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Early farming in Southeastern Norway: New evidence and interpretations

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Abstract

The spread of a Neolithic mode of production in prehistory had a significant impact on subsequent economic and demographic developments. Early farming in Norway is usually inferred from the pollen record or distribution maps of imported axes, which indicate its introduction around the Oslo Fjord around 3900 cal BCE. A persistent anomaly for this model is the lack of direct evidence of cultivation and knowledge of where farming took place. This paper argues that a number of sites used for farming in the Early Neolithic were discovered by excavations in Southeastern Norway in the period from 2004–2013. It is dedicated to the presentation and interpretation of these sites. As a main result of the investigations, the number of known Early Neolithic farming sites in Southeastern Norway increases from one to 15. It suggests a new economic model for the Oslo Fjord region that a) accounts for places of farming and b) argues that acculturation was an important factor for the adoption of farming in this region of Scandinavia. The poor condition of the 15 Early Neolithic farming sites in Southeastern Norway indicates that subsequent cultivation has erased most traces left behind from this pioneer phase.

Zusammenfassung

Die Verbreitung einer neolithischen Produktionsweise hatte erhebliche Auswirkungen auf die späteren wirtschaftlichen und demografischen Entwicklungen. Der frühe Ackerbau in Norwegen wird in der Regel aus Pollenanalysen oder Verbreitungskarten importierter Äxte abgeleitet, die auf seine Einführung am Oslofjord um 3900 cal BCE hindeuten. Eine Schwäche dieses Modells ist das Fehlen direkter Beweise für den Anbau von Getreide. In diesem Beitrag wird dargelegt, dass bei Ausgrabungen in Südostnorwegen im Zeitraum von 2004 bis 2013 eine Reihe von Fundorten entdeckt wurde, an denen im Frühneolithikum Ackerbau stattgefunden hat. Der Beitrag widmet sich der Vorstellung und Interpretation dieser Fundorte. Als Hauptergebnis der Forschung steigt die Zahl der bekannten frühneolithischen Siedlungen in Südostnorwegen von einer auf 15. Es wird ein neues Wirtschaftsmodell für die Osloer Fjordregion vorgeschlagen, das a) Orte für den Ackerbau berücksichtigt und b) argumentiert, dass Akkulturation ein wichtiger Faktor für die Übernahme von Ackerbau in dieser Region Skandinaviens war. Der schlechte Zustand der 15 frühneolithischen Fundstellen mit Ackerbau in Südostnorwegen deutet darauf hin, dass die meisten Spuren dieser Pionierphase durch die spätere Kultivierung ausgelöscht wurden.

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Further information can be found in the Supplements available as separate downloads on the article webpage.
Suppl. 1. Radiocarbon dates from 14 of the 15 Early Neolithic sites in Southeastern Norway interpreted here as places for early farming (calibration with OxCal 4.4.2, Bronk Ramsey 2020).
Suppl. 2. OxCal code for Figure 16.

Introduction

Archaeological sites in Eastern Norway from the first half of the fourth millennium BCE hold a key position for an understanding of the earliest farming in Norway (Fig. 1). Yet despite decades of research and many publications focused on the subject of early farming in Eastern Norway, the empirical basis of the settlement history is still poorly understood. When was farming introduced in Eastern Norway, where did this activity take place, and how did it spread into this area? This paper aims to seek answers to these questions once again through a review of available evidence. Based on the identification of settlement traces in the form of postholes, pits and ditches that date to the Early Neolithic (3900–3300 cal BCE) at in many cases multi-phased occupation sites, it is argued that a new settlement organisation emerged in Eastern Norway after 3900 cal BCE and that it lasted for at least ca. 400 years. Although direct evidence of farming and stock-keeping are yet to be documented in this region, I argue that the introduction of a Neolithic mode of production explains the observed changes of settlement re-organisation. The result is a more detailed model of Neolithisation processes in this region, as well as a better understanding of the subsequent de-Neolithisation processes at the transition to the Middle Neolithic.

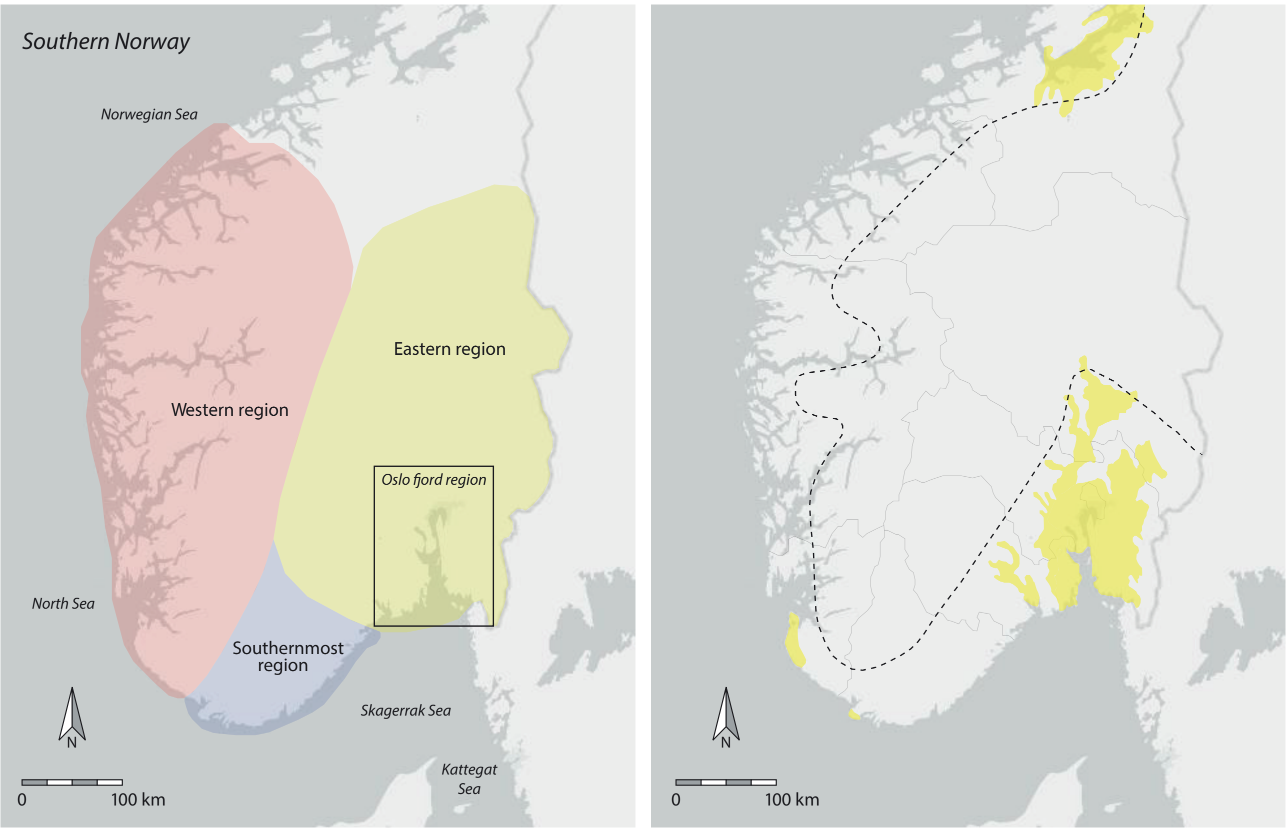


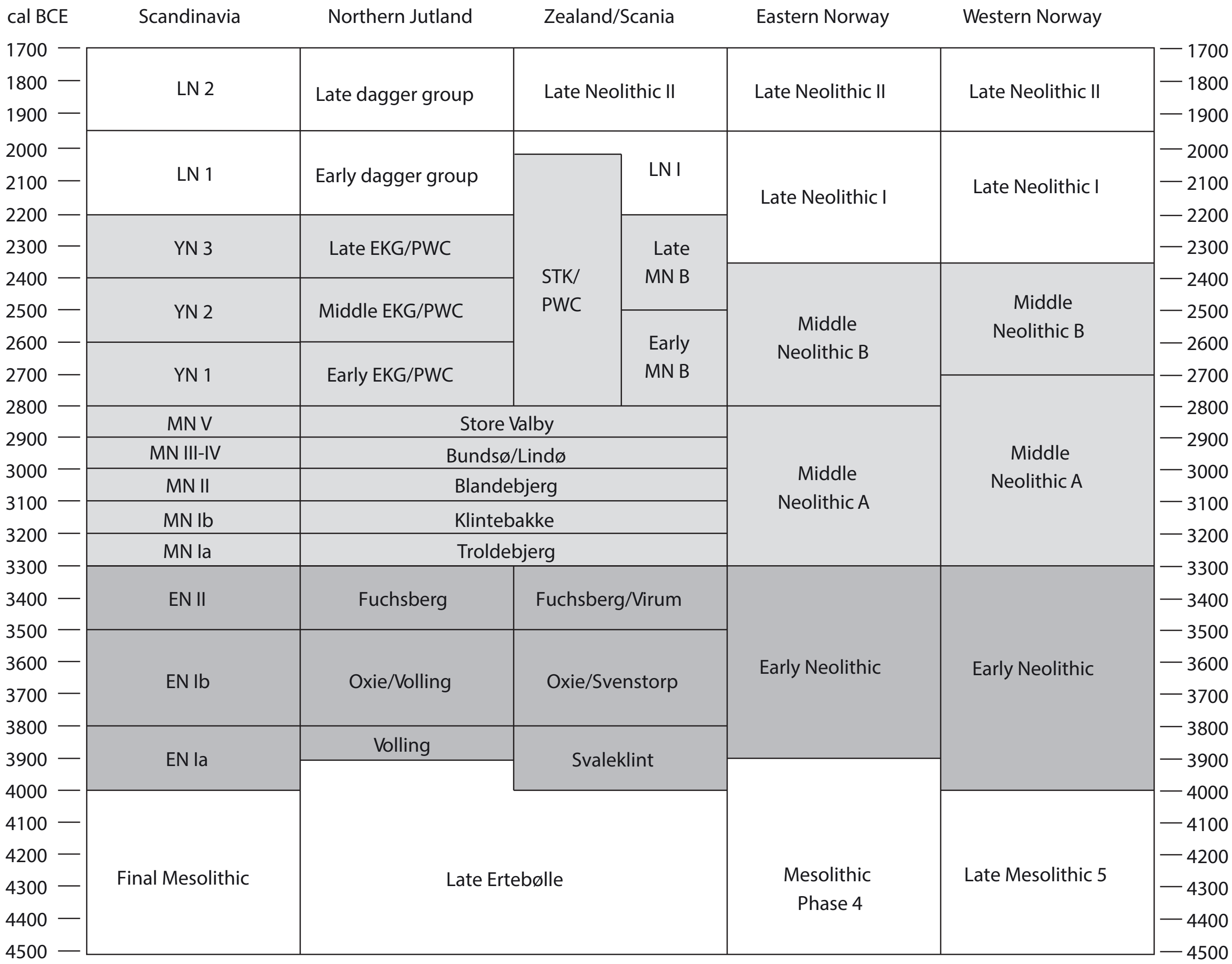
Fig. 1. The landscape under study with the three main regions in Southern Norway. Yellow marker in the bottom right map highlights areas favourable for agriculture in historical times (drawn after Puschmann 2005); dashed line marks the area with a 170-day growing season (i.e. days with 5 °C or more) (after Moen 1998, 21 fig. 6) (Graphics: S. V. Nielsen).

