution. That is, whether the sites in the south are generally older than the sites in the north, whether it is the other way around – or whether we are dealing with an arbitrary spread of more or less contemporaneous early dates along the Norwegian coast? Do the sites dated represent isolated events, preserved by chance, or do they fit within a continuum? Glørstad remains very prudent in his interpretation and use of these figures. Still, at least to me the cumulative graphs in Figs. 1, 7 and 9 make little sense without an informed source-critical discussion of the dates on which they are based.

ON MISSING EMPIRICAL FACTS

INGRID FUGLESTVEDT

The pioneer settlement on the Scandinavian Peninsula has been the focus of renewed attention and interest over the last few years. In Norway, this is due to a number of large projects which have yielded a substantial addition to our empirical data. In turn, this has stimulated cooperation through networks and the organizing of this field as an area of common priority. However, despite this recent accumulation of data concerning the early Mesolithic record, our general image of this period has not yet been essentially changed. Scholars working on the early Mesolithic have come to somewhat different conclusions on nuances, and are orientated towards their own special issues, yet there are reasons suggesting that the level of consensus is high. Thus, I think most scholars working on the Preboreal period/early Mesolithic in Scandinavia would agree, in general, on the following two features: the early Mesolithic is a period characterized by 1) site units indicating a fairly high degree of mobility and 2) a lithic material that both in terms of blade technology (Kutschera 1999, Kutschera and Waraas 2000, Waraas 2001, Fuglestad 2007) and tool typology –

especially projectiles (Schmitt 1995, 1999, Fischer 1996, Fuglestad 2010) – is strongly reminiscent of that which is found on the north-central part of the European Plain. Both factors in turn, point towards a life on the move, and suggests that groups residing on the Scandinavian peninsula – somehow – were integrated with the population at the Continent, either directly through regular movements between the two main landscapes (i.e. the Scandinavian peninsula and the Continent) (Fuglestad 2009, 2012) or ideologically through tradition and/or history (e.g. Knutsson 2005b, Selsing 2012). In the last case, migration and mobility are seen to be a gradual movement from the Swedish west coast and, later in time, to the coasts of today's Norway (Bjerck 2009, Bang-Andersen 2012). The degree of mobility and distance covered during these movements, as well as the degree of social integration with the rest of Europe may be a matter of controversy, but these two core issues are agreed upon. I would define this general concept as a consensus of opinion in regard to the early Mesolithic, even if this description would be especially appropriate for the EM1 (9500–9000 cal. bc and the earliest part of EM2) (cf. time scale in Bjerck *et al.* 2008, p. 82). Included in this general agreement is the notion that boats – similar to the ones used by present-day and historically known Inuit – were the main vehicle used in the realization of this mobility.

Strong consensus sometimes need a bold challenge – a challenge that turns everything upside down and demands a reconsideration of the empirical basis on which this consensus rests. Håkon Glørstad's debate article truly represents such a challenge. In 'Where are the Missing Boats?' it is argued that our quest to find the missing kayak'ish or *umiak'*-ish boats of the pioneer time is a dead end. Supported by results from the field of environmental history it is pointed out that veritable pine forests were present in the Preboreal at an

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earlier age than we previously thought possible. Thus, the environmental conditions in Scandinavia allowed for the making of log boats. The article argues for the possibility that log boats were in fact made, and that they represent the missing boats of the early Mesolithic.

In my comments to this article, I have no arguments against the environmental data that Glørstad's arguments rest upon; nor do I have arguments *per se* against the possibility that log-boat craft could have been made during the early Mesolithic. The strong challenge to the existing consensus is, as I see it, the implications of the log-boat argument; that is to say, a settlement situation similar to the one typical of the late Mesolithic and early Neolithic. Thus the early Mesolithic is approached through an analogy inspired by the late Mesolithic situation. One analogy specifically brought forward is Knut Andreas Bergsvik's (2006) study from western Norway, of societies that relied for their subsistence almost totally upon rich, stable and predictable fish resources in the vicinity of 'bottle necks' in the fjord system(s). This alludes to a semi-sedentary lifestyle and a situation in which groups have a more or less defined belonging to a given region. Bergsvik has established, as being most probable, how normative social groups belonging to more or less demarcated landscape regions are exemplified through their use of stone tools made of raw material from obvious sources within their ideological/social landscapes. Tools of raw material found at a long distance from its source makes for a part of the argument by suggesting a type of logistic mobility between respective social territories, a mobility including personal contact and visits to neighbouring groups working also as strategies for the formation of improved social repute in one's home group (Bergsvik 2002, 2006). This stands in contrast to the notion of mobility proper; that is to say, this late Mesolithic semi-sedentary situation is suggested as being the relevant model for the early Mesolithic as well. However, log boats do not fit into the EM

scenario. The log boat, for example, is best suited for smooth waters. Moreover, a hollowed log from an early Holocene pine trunk would not have much available space for equipment, and thus would not be well suited for either long-distance travel and/or local residential mobility.

The main problem with this use of a late Mesolithic analogy in an early Mesolithic context is simply that the site pattern does not support such a notion in the earliest Stone Age of western Sweden and Norway. So far, early Mesolithic sites do not point to anything more than short occupations, even if repeated at the same place in specific site areas. This stands in sharp contrast to late Mesolithic site complexes which include the presence of well-defined cultural layers. This late Mesolithic stationary dwelling in the vicinity of predictable fish resource cannot be traced in the early Mesolithic (cf. discussion and references in Fuglestad 2012). Indeed, this seems to be a development in the middle Mesolithic and onwards.

It is argued by Glørstad that, similarly to in the late Mesolithic, local raw materials were used in the early Mesolithic. It is also argued that northern Europe at large shared similar elements of technologies and types during the late Mesolithic; therefore, similarities between lithic records do not necessarily suit as an argument for long-distance social integration and residential mobility in the early Mesolithic. Both arguments concerning the lithic material are correct in a very general perspective and may seem trustworthy at first glance. However, a comparison between two types of 'pan-North-European similarities', i.e. the early Mesolithic in comparison to late Mesolithic, turns out to be of similarities that exist on very different scales; the one for the early Mesolithic is permeating, while the one for the late Mesolithic concerns only elements. Indeed, the use of non-flint raw material starts early and becomes a prominent feature throughout the Mesolithic. In the late Mesolithic, some types of raw material are social markers and tokens of origin. In the

early Mesolithic the context of non-flint utilization is quite different. The pioneers' point of departure is a technology developed on high-quality flint of south Scandinavian type. In this regard, travelling along the coasts of the Scandinavian Peninsula implies a possible shortage of this raw material. Consequently, local raw material has been tested and utilized en route. The use of beach flint nodules, quartzite and local chert seems to be part of this pattern, i.e. a context more in the direction of *ad hoc* choices. It involves the practising of a blade technology and use of a toolkit that – if it had not been for the raw material – could not have been distinguished from a Continental assemblage. An example of this permeating similarity in technology can be illustrated by finds from the recently concluded Tønsnes project close to Tromsø in northern Norway. The assemblage from one early Mesolithic site contains an exact example of a typical assemblage of the time in question; however, it is reminiscent only in that it has been produced on rock crystal, chert and quartzite – and not flint (Finstad and Grydeland 2009, pp. 25–27, Gjerde in press). As I have pointed out on several occasions (e.g. Fuglestad 2007, 2009, 2012), this blade technology represents the presence of an embodiment originating on the European Continent; that is, it is an expression of knowledge and know-how that implies that northern Europe should be understood as a version of a socially integrated whole.

In conclusion, 'Where are the Missing Boats?' draws an image of the early Mesolithic that is similar to the late Mesolithic/early Neolithic situation. Thus far, the archaeological record does not allow for such an interpretation, with regard either to settlement pattern or to material culture. This is the essence of my comments. Having given this blunt judgement, I wish to say that this effort to think differently is welcomed. Glørstad's contribution to the debate may have relevance to the later phases of the early

Mesolithic, i.e. the last half of EM2, but especially EM3. During these periods, residential mobility seems to be the lifeway still; however, the development towards a more settled life in the sense that mobile cycles are confined to limited regions – a development normally seen to start in the middle Mesolithic – probably starts earlier, that is in the late early Mesolithic.

OTHER COMPARISONS, OTHER DIRECTIONS?

PETER ROWLEY-CONWY

Håkon Glørstad presents us with an innovative and interesting perspective on the earliest colonization of the Norwegian coast. It is always good for us to be reminded how little of our 'mental picture' of the past is based on the archaeological record, and how much on ideas gathered haphazardly from elsewhere in anthropology and archaeology. The long-range boating skills of these early people have been much stressed (by this commentator as much as anyone), but recent *umiak*-equipped Inuit, and upper Palaeolithic cultures with no surviving coastlines may not be the best sources for our mental pictures.

Glørstad's preference is a comparison with the Norwegian late Mesolithic, which, although coastal, reveals fewer long-range voyaging skills. Since the evidence is similar in the two periods, the long-range boating skills of the early Mesolithic have been exaggerated: there is no evidence for *umiak*-like skin boats, and log boats are less suited to long-range voyaging; the colonization process was relatively slow, taking some 300 years; and much of the raw material used for stone artefacts was locally sourced.

This inter-period comparison as a source of ideas is the most intriguing aspect of Glørstad's argument, and is well worth following up in other contexts (I would love to

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This inter-period comparison as a source of ideas is the most intriguing aspect of Glørstad's argument, and is well worth following up in other contexts (I would love to

see a similar comparison between the Mesolithic of south-western Norway and Scotland). But does the comparison have to work in the direction argued by Glørstad? Do we have to interpret the early Mesolithic in the light of the late Mesolithic? The much greater wealth of material from the late Mesolithic might well make this inevitable. But in the rest of this comment I will explore the alternative possibility: that we might use our ideas of the early Mesolithic to cast light on the late Mesolithic – or at least allow the two periods to differ, despite both having low levels of evidence for long-range voyaging. Whether this approach has any merit must be decided by Norwegian scholars with much greater knowledge of the archaeological record than I have.

This alternative approach would work only if there are reasons why we can suggest a high degree of mobility in the early Mesolithic – and indeed that the technology was available to enable it to occur. I will explore three lines of argument that could support this: boats, kinship and raw materials. I am the first to admit that all are speculative, and come from directions arguably completely irrelevant to Norway. I offer them simply in the spirit of drawing inspiration from comparing traditions.

Boats. Skin boats like *umiaks* are often assumed, never demonstrated. Glørstad's suggested correlation between the colonization of the Norwegian coast, the appearance of axes in Denmark and the development of pine forests in the south is well worth exploring. But do these components *necessarily* go together? Might Norwegian axes despite this have been used for building skin boats? In the construction of Greenland kayaks, 'the hardest task was splitting the driftwood. Wedges of stone, bone and wood were used. . . . As flint is rare in Greenland, other rocks were used for the multifarious tools: rock crystal, chalcedony, jasper and silicone shale' (Petersen 1986, p. 17). Could the flake axes Glørstad illustrates (Fig. 4) have functioned as wedges? Even

small skin boats can undertake remarkable voyages. Early in the 18th century, a west Greenland kayak was found in the sea off Scotland, containing an Inuit who soon died, apparently having survived a crossing of the Atlantic (Whitaker 1977). The kayak is still on display in Aberdeen (Marischal Museum 2012). The smallest traditional skin boat is the Welsh coracle, a hemispherical one-man river craft; Bernard Thomas crossed the English Channel in one in 1974, taking 13.5 hours (Britannia 2012).