Background

While only 3.8 % of the total land cover in Norway is farmland today (Bryn et al. 2018), between 17 and 20 % of Eastern Norway was cultivated in 1959 (Mikkelsen 1984, 87; Østmo 1988; Puschmann 2005, 15). After the 1950's, there has been a massive closure of farms in the Oslo Fjord region and the downscaling of areas for cultivation have continued in many regions of Norway (Gundersen et al. 2017). Cereals are known to germinate at 6 °C and need about 175–200 days to ripen (Sørensen, L. 2014, 9). The farming regions from historical times in Southern Norway follow this boundary, but farming was most widespread in the eastern region (Fig. 1, below right). Topographically, Eastern Norway is similar to Southern Scandinavia due to a deciduous forest and easily farmable subsoils (Østmo 1998, with references).

Sites used for farming in the Early Neolithic in Eastern Norway are almost unknown (cf. chronological overview in Fig. 2) (Mikkelsen 1984; 1989; Østmo 1991; Prescott 1996). Domesticates, e.g. charred cereals or bones from domesticated animals, found in Norway have never been dated to the Early Neolithic. For many years, Jydehaugen – an Iron Age burial mound at Hunnfeltet in Østfold on the eastern side of the Oslo Fjord – was the only possible documented settlement site used for early farming (Hagen 1954). Excavations at Jydehaugen discovered a cultural layer with associated postholes directly below the mound. These structures were interpreted as traces of a house. Moreover, one trihedral arrowhead of flint was found inside the cultural layer, which we know today dates to the third millennium BCE (Nielsen et al. 2019). The excavation then discovered ard marks penetrating the subsoil beneath the house. As suggested by Østmo (1991), these marks could have been made before the house was built, possibly in the fourth millennium BCE, but other interpretations of the site formation processes are also possible. These discoveries occurred before the age of radiocarbon dating. Recent excavations at Hunnfeltet have produced dates spanning as far back as the Middle Neolithic B (e.g. Melheim et al. 2016). Thus, the true age of the ard marks at Jydehaugen remains unknown.

Fig. 2. Neolithic periods in Southern Norway and adjacent regions.



Stray finds of Neolithic artefacts in Eastern Norway with origins in Southern Scandinavia are often interpreted as indications of farming in the fourth millennium BCE (Glørstad et al. 2020; Hinsch 1955; Prescott 1996; 2020). Yet, the settlement history in this region changed with the Svinesund excavations in the early 2000's, which took place just north of the Swedish border (Glørstad 2009; 2004). These excavations documented a continuation of shore bound dwellings and economic specialisation from the Late Mesolithic Phase 4 (4500–3900 cal BCE) into the Early Neolithic period. This trend had been pointed out already by Mikkelsen (1984, 117), but it was confirmed with the excavations at Vestgård 3 (3720 cal BCE, Tua-4242, 4955 ± 55 BP) and Vestgård 6 (3870–3670 cal BCE based on several radiocarbon dates) at Svinesund (Johansen, K. B. 2005). Other notable excavated sites in this respect are Ystehede and Nordre Labo on the eastern side of the Oslo Fjord, and the sites Sandvigen, Holtan Nedre, and Langangen Vestgård 6 on the western side of the fjord (Bjørkli 2001; Glørstad 1998; Lyby/Koxvold 2019; Olstad 1993; Reitan 2014b). Thus, it seems clear today that many Early Neolithic settlements in Eastern Norway exhibit site location and tool inventories that strongly suggest they were places for hunting, gathering and fishing. Fragments and flakes from polished flint axes and pottery following a Southern Scandinavia tradition are sometimes found at these sites (Johansen, K. B. 2005; Glørstad 2004).

The results from Svinesund are still predominant in research (Glørstad et al. 2020; Prescott 2020; Solheim 2020; Solheim/Persson 2018), but some have favoured a more nuanced view. Shortly after the Svinesund excavations, Amundsen and colleagues (2006) presented data from the Nøkleby site in Ski, on the eastern side of the Oslo Fjord. In contrast to the coastal sites in the same region, Nøkleby was located in the hinterland about 10 km from the shore in the Early Neolithic. It was dated according to the typological analysis of two transverse arrowheads of flint, one fragmented polygonal battle-axe, and a collection of pottery sherds. The site location and the few discovered artefacts supported an interpretation of Nøkleby as representative of a different economic orientation, and for the presence of not one, but at least two site types in the Early Neolithic (see also Reitan et al. 2018). That the places for farming were organised in the hinterland was also the norm in Southern Scandinavia in the Early Neolithic (Sørensen, L. 2020, 307–308). This was discovered again in the northernmost part of Western Sweden by excavations conducted simultaneously to those at Svinesund (Johansson 2006). In contrast to the many Early Neolithic coastal forager sites in Western Sweden, the site of Skaveröd was located in the hinterland about 1 km from the coast, and very few artefacts were found by the excavation (Johansson 2006, 207). Thus, Skaveröd was a place quite similar to Nøkleby.

The appearance of more complex economic practices in Eastern Norway in the Early Neolithic was also indicated by two recent studies of population dynamics. Both studies found significant increases of carboniferous materials in the Early Neolithic I period (Nielsen et al. 2019; Solheim/Persson 2018). Solheim and Persson compared this to a site count of shoreline-dated sites – sites that were considered representative of foraging, which showed a 'gradual decrease during the Neolithic period' (Solheim/Persson 2018, 341). Thus, the peak in carboniferous materials in the Early Neolithic could not be explained by a growing population of foragers. Nielsen and colleagues (2019) found that the peak corresponded with the appearance of postholes and pits at hinterland-oriented sites around the Oslo Fjord, and suggested that the introduction of a Neolithic mode of production could explain this development (Nielsen et al. 2019, 88). This paper proceeds in this direction by exploring further exploitation of the hinterland and inland areas in Eastern Norway in the Early Neolithic.

Materials and methods

For this paper, the author reviewed published literature and unpublished excavation and survey reports – the latter often referred to as 'grey literature' (Evans 2015) – produced at museums and county councils in Eastern Norway. As a source of comparative treatment, data on cereals, the pollen record of the region, and stray finds, such as flint axes and stone battle-axes, were also compiled from previous research. The review of 'grey literature' focused primarily on publications younger than 2005, i. e. from the time after the Svinesund project. Many reports published by the Museum of Cultural History in Oslo, which conducts all excavations of Stone Age sites in Eastern Norway, are openly available online (a list of excavation reports with an internet source is presented at the end of this paper). It should be mentioned that the reports are written in Norwegian.

The review focused on identifying excavated or surveyed sites where settlement traces in the form of structures, i. e. intentionally dug pits, postholes, ditches, etc., were radiocarbon dated to the Early Neolithic. Previously, such places received less attention because of a predominance of younger structures at the sites. The identified places were excavated either by the use of machine top soil stripping, where an excavator removed the top cultivated soil, or by the use of manual digging in grid systems. The first method is used primarily at places where the top soil is known to have been cultivated, and because survey methods intended for the discovery of lithic scatters are rarely used at such places. Traces of settlements older than the Late Neolithic (2350–1700 cal BCE) at such sites are often said to have been discovered 'coincidentally' by archaeologists. In these cases, the top soil is removed from the site and is usually not studied further, while remains of pits and other structures in the ground below the cultivation layer are documented. This method is cost effective, but artefacts or bones dislodged inside this soil horizon are often not discovered. Unburnt bones are, in general, rarely discovered at such sites due to poor preservation conditions. Sites excavated in a grid system are usually investigated with the top soil because it is expected that artefacts will occur in the soil. Consequently, many artefacts are often found at such sites because the soil inside the grid is sieved, but considerably smaller areas are excavated compared to the first method. This second method is standard for excavations focused on the recovery of artefacts in non-cultivated places, such as in woodlands and mountainous areas.