I take the point that log boats might not be as seaworthy as skin boats, but considerable voyages could still be undertaken. The 10.5-metre log boat from La Marmotta in Italy, dated to ~5500 cal. BC (Fugazzola Delpino and Mineo 1995) suggests some possibilities: in the Mediterranean, a 9.2-metre replica travelled up to 50 km per day, with a crew of 10 and over 100 kg of cargo (Tichy 1999). The Mediterranean is of course not the Norwegian Sea, but the canoe proved seaworthy in 2-metre waves, provided it was bailed, and winds of force 7–9 on the Beaufort scale (Tichy 1999). We should not overlook the possibility of early Mesolithic maritime technologies or methods, completely unknown to us, that might have opened up possibilities that we cannot guess at; readers of *Norwegian Archaeological Review* may be unaware that the lowest-technology invasion of France ever carried out took place on 17 May 2007, when Tim FitzHigham crossed the English Channel in a bathtub, taking just nine hours (Daily Telegraph 2010). Frivolity aside, more knowledge of what types of prehistoric boats were used is an urgent priority not just in Norway but throughout Europe.

Kinship. Kinship and demography suggest that mobility would be at a premium in the early Mesolithic. Hunter-gatherers occupying a sequence of islands or points along a coast might be expected to fill each locale to biological carrying capacity before further

colonization is attempted. This has however been criticized by Keegan (2010), who points out that a degree of stress will be encountered after the population reaches 50 per cent of carrying capacity and numbers start to level off. A desire to maintain living standards provides an incentive to move on when this point is reached (Keegan 2010). Preparatory voyages of exploration are likely before the 50 per cent level is reached.

Moore (2001) explores various modes of hunter-gatherer colonization. Two are relevant here: the ‘beachhead’ model, where a group occupies a new location and does not keep touch with its parent group; and the ‘string of pearls’ model, where groups expanding along a coastline do retain contact with each other. Demographically, the isolated ‘beachhead’ group may experience problems. Moore (2001) modelled a colonizing group size of 100. Imbalance in the male/female birth ratio and the need to avoid incest within a group of people likely to contain many close relatives restrict the number of available mates. Many of Moore’s modelled ‘beachhead’ groups went into demographic decline (ultimately leading to extinction), and even those that did not decline exhibited low rates of increase. In the ‘string of pearls’ model, however, groups retained contact along the coast and were able to exchange mates between settlements. This ensured survival and demographic increase (Moore 2001).

Groups expanding along a coast are thus likely to maintain contacts with other groups, implying a considerable degree of voyaging. Keegan (2010) states that colonizing societies are often matrilineal, because this encourages mobility: each core group will comprise related females. In-marrying males often need to keep contact with their original settlement for kin-linked reasons and return there frequently. ‘The mobility of disenfranchised males promoted trading, raiding, and the exploration of new territories’ (Keegan 2010, p. 176).

The complexities of colonization by themselves may thus have involved greater mobility in the early Mesolithic than in later periods.

But were early Mesolithic societies matrilineal? I look forward to Norwegian archaeologists devising methods to answer this question.

Raw materials. The need to locate good-quality sources of stone raw material is another potential incentive towards mobility. Voyages of exploration beyond established settlements may well have included searching out suitable sources, *before* the 50 per cent demographic threshold was crossed and people moved with intent to settle. The importance of raw material sources is suggested by the great rapidity with which stone sources were located and exploited in one well-studied colonization area: New Zealand.

New Zealand was first occupied in AD ~1280 (Wilmshurst *et al.* 2008). The people came from Pacific islands with little useful stone, but they located and exploited the sources available in New Zealand with startling rapidity: Sheppard (2004) states that various types of basalt, argillite, greywacke, quartz, sandstone, garnet, chert, silcrete and greenstone were in use well before Europeans arrived in the 1760s. In addition, no fewer than 27 distinct sources of obsidian were being exploited, some from very minor outcrops. The largest, Mayer Island, is on an island 27 km offshore, and was exploited immediately: the frequency of obsidian from this source on archaeological sites *declined* as early as AD ~1350, presumably as other sources were located and exploited (Sheppard 2004).

This testifies to a great deal of exploratory travel, much of it presumably by boat, in the very earliest period of occupation. This all took place in considerably less than 500 years – a length of time that would fit neatly within the Preboreal.

In conclusion, Håkon Glørstad’s paper has raised as many interesting questions as it has answered, as good papers do. I very much appreciate the comparative methodology he employs. The Norwegian late Mesolithic is certainly more relevant than the comparisons I have used – but the Norwegian early Mesolithic is one

of the most remarkable archaeological records in Europe; perhaps we should not be shy of drawing inspiration from any source.

DO I FEEL LUCKY TODAY?

ROGER WIKELL AND MATTIAS PETTERSSON

Glørstad's article deals with many issues, circling around transport and communication during the early Mesolithic colonization of Norway. Most importantly, Glørstad questions the range and seagoing abilities of early Mesolithic vessels, as argued by, e.g., Bjerck (2009), and believes that small-scale movements along the coast prevailed from the very beginning.