The presentation and discussion of dated domesticates and the pollen record draw on data from previous publications (Høeg et al. 2019), as well as results from recent studies of population dynamics in Eastern Norway (Nielsen et al. 2019; Solheim 2020; Solheim/Persson 2018). For distribution maps of stone battle-axes and flint axes, previously published catalogues were used [1]. The construction of distribution maps of Middle Neolithic sites with pottery was based on a recently published review by Nielsen and colleagues (2019).

Radiocarbon dates presented in the text below have been re-calibrated in OxCal (version 4.4) online using the IntCal20 calibration curve (Bronk Ramsey 2021; Reimer et al. 2020). The end goal of any dating program in archaeology is to reach the highest possible precision, whereby radiocarbon dating has its own particular limitations. Calibrated dates are usually presented in research as probability distributions that take the standard deviation of the sample and the shape of the calibration curve into account (Bayliss et al. 2013; Bowman 1994). Single calendar ages, such as medians, are traditionally approached with caution. Van der Plicht and Mook (1987; 1989) argued that median values are informative when the probability distribution is not bimodal, in which case it is unlikely that the median is even close to the true age of the sample (see also Bronk Ramsey 2017, 2). Bayliss et al. (2013, 81)

1 Amundsen 2000; Bergsvik/Østmo 2011; Bjørn 1935; Brøgger 1906; Fossum 2017; Hagen 1946; Hinsch 1955; Mikkelsen 1974; 1989; Nielsen/Åkerstrøm 2016; Reitan 2005; Stubberud 2019; Østmo 1988.

have argued that median values should be regarded as summary statistics and not representative of the full information retained in a dated sample. Still much research is based on medians of (uncalibrated or calibrated) ages because the standard procedure for calculating age combinations uses medians as input (Crema/Bevan 2020; Ward/Wilson 1978). This text presents calibrated radiocarbon ages as the median value rounded off to the nearest five years after calibration in OxCal. Uncalibrated ^{14}C ages and standard deviations are presented in parenthesis when appropriate.

Results: Settlements, cereals, pollen record, artefacts

Settlements

The review resulted in the identification of 15 sites with Early Neolithic structures or site locations in Eastern Norway (Fig. 3; Table 1). Documented structures and interpretations of architectural traits are shown in Figures 4 and 5 (radiocarbon dates are found in Supplement 1). Considering the nature of the excavation data, few of the presented settlements were classified as 'Stone Age sites' in reports or other literature because, in these cases, the excavations revealed settlement traces primarily from younger periods, particularly from the Bronze Age and the Iron Age.

Low representability of Early Neolithic activity is illustrated in Figure 6. Clearly, there are huge variations in the extent of the excavations, in the occurrence of the structures, dating strategies and budgets, and thus also in the frequency of Early Neolithic structures. This is also visualised in a summed probability distribution (SPD) of all (n = 151) radiocarbon dates

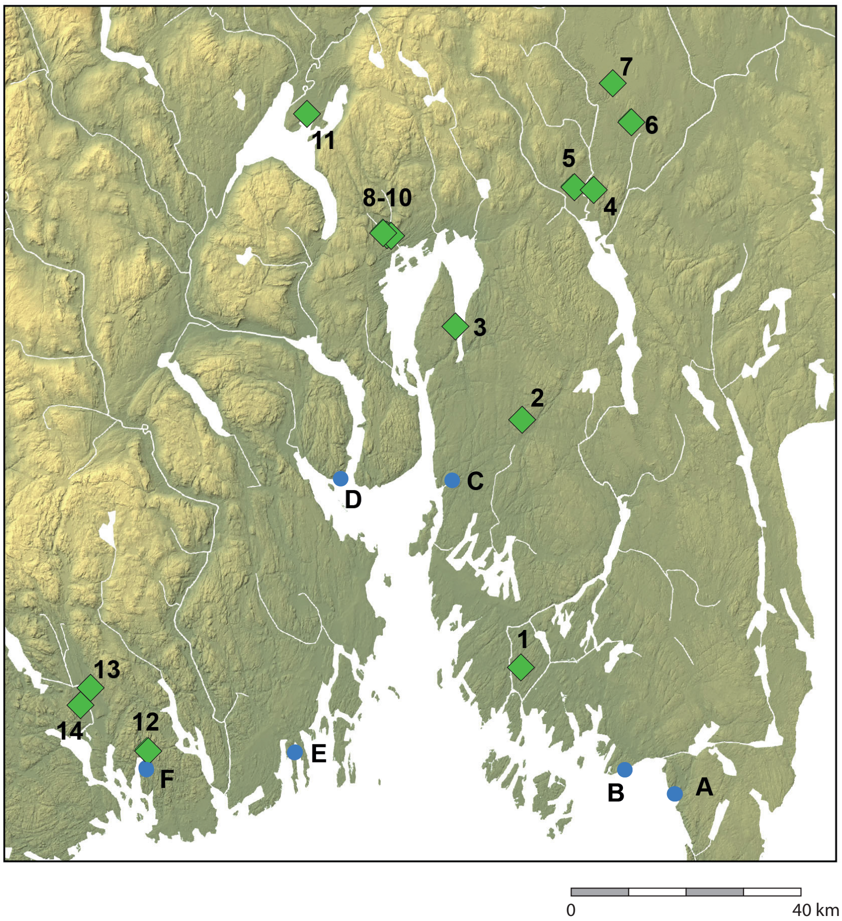


Fig. 3. Early Neolithic settlements in the Oslo Fjord region identified in this paper (1–14), and previously excavated coastal sites (A–F): 1 Veum Søndre; 2 Nøkleby; 3 Haslum; 4 Asak Øvre; 5 Skedsmovollen III; 6 Kåstad; 7 Holen; 8 Dønski; 9 Vøyen I; 10 Vøyenenga; 11 Svensrudsletta; 12 Gunnarsrød 5; 13 Bratsberg; 14 Larønningen. The site Bullmuseet is located further north. A Ystehede; B the Svinesund sites; C Nordre Labo; D Sandvigen; E Holtan Nedre; F Langangen Vestgård 6 (Graphics: S. V. Nielsen).

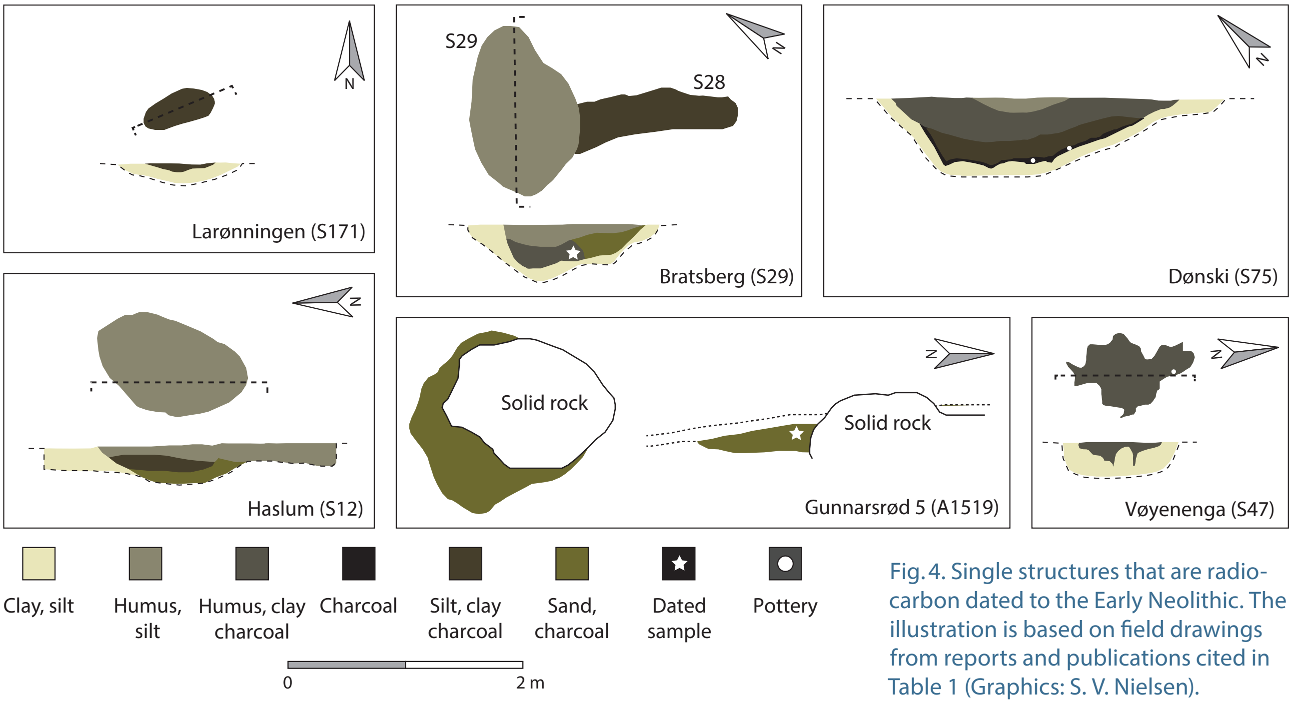


Fig. 4. Single structures that are radiocarbon dated to the Early Neolithic. The illustration is based on field drawings from reports and publications cited in Table 1 (Graphics: S. V. Nielsen).

Table 1. Data for the 15 Early Neolithic sites in Eastern Norway interpreted here as places for early farming.

Site name	Year	Area (m²) excavated	Number of features	Number of dated features	Number of EN dates	Location	Artefacts	Reference
Asak Øvre	2008	1000	39	10	1	Hinterland	One flint flake from posthole S65 (probable age: Late Neolithic)	Eggen 2010
Bratsberg	2010	3830	281	25	3	Hinterland	-	Wenn 2012
Bullmuseet	2012	-	20	6	3	Inland	-	Grimbe 2013
Dønski	2007	6000	62	7	3	Coast near	Pottery sherds (TRB) in pit S75, pottery and flint flake in pit S67, pottery in cultural layer S54	Demut 2010
Gunnarsrød 5	2011	900	12	4	1	Hinterland	Pottery from pit A1519, tanged points of flint, polished flint axe (fragment)	Reitan 2014c
Haslum	2010	200	7	4	1	Coast near	2389 artefacts in totat: pottery sherds (TRB), clay disc, point-butted and thin-butted flint axes (fragmented), transverse arrowheads	Schaller Åhrberg 2011
Holen	2013	3350	163	19	1	Hinterland	Flint flake from posthole A1446 (probable age: Bronze Age)	Wenn 2014
Kåstad	2004	760	58	29	2	Hinterland	-	Johansen 2005
Larønningen	2012	2254	37	5	2	Hinterland	-	Røberg 2014
Nøkleby	-	-	-	-	-	Hinterland	Pottery, two transverse arrowheads, one polygonal battle-axe	Amundsen et al. 2006
Skedsmovollen III	2012	-	287	8	1	Hinterland	One flint flake from posthole S898	Sørensen and Lønaas 2013
Veum Søndre	2008	200	20	7	1	Hinterland	Flint debris (probable age: Bronze Age)	Dahl and Skogsfjord 2011
Svensrudsletta	2012	775	1	1	1	Hinterland	Pottery sherds (TRB) spread on the site	Bjørkli 2014
Vøyen 1	2008	3500	81	20	5	Coast near	One transverse arrowheads of flint, one fragment from polished flint axe	Berg-Hansen 2013
Vøyenenga	2004	2516	58	9	2	Coast near	Pottery in pit S47, one flint flake without context	Skogstrand 2004

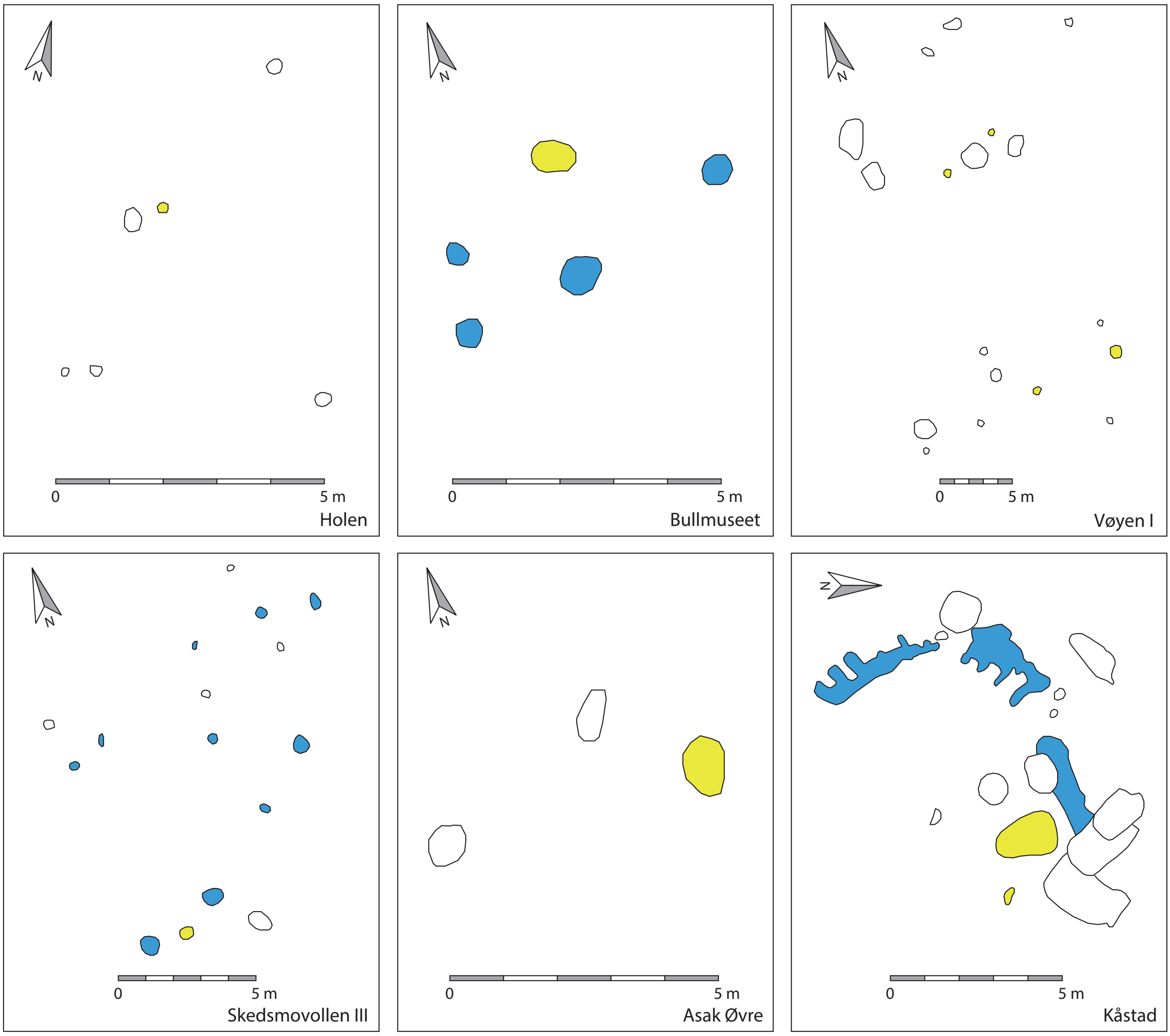


Fig. 5. Clusters of structures from the identified sites. Yellow: Radiocarbon dated to the Early Neolithic. Blue: Interpreted by the author as related to the Early Neolithic structures. White structures: Interpreted as not related to the Early Neolithic structures. The illustration is based on field drawings from reports and publications cited in Table 1 (Graphics: S. V. Nielsen).

from 14 of the 15 sites (Fig. 7). Here, the density distributions of each calibrated date have been added together and normalised on a ^{14}C-scale using the sum function in OxCal (Bronk Ramsey 2021; Contreras/Meadows 2014). We can see occasional Mesolithic events followed by an increase of dates in the Early Neolithic, a gap in the late third millennium BCE and then a new increase continuing into the Early Iron Age. It can be noted that a majority of the dated samples were from birch *(Betula)* and burnt nutshells *(Corylus)*, fewer from combinations of charcoal stemming from different wood species, as well as a few samples of burnt bones. Species associated with old wood effects, such as oak *(Quercus)* or juniper *(Juniperus)*, were not dated at any of the sites.

The sites' closeness to the sea has been interpreted here based on available data (Table 1), but as discussed below, this is a problematic task for many reasons. I have used the location types "inland", "hinterland", and "coast-near". "Inland" refers to places located far away from the coast, such as the valleys north of Oslo. "Hinterland" refers to landscapes close to the coast, but with an inland character, while "coast-near" refers to places where it is likely that the settlement activity was partly adjacent to the coast. The results point to one inland site, nine hinterland sites, and four coast-near sites.

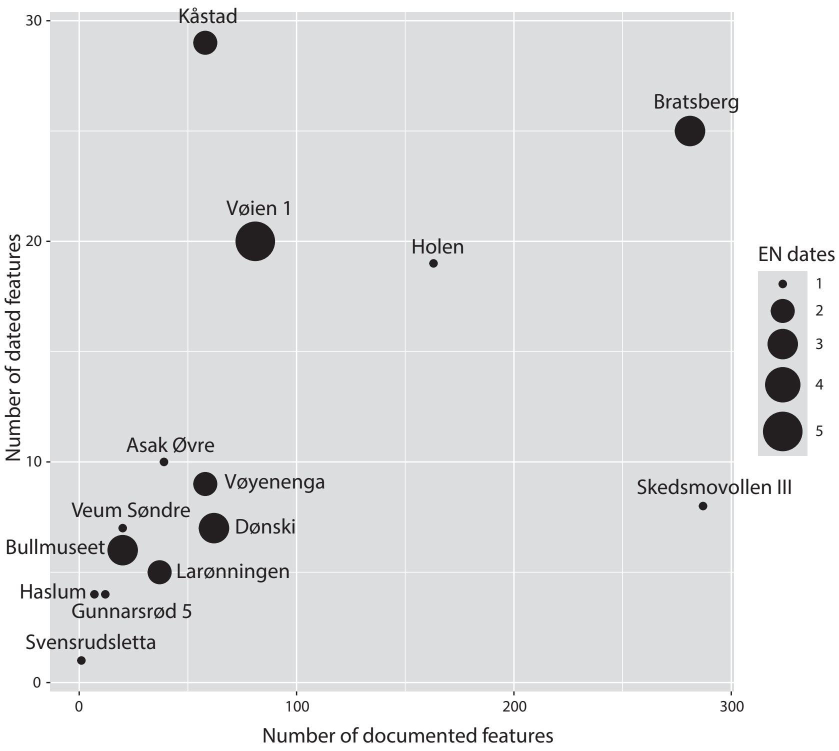


Fig. 6. Excavation data from Early Neolithic settlements in the Oslo Fjord region. For the sites Bullmuseet and Skedsmovollen III, information is incomplete (data: see Table 1).