Glørstad generally speaks in favour of log boats before skin boats. Regarding the question of skin versus log boats we believe that both existed during the Mesolithic. There must have been many boat types around, suited for different purposes and environments. Chronologically we believe that in southern Scandinavia there was a general switch from skin boats to log boats, without saying exactly when this switch took place. Skin boats were the only solution in the earliest post-glacial landscapes with no large trees. Two things must have accelerated the shift from skin to wood: warmer climate and increased competition and warfare. The warmer seawater made the skin boats age faster and the climate favoured the growth of larger trees, and with increased warfare skin hulls became impractical: they are much easier to penetrate with spears and arrows.

In the material being analysed by us from the Mesolithic of the Stockholm area, the appearance of pecked greenstone axes from slightly before 7000 cal. BC strongly indicates that log boats appeared at about this time. At the oldest excavated sites, *c.* 7800 cal. BC, no axes have been found (Pettersson and Wikell

2012), which could indicate the presence of skin boats.

We believe that there existed a wide range of boat types suited for different waters and needs. On inland lakes, estuaries and sheltered coastal waters simple dugouts were used. In continental northern Europe, including Denmark, many have been preserved and discovered since these are flat landscapes, with no or little land upheaval, where the Stone Age waterways have turned into lakes and wetlands.

In the archipelagos further north and north-east in Scandinavia, geographic conditions and logistics led to a development towards different boat types for different needs. Deep-hulled skin boats and canoes as well as dugouts with raised gunwales were the best choices for journeys among the outer archipelagos. On more sheltered waters, simple dugouts were probably used as well. The reason why no missing boat has been discovered here must be explained by the poorer preservation conditions: the beaches are generally much less sheltered, and the soil is generally coarser – often gravel or sand. In many cases, the place will, through upheaval, rather soon be lifted above the shore-line – and once on dry land the remains are quickly destroyed.

We fully agree with Glørstad that the Nøstvet axes can be linked with the production of dugout canoes of some sort. But the author goes further and believes also that the early Mesolithic flake axes were used to make dugouts, because on a large scale the Nøstvet axe distribution matches the distribution of early Mesolithic flake axes.

Many issues can be questioned in this comparison. First, the two axe types are not in the same environments: the flake axe (Fosna/Hensbacka) sites are situated in a more distinctive maritime setting, while Nøstvet axes generally are close to where you find trees on the mainland (as Glørstad writes). Second, we surely need more use-wear analysis on

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flake axes. But our impression is that flake axes are not as suitable for woodworking as greenstone axes. Flake axes are too small and too thin along the edge. Preserved examples should be more damaged if they were used to work on the dry driftwood that Glørstad suggests. Did fire really help here? But flake axes seem to be very good as knives, and the preparation of sea-mammal skin lies close at hand. In an early post-glacial milieu skin boats are the best choice.

Third, what is interesting is not only the question of skin or wood, but also the seagoing abilities of the boats. Both flake axes and Nøstvet axes, though separated by 1500 years, speak of a maritime culture. Looking along the whole Norwegian coast, the excavations during recent years have revealed many Stone Age coastal sites (Bjerck *et al.* 2008). Five hundred kilometres to the east, the situation is the same in the Stockholm area. During a survey in a forest area we found *c.* 250 sites in an area of 4.5 km². This is *c.* 50 sites/km² (Pettersson and Wikell 2004). Most of these sites were once shore-bound and reachable only by boat or on the winter ice. Surveys in other parts of Sweden's east coast indicate the same pattern: there are incredible numbers of finds out there – probably tens of thousands of sites in the surroundings of Stockholm alone. The situation must be the same or more so in Norway, where the waters are more saline and the animal life should have been richer than in the Baltic. It was the stable rich natural resources like fish, fowl and seal that attracted the boat-carried people. The settlement pattern is thus the result of a wish to harvest the sea.

We do not need ethnographical analogies to explain this overwhelming find material: this is a cultural landscape screaming for boats.

Glørstad calls our attention to simple log boats – like the find in Pesse, Netherlands – and he argues that this was the type of boat used during the colonization of Scandinavia. It is argued that the movements were made when the weather was fine. Then the sea was calm and journeys with these open, low log boats were possible. Glørstad cites a Danish

experiment in crossing the Öresund in a dug-out canoe. We think it is not a good example. Just as Glørstad questions the archaeological value of distances paddled with modern sea kayaks, given the security of modern infrastructure, the same can be applied to the experimental Öresund crossing. The paddlers probably waited in their cosy modern homes for good weather. But the Stone Age people had to move in time, not wait forever. How large supplies do you have? Simple dugouts just will not do in the hostile environment which is the Norwegian coast.

The sites are not the results of adventures or sunny vacation on the beach; it is everyday life. Yes, often they waited for good weather, but they also came up with better technological solutions. We do not really see the problem with the missing boats, as Glørstad does. Even in the quite protected waters along the Scandinavian coast, conditions can be rather rough. Then you need boats that can deal with the Scandinavian climate. What would you do when it actually counts, if you have no choice? Then you are there and must ask: do I feel lucky today – or take the skin boat and play it safe?

Glørstad talks about a forest people making marine adventures. What *we* see in an early phase on the coast is a settlement pattern of highly mobile seafaring marine mammal hunters. In Norway more than 90 per cent of the Preboreal sites are estimated to lie on the coast and 60 per cent on islands (Bjerck 2009). **In our *c.* 1000 years younger Mesolithic material from eastern Middle Sweden, we have discovered a number of outer archipelago sites dating to the pioneer phase, 8000–7500 cal. BC. The sites were located in a small archipelago 150 km out in the Baltic. The first pioneers followed a narrow chain of low islands, and we know that in some places they had to visit high peaks to see the next island on the horizon. In the boats, some sort of navigation skill was necessary. The most interesting sites were located on very small islands, 300–800 m across, treeless, surrounded by open water 15 km east of the main island group. One of these sites contained a dwelling structure similar to the ones on Vega, Nordland**

(Bjerck 1989). The excavation revealed lumps of burned seal fat, in Norway called *spekkebetong* (blubber concrete). Chemical analysis confirmed that there were remains of marine lipids in the material (Isaksson 2012, Pettersson and Wikell 2012). We also found *c.* 1 kg of burnt seal bones (*Halichoerus grypus* and *Phoca hispida*). ¹⁴C dating has been carried out on the burnt seal fat, giving the date *c.* 7800–7500 cal. BC (after correction for reservoir effect).

In this early phase we believe that people in this region moved between the archipelago and the inland, and yes they probably hunted a lot of elk. Very possibly they had skis and sledges too. But, later on in the Mesolithic, the archipelago was much larger, and we see a much denser settlement pattern there with a variety of sites of different size and location. Greenstone axes are a common trait for these – we would like to say – permanent settlements. The marine

eco-system is stable and diverse. By this time you do not need to move to the inland for elk hunting. That is something the inland neighbours do. As a seafaring coastal people you have your identity and pride with the elaborate boats – log boats with raised gunwale and lots of carved decorations. With these you met your friends and relatives along the coast of Scandinavia, on rare occasions perhaps even the distant Nøstvet people; with these boats you faced the enemy. We think that prestigious long-distance war canoes were at hand long before the late Neolithic and the rise of Scandinavian Bronze Age. The reader recalls Glørstad's opening question: 'Where are the missing boats?' And we agree – the boats are truly missed.

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Eriksen and Rowley-Conwy to the article 'Where are the missing boats?'. My intention in writing this article was not to solve all the problems of early Mesolithic Norway, nor to put an end to current research. It was to create a renewed and engaged debate on the difficult questions about initial colonization of a new

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area and landscape and the historical circumstances of such a process. Judging from the replies, this ambition has to a certain degree been achieved. I think all the comments explore several important aspects of doing research, challenging established knowledge and the passable ways for developing Mesolithic archaeology. There is no need for me to close down the debate by remarks that are too conclusive. On the contrary, I hope that scholars and students will continue to explore the colonization of northern Europe from new and diverging angles. As so elegantly formulated by Tim Ingold, apparently biological taxonomy and DNA research reveal two very different knowledge universes. This does not mean that one of them has to be wrong or that they cannot be combined into new and though provoking models (Ingold 2012). Hence, I prefer to think that my ‘continental’ or Boreal perspective on the colonizing process could contribute to some new insights on the ‘aquatic’ and Arctic perspectives that dominate research on early Mesolithic northern Europe. I think several of the comments received also share this opinion.

I have heard that irony is the last type of humour that a child develops. Maybe self-irony is even a later achievement. Bjerck thinks that I have misunderstood my own joke. Well, there could also be an element of self-irony involved. To question and challenge established and apparently self-evident facts about prehistory one has to put oneself on trial or, to quote Henrik Ibsen, ‘to sit in session, judging one’s very soul’ (Ibsen 1878). If we are going to reveal some new facts, some new hypotheses or perspectives, must we not do exactly this – expose our self to the unease of saying something odd or radical? I think so. To treat ethnography and/or actor network theory as superior to critical comments and fresh examination is to deal with them in a religious manner, maybe suitable conduct for the mythical archaeology advocated by Nina Witoszek (2012) in her vision for the future of archaeology, but not according to my preference. On the contrary, I think archaeology will gain from profane and empirical analyses as a foundation for social theory.

Of course we should not abandon studies in philosophy, sociology and ethnography, but we should deal with such domains according to an archaeological agenda.

Liberated from dull facts of life, the mind almost inevitably finds the obvious routes into difficult problems. When confronted with the choice between a *umiak* and a log boat as a transport vessel for travel along the Norwegian coast (*sensu* Bang-Andersen, Wikell and Pettersson), I would spontaneously answer that I would prefer the skin boat. But I would even more prefer a steamboat or a modern steel ship. However, if I *had* to travel alone as ship-owner, I probably would have to go in an old and open fibreglass boat – in accordance with my available means for buying a vessel. Such are the realities for most people that have lived. We cannot always take the best option offered by the mind. Every month people drown in their attempts to reach Europe by small boats from Africa. I am sure that they are aware of superior means for doing this voyage. Sadly, they cannot afford it. We do not know much about the relations between population and resources in the early Mesolithic. Why should we take for granted that they did not feel the pressure of scarce resources, tradition or esteem and made only unconstrained choices?

Eriksen and Rowley-Conwy point to fact that we know very little about the distribution and size of the late Palaeolithic and early Mesolithic populations in northern Europe, and certainly their patterns of movement, range of mobility and strategies of adaptation would be very dependent on such factors. This is an important point and deserves future investigation. Surely, I fully agree with Eriksen that the potential in the Norwegian ¹⁴C datings are not sufficiently explored in my paper, and maybe a more refined analysis would reveal much more temporal and geographical detail about the colonization process. The work of Lou Schmitt (Schmitt *et al.* 2006) has emphasized the large agglomeration of settlement sites and probably people in the