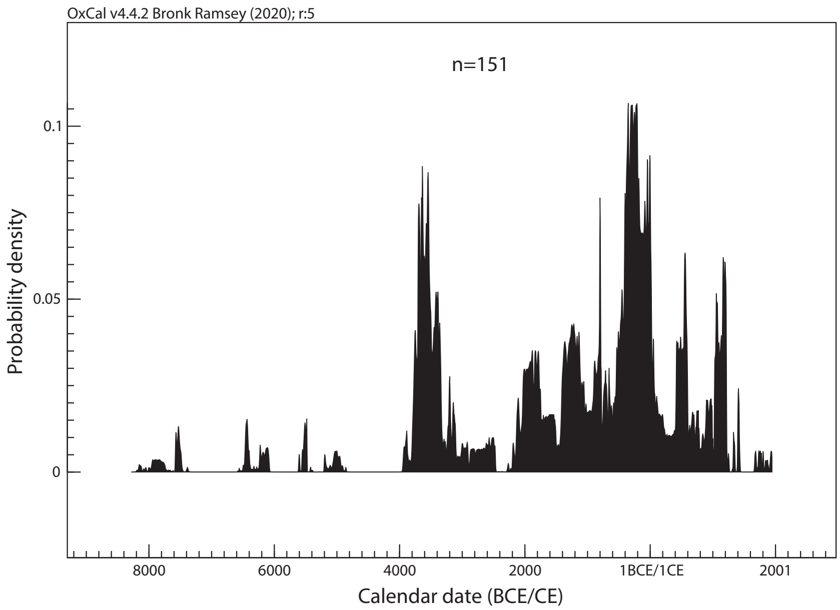


Fig. 7. Summed probability density of all dates from 14 of the 15 Early Neolithic settlements (n = 151; for the data see Supplement 1).

Veum Søndre

The Veum Søndre site, located about 25 km north of the Swedish border, was excavated using machine top soil stripping in 2008 (Dahl/Skogsfjord 2010). Several pits and hearths were documented, as well as three cultural layers (S18, S19 and S20) dislodged on top of one another. The layers S18 and S19 were radiocarbon dated to the Bronze Age, while the deepest layer (S20) was dated on charcoal to 3530 cal BCE (Tua-7945, 4740 ± 45 BP). A series of pollen samples from these cultural layers showed evidence of an open landscape around the site during the time of the habitations, which was interpreted as indicative of either grazing or farming in the area. The deepest layer in S20 contained only charcoal, but the same interpretation of an open landscape was applied to all three stratigraphic layers. Thus, at the site Veum Søndre, there was no evidence of actual human behaviour or occupations from the Early Neolithic apart from an impression of the landscape filled with anthropogenic soil, as inferred from the palynological analysis of layer S20. The sea level history of the area suggests that Veum Søndre was located on an island in the Early Neolithic.

Haslum

The Haslum site, located north of Veum Søndre on the eastern side of the Oslo Fjord, was investigated in 2010 (Schaller Åhrberg 2011). At the time of excavation, the site was located in a woodland area. In the Early Neolithic, it was located about 10 m above sea level and about 350 m from the shore. Though located fairly close to the sea, it was unusual for Early Neolithic sites in the area to appear with such a marked distance (ibid. 42). The site was discovered by a survey based on lithic artefacts recovered through sampling during a grid system excavation.

Pits and hearths discovered at the site were radiocarbon dated to the Neolithic, the Bronze Age or the Iron Age. The deposited artefact material was mainly from the Neolithic period, but there were also finds from the Mesolithic and more recent periods. Pottery sherds were found scattered within the upper 30 cm of the subsoil, concentrated mostly between a depth of 10 and 20 cm (Schaller Åhrberg 2011, 11). Burnt bones, flints and pottery were found mainly during the documentation of hearth S12 (Fig. 4). One burnt bone from within the hearth dated to 3685 cal BCE (Tra-1574, 4915 ± 25 BP). A soil sample from S12 contained one seed of *Chenopodium* (unknown subspecies), also known as goosefoot or fat hen.

The total number of pottery sherds at Haslum amounted to 798 pieces, of which 101 were decorated. The assemblage was highly fragmented, as the median weight of the sherds was 2 g and the largest weight was 26 g (Schaller Åhrberg 2011, 21). The decorated sherds had a variety of imprints, including lines *(Tiefstich)*, pin-sticks, cord, cord-stamp, and oval pits. A few sherds had holes combined with cord-stamp ornamentation. Clearly, due to their characteristic ornamentations, the sherds with cord and pin-stick ornaments could have been contemporaneous with the hearth, i. e. 3685 cal BCE. This is supported by finds of fragmented point- and thin-butted flint axes and transverse arrowheads, pointing to Early Neolithic activity.

There is also reason to presume subsequent activity at Haslum; one rim sherd with a marked carinated shoulder is quite similar to the type B vessels from the Middle Neolithic forager sites of Siretorp and sherds from Fagervik (late stage) in Sweden (Edenmo et al. 1997; Larsson 2009, 90). These sherds, and the *Tiefstich*-ornamented sherds from Haslum, probably point to activity in the late fourth or early third millennium BCE.

Skedsmovollen III

The sites at Skedsmovollen (I, II and III) were all located about 15 km northeast of Oslo City. They were excavated using machine top soil stripping through three seasons. During the third season and at the third site area, one posthole (S884) was dated to 3450 cal BCE (Ua-46613, 4702 ± 33 BP) (Sørensen/Lønaas 2013). Generally, the postholes from all periods discovered at Skedsmovollen III occurred in concentrations, but no separate house features were defined by the excavation report. No Early Neolithic artefacts were discovered at this site either. Overall, very few structures were radiocarbon dated at Skedsmovollen III, but it is conceivable that the posthole S884 was part of a longhouse. An interpretation of the structures, which could have been part of this house, is presented in Figure 5, but it needs to be confirmed by radiocarbon dating of relevant samples from the site.

Asak Øvre

The Asak Øvre site was excavated using machine top soil stripping in 2008 at the Asak farm in Akershus, about 18 km northeast of Oslo (Eggen 2010). The survey project dated one hearth to 3360 cal BCE (4590 ± 40 BP, unknown lab ID), and this structure was dated again by the excavation to 3457 cal BCE (TUa-7995, 4635 ± 35 BP). One thin-butted flint axe had been discovered several years earlier in the area by local farmers, who delivered it to the Museum of Cultural History in Oslo (Fig. 8). The flint axe is worked and chipped along several edges. In contrast to many of the complete thin-butted flint axes found around the Oslo Fjord (such as Fig. 9), the axe from Asak was probably used for practical purposes before it was deposited.

Fig. 8. Thin-butted flint axe discovered by farmers at Asak, northeast of Oslo. Museum inventory number C24012 (Photo: Anne Christine Eek; CC BY-SA 4.0).

Fig. 9. Thin-butted flint axe discovered by farmers at Skoro in Ski, on the eastern side of the Oslo Fjord. Museum inventory number C19587 (Photo: Kristen Helgeland; CC BY-SA 4.0).

The discovery of activity from the Early Neolithic at Asak Øvre is additionally interesting because two Late Neolithic longhouses were also discovered there. This could indicate that the area in question had not been ploughed as intensely as other parts of the farm in historical times, thus preserving more structures. At the other excavated areas at Asak, only Iron Age settlements and no older activity were discovered by the project (Eggen 2010). The polished and used flint axe itself suggests that the Early Neolithic activity was possibly more comprehensive than indicated by the single hearth discovered by the excavation.

Kåstad

The Kåstad site, located about 30 km northeast of Oslo, was excavated using machine top soil stripping in 2004. The project documented remains from occupations in various prehistoric periods, including a few structures from the Early Neolithic. One pit (S4356) was dated to 3575 cal BCE (Beta-197798, 4810 ± 40 BP), and one posthole (S4218) belonging to 'House 2' on the site dated to 3505 cal BCE (Beta-197799, 4720 ± 40 BP) (Johansen, J. S. 2005; Martens/Johansen 2008).

House 2 was defined by two wall ditches, a number of small postholes, and one large posthole (S4218) positioned inside the house. The house could have been square or rectangular, with a width of ca. 8 m (Martens/Johansen 2008, 80). Artefacts were not discovered at the site.

The pit S4356, which could have been contemporaneous to or slightly older than the posthole, was discovered below the floor layer. The pit was oval, measuring 100 × 186 cm and 21 cm in depth. Because of a particularly high level of organic content in the soil, it was proposed by the excavator that pit S4356 could represent an Early Neolithic grave (Johansen, J. S. 2005, 19). However, this interpretation has not been confirmed by subsequent research. Soil analysis of a wall ditch sample (F5434, from S4183) identified one charred cereal (unidentified species), but it was not radiocarbon dated by the project.

Holen

The Holen site, located about 33 km northeast of Oslo, was excavated using machine top soil stripping in 2013 (Wenn 2014). Among the 164 features, including 105 postholes that were discovered at the site, one posthole (A2664) was dated to 3450 cal BCE (UBA-24156, 4669 ± 31 BP). The feature was not interpreted by the excavator as having been associated with other structures forming, e.g., houses or other construction types on the site, and Neolithic artefacts were not discovered. Thus, in the case of Holen, there is some evidence of human activity in the Early Neolithic II.

Bullmuseet

A site was surveyed in 2012 at Bullmuseet, about 220 km north of Oslo, which revealed Early Neolithic occupations. The site is located in Østerdalen, one of the largest valleys in Eastern Norway, which leads to Oslo in southern direction. The Bullmuseet site was surveyed by use of digging trenches with an excavator, i.e., removing the top soil within an area. In one of the trenches, five postholes that probably belonged to one building were discovered (Grimbe 2013). One of the postholes (ID 160967-8) in this excavation area was dated to 3710 cal BCE (Beta-337641, 4950 ± 30 BP). Another posthole (ID 160967-3) discovered a few metres away from the mentioned concentration of five postholes was dated to 3695 cal BCE (Beta-337640, 4930 ± 30 BP). These structures indicate the presence of possibly two Early Neolithic buildings on the site.