Bohuslän area that are roughly contemporaneous to the initial colonization of Norway (if we are to rely on the ^{14}C datings). Which effect did the rising population in this bridgehead area have on the relationship between humans and resources? Was this population of a sufficient size to fuel the colonization of the entire Norwegian coast in just a few hundred years? Such questions arise in the wake of Eriksen's argument and should certainly be further explored. Related perspectives are also on the agenda of Rowley-Conwy. I think his point that small populations need well-developed communicative systems in order to stay viable is worth considerable attention. The pioneer situation, as emphasized by Fuglestedt, enhances the importance of this argument: how could a small population stay viable when taking such a long coastline, as the Norwegian coast is, into its possession in only 300 years? I think a lot of research and modelling must be done before such a question can be given a decisive answer. I agree with Rowley-Conwy when he suggests that the Mesolithic record of Norway could be a particularly suitable source material for such a study. In my opinion, though, I think that it is not only the Preboreal period that is of interest here. The whole Mesolithic should be modelled. The length of Preboreal occupation seems to be quite short in Norway, approximately 1000 years, compared to the 3000 years of Atlantic occupation. Is the relative presence of settlement sites considerably higher in the Atlantic than in the Preboreal? If not, are we dealing with quite small populations throughout the whole period, facing the same problems of viability and communication? Was the need for long-distance travel more pertinent in the early Mesolithic than in the late Mesolithic? Were the solutions to the challenge the same? Cummings' point that the motivation for doing voyages is often defined by social factors and reputation, inherent in the allure of the journey itself, certainly adds another important aspect to the questions of prehistoric communication. As Fuglestedt has emphasized in her earlier work on the

pioneer situation, the frontiers may have their own psychology and phenomenology (Fuglestedt 2001, 2009). The nature of these frontiers is, however, not well known.

Bang-Andersen, Eriksen and Bjerck point to the difficulties in logical reasoning in archaeology. The absence of archaeological sources does not necessarily mean that such things were absent in prehistory. This is a truism still quite difficult to deal with in archaeological research. We do not know for sure that the absence of skin and plank boats in our archaeological record means that they also were missing in prehistory. Cummings and Rowley-Conwy remark that other options for sea transport could also have had importance without leaving overt marks in the archaeological record. These are possibilities, yet we do not know for sure. What we do know, however, is that log boats existed from the beginning of the Boreal period and apparently they appear together with another indication for boating, that is, paddles. I would like to begin my analysis here, and the fact that the nearest log boat is found in the Netherlands does not make it irrelevant. Actually, Pesse is closer to Oslo than Vega is. Why always treat Norway as something on its own?

Fuglestedt points to the importance of the continental perspective to early Mesolithic Norway. I think she is right. The meaning of this connection is, however, disputed. The Ahrensburg sites in southern Scandinavia are mainly situated in the areas where the soils were most fertile and where forest was first established. Was it the tundra people that reached the coasts of Norway? Or did they come here because of a steadily growing boreal environment in eastern Denmark and Scania, opening up rich and varied possibilities for subsistence in Sweden and Norway? I think the latter. The available ^{14}C datings from Norway also indicate this: the land is settled in the final centuries of the tenth millennia. Large parts of this period were perhaps not that different from the Boreal epoch. This could also include subsistence strategies. The fishing net from Antrea in former Finland

(today Kamennogorsk in Russia) is dated to 9116–8280 cal. BC (9310±120 BP, Miettinen *et al.* 2008). This find shows that fishing with typical Mesolithic techniques was established in the Baltic in the Preboreal period. In the future we will probably see new evidence for early forestation and ‘Boreal’ or ‘Atlantic’ lifestyles with fishing weirs and nets, when the Preboreal submerged landscapes of northern Europe are systematically explored. Now, why is this important? It is important because such technologies allow for efficient land-based marine subsistence strategies. As Bonsall, Pickard and Groom remark, fishing and gathering are not dependent on boats. Consequently, subsistence did not *oblige* people to make daily sea journeys in order to live, as for instance Wikell and Pettersson seem to think.

Conclusions based on absence are, however, not a problem only in archaeology. The ethnographic record is also strongly coloured by the interest and preferences of the recorder. None of those commenting has made any remark on the Greenland picture in my article, made by Nansen in the 1880s. Maybe from the 15th century and onwards, the *umiaks* were rowed and sailed (cf. McGrail 2001, p. 416, Gulløv 2004, pp. 300–301), most likely inspired by European boating. This small detail displayed in Nansen’s drawing must have had significant effect on the shape of the boats, because rowing allows for a considerably higher freeboard than paddling does. This affects the vessel’s seagoing abilities in a positive manner (Østmo 2003). My question then is what kind of skin boats do we discuss? Is it the European-style boats? I will not dwell for long on this point, but I think a final reply here would be proper: regarding the great seagoing skin boats and for that matter log boats of the Arctic and the Americas, what type of social environment do they represent? To my knowledge, these boats were part of quite stratified/complex societies. The Thule culture with their *umiaks* probably originated as specialized whale-hunting communities (McCartney and

Savelle 1985), where the boat teams of men and in particular their leaders had outstanding positions (McCartney 1980). Such stratification is also evident in the material organization of the campsite. They lived with permanent winter camps and had solid architecture with buildings that marked differentiation (Le Mouël and Le Mouël 2002, Gulløv 2004, pp. 286–290). The sedentary west-coast societies of North America are famous for their fierce and strong leaders and dominating lineages. The great canoes were important parts of this chief-based system (Boas 1895, Mauss 1954, Lévi-Strauss 1982). Hence, it seems as though the boats as well as their maintenance were firmly integrated in these complex social structures (Arnold 1995). Are these kinds of societies and their boats more representative or suitable for understanding early Mesolithic Norway than the middle and late Mesolithic record of Scandinavia? To my knowledge very few marks of social stratification have so far been found on early Mesolithic sites in Scandinavia that could match the material record of the great canoe or *umiak* societies. I totally agree with Bjerck in his emphasis on the boats as part of larger social structures. To me it appears that the seagoing skin boats and whale-hunting canoes were conditional on a quite complex and stratified social structure. A skin boat is not just a skin boat.

Perhaps we should treat native societies more cautiously, not as examples of a universal *socius* but as historically constituted communities (Hood 1995)? This does not mean that we should abandon ethnography, but we have to start to discuss how to undertake universal comparisons based on the historical record. This work has started up again in *social* anthropology (Willerslev 2011) and I think, for instance, Vogel (2010) has pointed out how archaeology could contribute to this work, that is, not as a mere consumer of ethnographical data, but as the historical and temporal entrance to human ethnography. This is also emphasized by Cummings in her comments.

Fuglestedt too raises criticism along these lines. She claims that I miss the essential qualities of early Mesolithic by using models from the final part of this period. She raises a question that has been very central in post-processual archaeology: can we in a significant manner analyse prehistory as large-scale processes? She boldly deals with a very large territory, stretching from northern Germany to the Kola Peninsula and identifies a remarkably homogenous early Mesolithic technology in this whole area. She claims that we cannot find a similar fundamental homogeneity in latter periods. This homogeneity is based on long-distance movements.

Her argument is presented in a convincing manner, even though I still find it puzzling that the raw material profiles are local in such a scenario. It is, however, important to perform the same type of large-scale analysis for the middle and late Mesolithic before a decisive conclusion can be made on this subject. So far only half of the relationship is spoken for. My own research has indicated that the range of communication in the late Mesolithic was not that small. The late Mesolithic Nøstvet complex, for instance, comprised the coast and uplands from Halland in Sweden to Lista in Norway (Glørstad 2010). This is a coastline of more than 700 kilometres. I can, however, see very few traces of long-distance travels or overseas voyages in this record. I think that frequent small-scale movements can more likely explain the patterns. Such a system was apparently quite efficient, enabling significant raw material transport for more than 220 kilometres. How different is this situation actually from the early Mesolithic? As already mentioned, Schmitt has emphasized in his work that productive marine ecosystems were the backbone of the (very) early Mesolithic western Sweden. He also sees an agglomeration of sites as well as an increase in size (Schmitt *et al.* 2006) in the same period as the Norwegian coast is settled. Now, what exactly differs in these observed patterns from the middle and late Mesolithic developments? I think such a

question would be of great interest in order to follow up the scenario that Fuglestedt sketches.

Wikell and Pettersson pertinently draw attention to our models and perspectives for understanding the Mesolithic and reject my interpretation of a forest people making marine adventures. They have an important point. Their own example certainly illustrates this. They present early sites from the Stockholm archipelago. To reach this area demands skin boats and a genuinely maritime life-way, they claim. From my point of view I would ask if this example also could prove the opposite. To my knowledge the site they present was situated in the Ancylus Lake. With a Boreal climate it is not unlikely that this freshwater lake froze in the winter. Even the present Baltic Sea freezes at this time of the year. Could it not be that people walked or skied on the ice to the island in the Mesolithic? In fairly recent times, winter hunts on foot or by skis for seals resting on ice were an important part of the subsistence economy in Sweden (cf. Clark 1952, Hallgren 2008). Why not consider ice and winter hunts in the Boreal period as well?

The fact that they have identified a very solid hut structure, indoor heating and heavy dependence on seals points in my opinion towards winter occupation. Hence, what seem to be obvious conclusions from one point of view could be quite troublesome from another.

Techniques, raw materials and traditions are discussed in several comments. Bang-Andersen and Bjerck are very critical of the suggestion of any presence of suitable materials for making dugouts on the Norwegian coast in the early Mesolithic. 'And would the waterlogged, salt-saturated logs, partly rotten, partly dried and cracked be suitable to support the need for vessels?', Bjerck remarks. The problem with his argument is that it is not particularly scientific. He ascribes qualities to the driftwood of which we have no knowledge. This is demonstrated by evaluating skin in the same manner: leaking, smelling, fragile, unstable and so forth. Skin can be this

way, but I have no evidence for such general presence in the early Mesolithic. Floating of trunks has been a common way to transport timber in Scandinavia (Vestheim 1998). This did not ruin the quality of the logs for future use. On the contrary, in recent historical times most wooden constructions, including houses and ships, were made by timber transported in water. The Icelanders of the Sagas made their boats of driftwood that had come all the way from Siberia (Short 2010). Ethnographical sources have even stated that some log-boat builders preferred driftwood (e.g. Steward 1963, p. 695, Sturtevant and Walker 1998, p. 397, Goodchild 1999, p. 163), maybe because it spared them for the work of felling the tree. In my article I have presented indications and evidence from the Continent, indicating vital forestation in the Preboreal period (see also Schmitt *et al.* 2006 concerning the favourable climate). Recent palaeo-biological research has also made arguments in favour of coniferous trees surviving the last Ice Age on the outer Norwegian coast (Parducci *et al.* 2012). Likewise, the ecologist Leif Kullman (2013) has recently concluded: ‘Most boreal tree species may have survived the last glacial period (Weichselian) much closer to Scandinavia than traditionally believed.’ In sum, much research seems to indicate early forestation close to the Scandinavian Peninsula. **I therefore think that we should be cautious in our conclusions concerning the availability of suitable logs.**