In a second trench, one fossilised cultivation layer (ID 160967-19) was documented in an earth profile and was dated on charcoal to 3235 cal BCE (Beta-337639, 4560 ± 30 BP). It is uncertain if this date represents the formation of the cultivation layer or older charcoal mixed into a subsequently formed cultivation horizon. As the maximum width of trenches at archaeological surveys in Norway is three to four metres, complete house features are rarely documented at this stage of investigations. However, the few documented postholes at Bullmuseet indicate the presence of buildings in the Early Neolithic I.

Vøyenenga, Dønski, Vøyen 1

In the municipality of Bærum, about 15 km west of Oslo, three sites with Early Neolithic occupations were excavated using machine top soil stripping; Vøyenenga in 2004, Dønski in 2007, and Vøyen 1 in 2008 (Berg-Hansen 2013; Demuth/Simonsen 2010; Østmo/Skogstrand 2006; Skogstrand 2004). Today, the area where the sites are located have an inland orientation, but in the Early Neolithic, the sites were connected to the Oslo Fjord (Fig. 10) (Mjærum 2010).

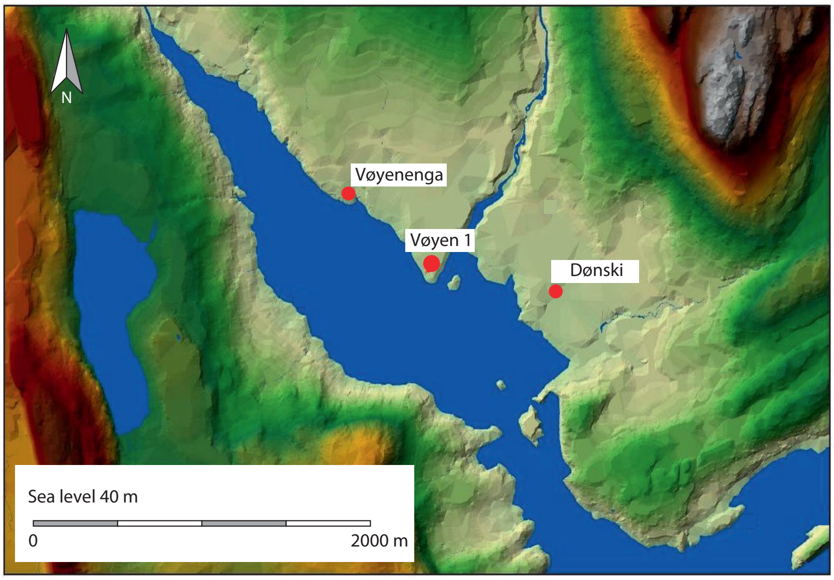
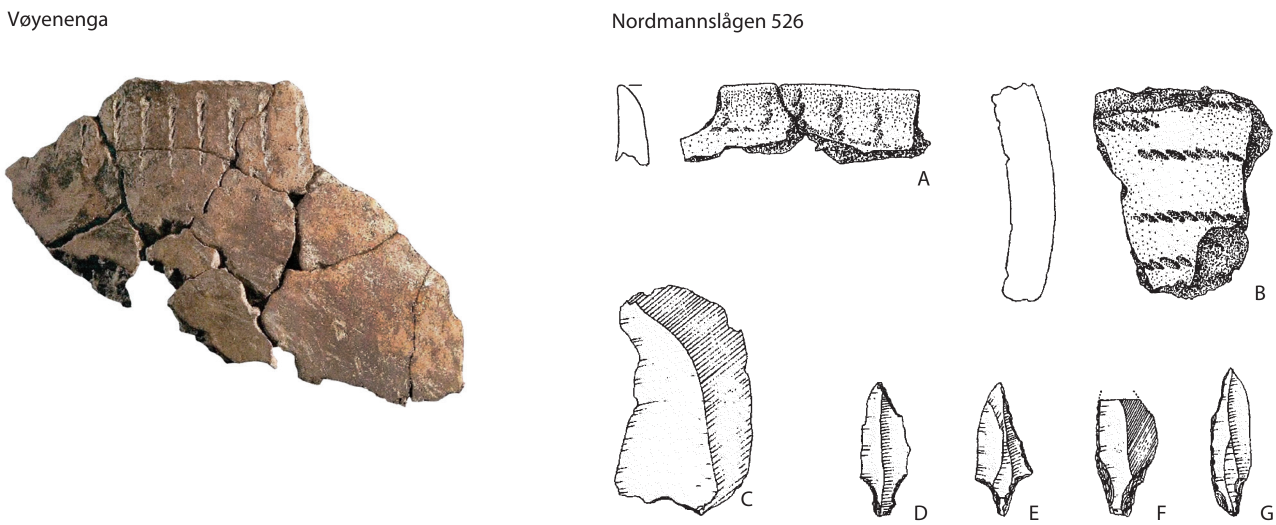


Fig. 10. The location of the sites Vøyenenga, Vøyen 1 and Dønski with the sea level elevated by 40 m, which corresponds approximately to that of the Early Neolithic period (map based on Mjærum 2010, 36 fig. 29).

At Vøyenenga, traces of activity from multiple prehistoric periods were documented, including ditches from Iron Age mounds. One charcoal sample from a ditch (S14) surrounding 'mound 2' was dated to 3712 cal BCE (Ua-5512, 4940 ± 45 BP), indicating that Iron Age activity mixed older anthropogenic soils into new structures. Pottery sherds occurred in one pit (S47), which was dated on charcoal to 3580 cal BCE (T-17864, 4810 ± 55 BP) (Østmo/Skogstrand 2006; Skogstrand 2004). The sherds belonged to one vessel decorated with 1.5–1.8 cm long vertical lines made with cord below the rim. Østmo and Skogstrand argued that the Vøyenenga vessel is comparable to type III of the Eastern Danish funnel beakers in Eva Koch's (1998) typology. They also pointed to similarities with the sherds discovered inside a hearth at Nordmannslågen 526 (Fig. 11), a forager site located on the Hardangervidda mountain plateau (Indrelid/Moe 1983; Indrelid 1994). The hearth at Nordmannslågen 526 was dated by charcoal to 3650 cal BCE, but the date has a large standard deviation (T-1618, 4860 ± 170 BP). It could also be mentioned that one cord-decorated sherd was discovered at Austbu/Vestbu – another hunting site on Hardangervidda – by A. Bøe in 1939–1940 (Bøe 1942, 69 fig. 39). A subsequent excavation at Austbu/Vestbu dated one charcoal sample from the lowest cultural layer to 3910 cal BCE (GrN-7170, 5125 ± 75 BP), but its relation to the pottery sherd is uncertain (Indrelid 1994, 149).

Fig. 11. Artefacts from the sites Vøyenenga (cord ornamented sherd) and Nordmannslågen 526: A–B Cord ornamented sherds; C flint flake; D–G flint tanged points of type A (Vøyenenga after Skogstrand 2004, 16 fig. 14/photo: Tom Heibreen; Nordmannslågen original drawings by Svein Indrelid and reprinted here with permission; first published in Indrelid/Moe 1983, 42 fig. 3).



Koch's type III vessels are known to also occur outside Eastern Denmark. Sherds with similar decorations are found on Volling type vessels from Hov, Rørgårdsvej, and Liselund on Jutland (Sørensen, L. 2014, 256), and at sites in Western and Eastern Middle Sweden (Petersson 1998). Koch's type III is also known as type Vrå II in Eastern Middle Sweden. Hallgren (2008) has cited radiocarbon dated food crusts with this decoration; one sherd from Skogsmossen dating to 3460 cal BCE (Ua-10389, 4675 ± 80 BP), and one from Trössla södra also dating to 3460 cal BCE (Ua-22411, 4690 ± 45 BP). Thus, the date from pit S47 at Vøyenenga is quite similar to dates associated with type III vessels in Eastern Denmark and type Vrå II vessels in Eastern Sweden.

At Dønski, pottery sherds were discovered in the bottom layer of pit S75, which was dated on charcoal to 3640 cal BCE (T-19326, 4850 ± 95 BP) (Demuth/Simonsen 2010). A charcoal layer from the uppermost fill in S75 was dated to 1045 cal BCE (T-19325, 2860 ± 95 BP). A few sherds with the same tempering were found in pit S67 and inside cultural layer S54. This layer measured 260 × 170 cm and its function is still unknown. The collection of pottery sherds from the three structures belong to three or possibly four vessels; one with a handle, one decorated with two rows of small (stick) imprints below the rim, and one decorated with two rows of cord imprints below the rim. One sherd with more complex decoration of several small (stick) imprints could belong to the second vessel.

Decorations with stick imprints are also known from Early Neolithic sites in Western Sweden such as Slottsmöllan and Skee 1616. At Slottsmöllan, one burnt nutshell was dated to 3600 cal BCE (Ua-1663, 4830 ± 80 BP), and two samples of food crusts provided very similar results (Westergaard 1998). At Skee 1616, one cereal (of unknown type) was dated to 3450 cal BCE (Ua-26850, 4615 ± 40 BP) (Westergaard 2008). The pottery decorations with stick imprints at Dønski, Slottsmöllan and Skee 1616 also occur on pots belonging to Koch's type I–III, which all date to the Early Neolithic.

At the Vøyen 1 site, several structures, including pits and postholes, were dated to the Early and Middle Neolithic. Among the oldest structures were one pit dating to 3830 cal BCE (Tua-7761, 5025 ± 40 BP) and one posthole dating to 3690 cal BCE (Tua-7765, 4905 ± 40 BC). Pottery was not found at Vøyen I, but among the lithic artefacts were one polished flint flake stemming from a Neolithic axe (of unknown type), and one transverse arrowhead of flint (Berg-Hansen 2013).