Bonsall, Pickard and Groom raise well-founded arguments in their analysis of early Mesolithic Scotland. A comparison of the Scottish and Norwegian Mesolithic seems to be a fruitful analysis. **Their suggested method of tracking techniques that could have been involved in skin boat production in alternative archaeological sources seems to be a promising way to go, in order to explore a possible skin boat tradition.** The insular tradition of using skin boats such as *coracles* and *currachs*, already mentioned by Caesar (54 BC), the absence of woodworking tools and presence of skin-working tools could be

indications for a skin boat tradition which may reach back to the Mesolithic in this part of the world. The absence of growing trees suitable for dugouts is, as already discussed, maybe a more troublesome argument. However, the Mesolithic evidence of log boats points to a certain preference concerning types of trees – first pine, then soft, deciduous trees. Maybe the absence of such trees in the flora also indicates absence of a log-boat tradition? Another question of importance concerning the Scottish record is the isostatic movements and the impact of a changing sea level in the Holocene. How was the archipelago on the west coast of Scotland shaped during the initial colonization of the landscape? Was the sea/land relation considerably different from the present (cf. Coles 1998)? Could this have affected the communicative options in the Mesolithic in such a way that more communication had been channelled along dry land? Such questions could be a very productive platform for comparing the Scottish and the Norwegian Mesolithic.

Bang-Andersen emphasizes the possibility that the flake axes are not axes at all but knives and scrapers (Kindgren 1996, Schmitt 2013) or maybe hatchets for killing reindeer (Fuglestad 2012). I think that such questions could be explored by use-wear analysis and further experiments. Helena Knutsson has made me aware that the use-wear analyses done in the 1980s could to some degree be questionable (pers. comm.). This type of examination can be done with much better accuracy today. Now, if it is possible to make convincing arguments in favour of an alternative function for these artefacts, indicating that axes were practically absent until the Boreal period, it would be a much better starting point for discussing a situation similar to the one presented by Bonsall, Pickard and Groom for Scotland. Nevertheless, as far as I remember, Bang-Andersen in 2003 and Fuglestad in 2007 also suggested an interpretation of these artefacts as axes. The latter even emphasized their use as woodworking instruments. They both seem to equate them

functionally to the flake axes found at the inland Maglemose sites (Bang-Andersen 2003, Fuglest-vedt 2007). New evidence or perspectives should, however, certainly allow them to change their opinions.

Wikell and Pettersson also question the interpretations of the flake axes as woodworking tools. They claim that such artefacts are too fragile for such duties. They must have overlooked the part of my article describing the experimental production of a log boat by flake and antler axes in Denmark. If flake axes were useful in this context I can see no reason for why they should be unsuitable in the Mesolithic. Contrary to their claim, fire is decisive when making log boats of pine and related coniferous trees. Use of fire allows precise and effective shaping of the hull. The Pesse boat, which I by the way do not think is representative for the *shape* of the coastal dug-outs in the Mesolithic, but is representative for the boat production *technology* in the period in question, seems to be made by use of fire. This was also observed on a Danish pine boat, which unfortunately not was preserved after discovery (Rieck and Crumlin-Pedersen 1988, p. 13). By use of fire the need for axes is significantly reduced. Flake axes would certainly be more than sufficient for finishing the making of the boat.

Bjerck claims that I presume that all axes *per se* were exclusively used for log-boat production. My argument was, however, put slightly differently. My point is that almost all Mesolithic axes are found along the coast or the major waterways. Presumably this indicates that the axes were used in boat production. At least, this could explain the affinity between water and axes. Now, from this starting point I made arguments in favour of log boats as the main vessel for late Mesolithic coastal traffic. The rationality in this hypothesis was based on actual presence of log boats in this period, a co-variation of axes, waterways and suitable forest as well as the shape of the axes. With this background I made the retrospective inductions already spoken for. *Ergo*, axes could also have been used for

other tasks at the campsite, but my point is that a main function seems to have been connected to boat production. Why else are axes almost always found along the main sea- and waterways and in few other places? I cannot see that Bjerck presents a more consistent interpretation of the distribution of axes of the Mesolithic. Such new interpretations are, however, certainly welcome.

Eriksen points to inconsistencies in my reasoning when assuming that boat technology did not alter significantly during the transition to the Neolithic. She sees significant alterations in the toolkit in this period. This could also indicate new types of vessels, she argues. There is actually some source material that could be taken as an indication for slightly longer journeys across open water in the Neolithic than in the preceding period (Glørstad 2010). The changes in the artefact inventory and the indications for longer journeys could therefore be related phenomena. This connection should certainly be followed up in new analyses. For the moment, only log boats are known from the Neolithic period. The challenge for the future would be how to furnish the discussion for a Neolithic setting. If, as Eriksen seems to suggest, plank boats existed, did their presence have significant impact on the communication patterns? Could the same method as suggested by Bonsall, Pickard and Groom be used in a Neolithic setting?

There are many other topics raised in the comments that could be elaborated and analysed in my reply. However, I think I would exhaust the reader by going into greater detail. As initially stated, my ambition with the article, as my reply, is not to solve all the problems of early Mesolithic research, nor is it to suspend the problems and challenges raised in the comments. On the contrary, I hope that researchers in pioneer settlement of northern Europe will find some of the topics thought provoking enough to go deeper into the problems. I thus finish with a small quote from the film *The Untouchables* (from 1987) about the mob-hunter Eliot Ness: having managed to

put an end to the illegal booze of Al Capone, during Prohibition, Ness is faced with a totally new situation: alcohol is made legal again. 'What will you do about that', a journalist asks him. 'I will have a drink', he replies. I adhere to the same pragmatism: if in the future we find evidence that persuasively puts the long-distance, seagoing skin boat at the top of the list of early Mesolithic transport means, if such vessels are just one of many devices for water transport or, for that matter, if the bathtub turns out to be the most likely option, I will gladly salute them all, insofar as the arguments are put in a logical and empirical, sound and convincing order. This pragmatism is the privilege of being part of an academic community and the foundation of a healthy discipline.

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