Svensrudsletta

The Svensrudsletta site, located about 24 km north-northwest of the aforementioned sites in Bærum, was excavated using machine top soil stripping in 2012 (Bjørkli 2014). No features at Svensrudsletta could be connected to Early Neolithic settlements, but several pottery sherds (44 sherds in total) were collected on the site during the excavation. The decorated sherds had one line of oblique imprints of cord just below the rim, or simple straight lines made with cord on an unknown part of the vessel.

One sample of a food crust collected from a sherd was dated to 3570 cal BCE (Ua-46420, 4793 ± 30 BP, –24.7 ^{13}C). As lipid analysis of samples collected from inside two sherds indicated fatty acids from terrestrial animals and plants, the date Ua-46420 should probably not be corrected for a marine reservoir effect. It was concluded in the excavation report that the area had been subject to extensive interventions from subsequent human activities (Bjørkli 2014, 21).

Gunnarsrød 5, Bratsberg and Larønningen

The three sites Gunnarsrød 5, Bratsberg, and Larønningen were located on the western side of the Oslo Fjord, about 100 km southwest of Oslo. The Gunnarsrød 5 site was excavated in 2011 using machine top soil stripping (Reitan 2014c). In this case, a number of lithic artefacts were documented and a collection of undecorated pottery sherds was found in one pit (A1519) cut into the subsoil. The assemblage of sherds probably originated from a singular vessel, except for one rim sherd that may have belonged to a second vessel.

Based on the shape of the almost complete vessel from A1519, G. Reitan (2014c, 244) drew parallels to the Vrå III and IV vessel types in Eastern Sweden, which date to the Early Neolithic. The pit A1519 was dated with a charred nutshell to 3475 cal BCE (UBA-19160, 4716 ± 31 BP), although ash from inside one sherd provided a Late Neolithic date. This suggested reuse of the pit several centuries later. However, the dating of pottery sherds, whether by use of tempering or ash, poses methodological challenges (Casanova et al. 2020; Evin et al. 1989; Hedges et al. 1992; Kolic 1995). From a methodological point of view, the dated sherd at Gunnarsrød 5 is questionable. It should be supplemented by further investigations before it can be confirmed. In the Early Neolithic, when the nutshell from A1519 was burnt, the site was located about 300 m from the seashore.

The site of Bratsberg, located in Skien, was excavated in 2010 using machine top soil stripping (Wenn 2012). One pit (S50) was dated to 3725 cal BCE (Tra-2488, 4950 ± 50 BP) and another pit (S29) to 3575 cal BCE (Tra-2499, 4800 ± 40 BP). Additionally, a fossilised cultivation layer (S42) was dated with charcoal to 3635 cal BCE (Tra-2501, 4850 ± 40 BP). Due to stratigraphic observations regarding these structures, the report concluded that S42 and S50 were younger, and that the charcoal used to date them probably represented mixed anthropogenic soil from Early Neolithic occupations. Conversely, pit S29 was interpreted as having been formed in the Early Neolithic. Several features with similar fill as in S29 were indeed documented at Bratsberg, but they were unfortunately not dated.

The Larønningen site, also located in Skien, was excavated in 2012 using machine top soil stripping (Røberg 2014). One hearth (S171) was dated to 3450 cal BCE (Ua-46661, 4705 ± 31 BP) and one pit (S177) was dated to 3570 cal BCE (Ua-46657, 4796 ± 32 BP). The hearth was discovered inside a longhouse with postholes dating to the Bronze Age, whereby its conservation was probably due to the overlaying house feature. Conversely, pit S177 was discovered outside the longhouse and was reported as very poorly preserved compared to other pits on the site (Røberg 2014, 15). No artefacts were discovered at the Larønningen site.

Discussion

How to interpret the sites

The review identified a majority of sites located in the hinterland, a concept that refers to landscapes close to the coast, but with an inland character (as defined by Schülke 2020). The hinterland is often understood precisely as an area behind the coast, and in this sense, its meaning is derived in relation to occupied areas along the shoreline or rivers. As already noted, the hermeneutics involved in prehistoric site description in Norway is complex because the ‘coastal zone’ itself has changed its location through time. The sea level in the Oslo Fjord region was elevated in the Neolithic due to postglacial eustacy; about 30 m higher on the eastern side and about 25 m higher on the western side (Påsse 2003; Sørensen, R. 1999; Sørensen, R. et al. 2014).

When we include Nøkleby, we know now of 15 sites in the Oslo Fjord region that deviate more or less from the general pattern of coast-near foraging in the Early Neolithic.

The pollen analyses of layer S20 at Veum Søndre demonstrated an open landscape with no direct evidence of farming or husbandry economy. Goosefoot is a wild seed that tends to grow in cultivated areas and is known to occur on Early Neolithic settlements (Kirleis et al. 2011; Mueller-Bieniek et al. 2019; 2020; Nowak et al. 2020). It could indicate the presence of farming at Haslum. Cultivation layers were documented at Bullmuseet (3235 cal BCE) and at Bratsberg (3635 cal BCE), but these were dated on charcoal samples because no cereals were found. One charred cereal did occur inside an Early Neolithic structure at Kåstad, but it was not dated. Although the traces of human activity are often sparse, the occurrence of postholes indicates the presence of robust buildings. House 2 at Kåstad, for instance, had direct parallels to longhouses previously documented in Scania and Eastern Denmark. Such houses seem to appear around 3800 cal BCE, and relevant parallels are houses documented at Mossby and Saxtorp in Southern Sweden (Andersson et al. 2016; Nielsen 2019; Schulz Paulsson et al. 2017; Sørensen, L. 2014, 206 fig. 156; Sundström 2003, 199). Remains of longhouses were also discovered at Vøyen 1, Skedsmovollen III and Bullmuseet.

The divergent nature of the 15 sites points to a different economic orientation than the impression we get from the coast-near forager sites in Eastern Norway. Despite a lack of direct evidence of farming or husbandry, it is proposed here that the term 'Early Neolithic farming sites' is appropriate to describe them. Nevertheless, the variety in site locations in terms of distance to the shore as well as artefact inventories could indicate an even more complex settlement pattern than previously anticipated, a complexity that is not properly covered by the foraging-farming dichotomy. This will be discussed further below. However, I maintain in the following that the combined impression of the sites' deviation from the more typical coastal foraging structure in Eastern Norway during this period justifies the use of 'farming sites' as a fitting description.

Correlation with dated cereals and the pollen record

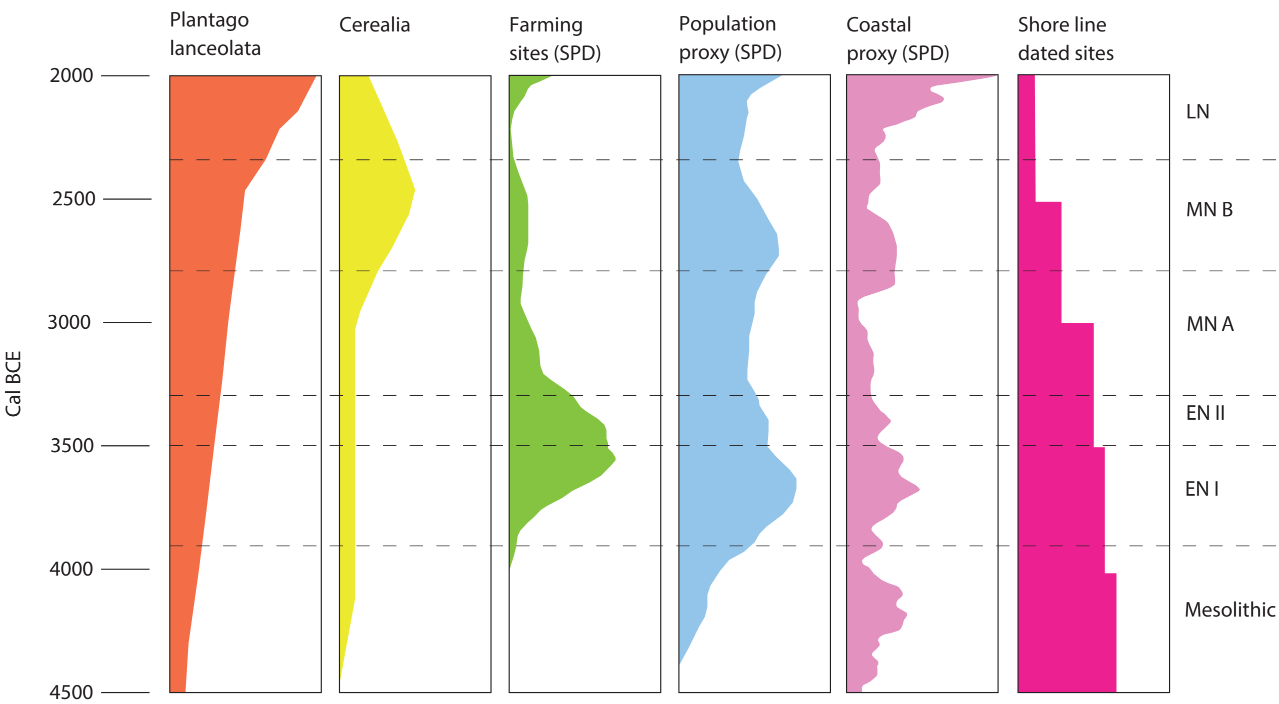
Although no direct evidence of farming was documented on the 15 Early Neolithic farming sites, direct evidence has been documented in the northern regions of Western Sweden. One kernel *(Triticum compactum)* from the Veddige 128b site was radiocarbon dated to 3970 cal BCE (Ua-29267, 5160 ± 78 BP), and an unspecified kernel from Skee 1616 was dated to 3450 cal BCE (Ua-26850, 4615 ± 40 BP) (Johansson et al. 2011; Westergaard 2008). In Eastern Norway, more precisely on the Central Skagerrak coast, the first cereals appear in the MN A period, with evidence of barley *(Hordeum vulgare var. nudum)* from the Kvastad A2 site recently dated to 3250 cal BCE (Ua-52925, 4551 ± 56 BP) and wheat *(Triticum dicoccum)* dated to 2980 cal BCE (Ua-52926, 4351 ± 55 BP) (Reitan et al. 2018).

The pollen record, as inferred from lake basins, has been used as a source of indirect evidence of prehistoric cultivation in Eastern Norway for some time (Hafsten 1957). However, the tradition of simply drawing inferences from pollen that could indicate cultivation to interpretations of the presence of actual cultivation has also been criticised (Behre 2007; Mikkelsen 1984; Prescott 1996). A reproduction of previous studies is also problematic, as they often lack detailed data descriptions, which make the re-calibration of dated levels practically impossible. In a recent study, H. I. Høeg et al. (2019) presented a standard pollen diagram for Eastern Norway based on 60 local pollen diagrams. The results showed grazing indicators (ribwort, *Plantago lanceolata*) shortly after 5000 cal BCE and pollen indicating cultivation

(Cerealia) between 4050 and 3750 cal BCE. The diagram correlates vaguely with the settlement data presented here, as activity possibly connected to farming before 3750 cal BCE is only documented at Vøyen 1.

The correspondence between the standard pollen diagram and population proxy data for Eastern Norway is also vague (Fig. 12). In this figure, 'Farming sites (SPD)' refers to dates from 14 of the 15 sites presented in this paper. 'Population proxy (SPD)' refers to radiocarbon dates from Eastern Norway (based on Nielsen et al. 2019, 86 fig. 3), and 'Coastal proxy (SPD)' refers to radiocarbon dates exclusively from coastal sites in Eastern Norway (based on Solheim 2020, 49 fig. 3.3). Lastly, 'Shoreline dated sites' refers to the frequency of known forager settlements in Eastern Norway (based on Solheim/Persson 2018, 341 fig. 7). In the Neolithic period, the three SPD proxies show similar developments, while the site count shows a steady decline. However, the grazing indicator ribwort starts too early to represent stock-keeping. *Cerealia* also seems to appear too early, and it increases at a point in time when the other proxies have decreased.

Fig. 12. Frequency of *Plantago lanceolata* and *Cerealia* pollen in Eastern Norway (based on Høeg et al. 2019, 112 fig. 5) compared to three Summed Probability Densities (SPD) of radiocarbon dates and one site count (see text for further information; graphics: S. V. Nielsen).



In a reverse sense, settlement data can be used to test the efficacy of the pollen record. In 2008, A. Mjærum and colleagues (2008) published a pollen core sampled at Ambjørnrudmåsan, located ca. 150 m from the Nøkleby site, but neither cereal pollen nor grazing indicators occurred at Neolithic levels. Another example is Kvastad A2, where a pollen core was sampled at Låmyra, ca. 70 m from where charred cereals were found, but neither cereal pollen nor grazing indicators occurred at Neolithic levels. Reitan et al. (2018, 556) argued that the result from Låmyra, where there actually was direct evidence of Neolithic farming nearby, illustrated "the challenges of basing conclusions on the absence or presence of cereal cultivation in pollen analyses". It is therefore uncertain whether the earliest grazing and farming indicators in the standard pollen diagram for Eastern Norway reflect actual grazing and farming activities in the past (for different interpretations, see Prøsch-Danielsen et al. 2020, 13; Wieckowska-Lüth et al. 2017).

Correlation with flint axes and stone battle-axes

The distribution of point-butted and thin-butted flint axes, as well as polygonal stone battle-axes, is relevant for correlations between imports from a region where farming was practised, which in this case is Southern Scandinavia, and places we presume where farming took place in Eastern Norway. The point-butted flint axes (Types I–III) date to the period from 4000–3400 cal BCE in Southern Scandinavia (Sørensen, L. 2014, 164–68), while dates associated with such axes in Eastern Middle Sweden are hardly older than 3800 cal BCE (Hallgren 2008). In Southern Scandinavia and Northern Germany, thin-butted flint axes date to the period from 3800–3200 cal BCE (Sørensen, L. 2014, 194). Hallgren (2008, 222) has proposed that polygonal stone battle-axes probably date to the EN I–II.

In Southern Norway, the dating of thin-butted stone axes made from local rock outcrops (Fig. 13) is more precise compared to the imported flint axes with the same shape. Previously, the oldest date was from the site of Bjornesfjorden 1020 on the Hardangervidda plateau (Indrelid/Moe 1983), where one thin-butted stone axe was found and charcoal from one pit dated to 4015 cal BCE (sample with large standard deviation, T-1785, 5190 ± 100 BP). More precise dates were retrieved from the coastal site Langangen Vestgård 5 (Fig. 13), on the western side of the Oslo Fjord, where three pits were dated to 3870 cal BCE (Tra-2257, 5085 ± 50 BP), 3805 cal BCE (Tra-2256, 5015 ± 55 BP) and 3785 cal BCE (Tra-2252, 5005 ± 45 BP), respectively (Reitan 2014a).

Fig. 13. Thin-butted rock axe and grinding stone from the coastal forager site Langangen Vestgård 5 (reproduced with permission from Reitan 2014a, 146 fig. 7.12/photo: Ellen C. Holte, Museum of Cultural History Oslo).

Figure 14 shows Early Neolithic farming settlements in Eastern Norway compared to the distribution of stone battle-axes of polygonal type (left) and thin-butted flint axes (centre). The three categories are concentrated around the Oslo Fjord with fall-off patterns along the coast and further north. It is interesting to note the affiliation that thin-butted flint axes show with the valleys pointing to the high-mountain plateaus in the west, where Early Neolithic pottery sherds have been found at hunting sites (Indrelid/Moe 1983). The coast-near axes were probably deposited even closer to the coast in the Early Neolithic, many even along the shoreline (Solberg 2012). Figure 14 (right) also shows the distribution of Middle Neolithic stone battle-axes (of TRB types) and settlement sites with finds of pottery (Nielsen et al. 2019).

As argued already by E. Hinsch (1955), the settlements from the Middle Neolithic are more intimately connected to the coast, often shore bound, and we see here an even wider distribution of battle-axes in Southern Norway.

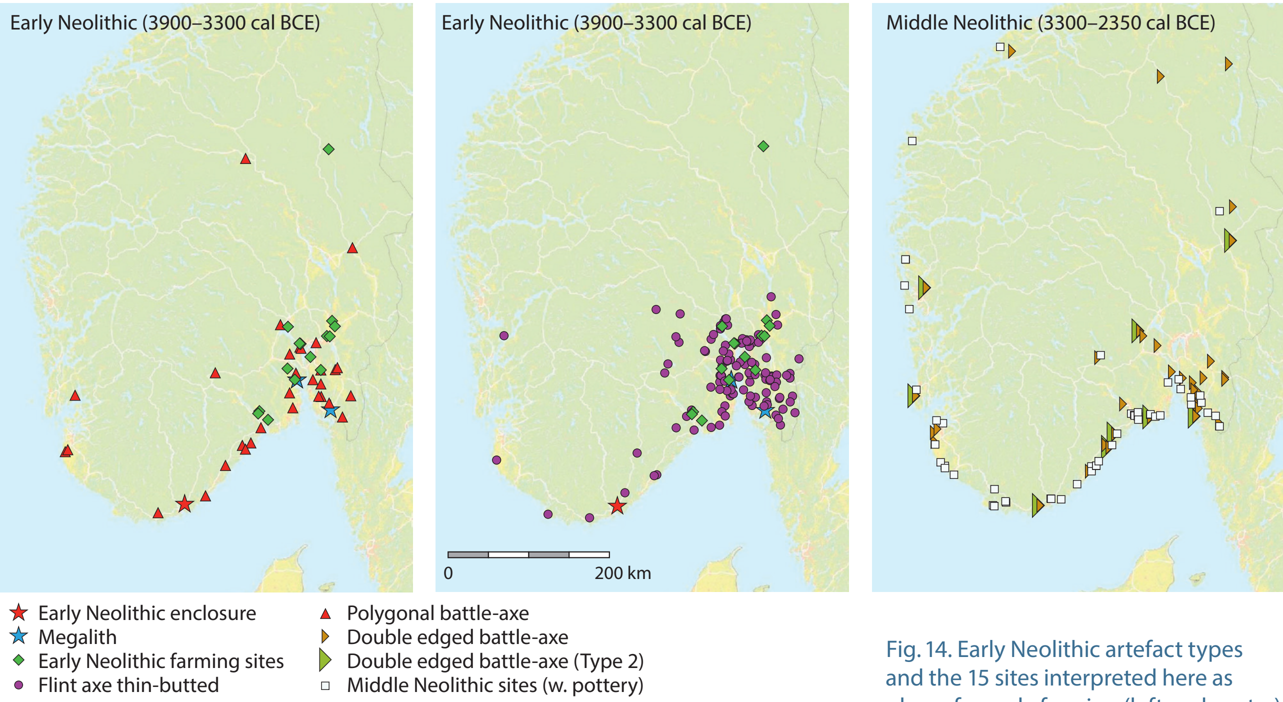


Fig. 14. Early Neolithic artefact types and the 15 sites interpreted here as places for early farming (left and centre), and Middle Neolithic battle-axes and sites with pottery (right) (Graphics: S. V. Nielsen).

Significantly, the inner part of the Oslo Fjord, where the concentration of thin-butted flint axes was strong in the Early Neolithic, has revealed no finds of battle-axes in the Middle Neolithic, which would suggest a significant change in land use. Figure 15 shows a close-up of the Oslo Fjord region and the distribution of Early Neolithic farming sites, megalithic monuments, and lithic artefacts.

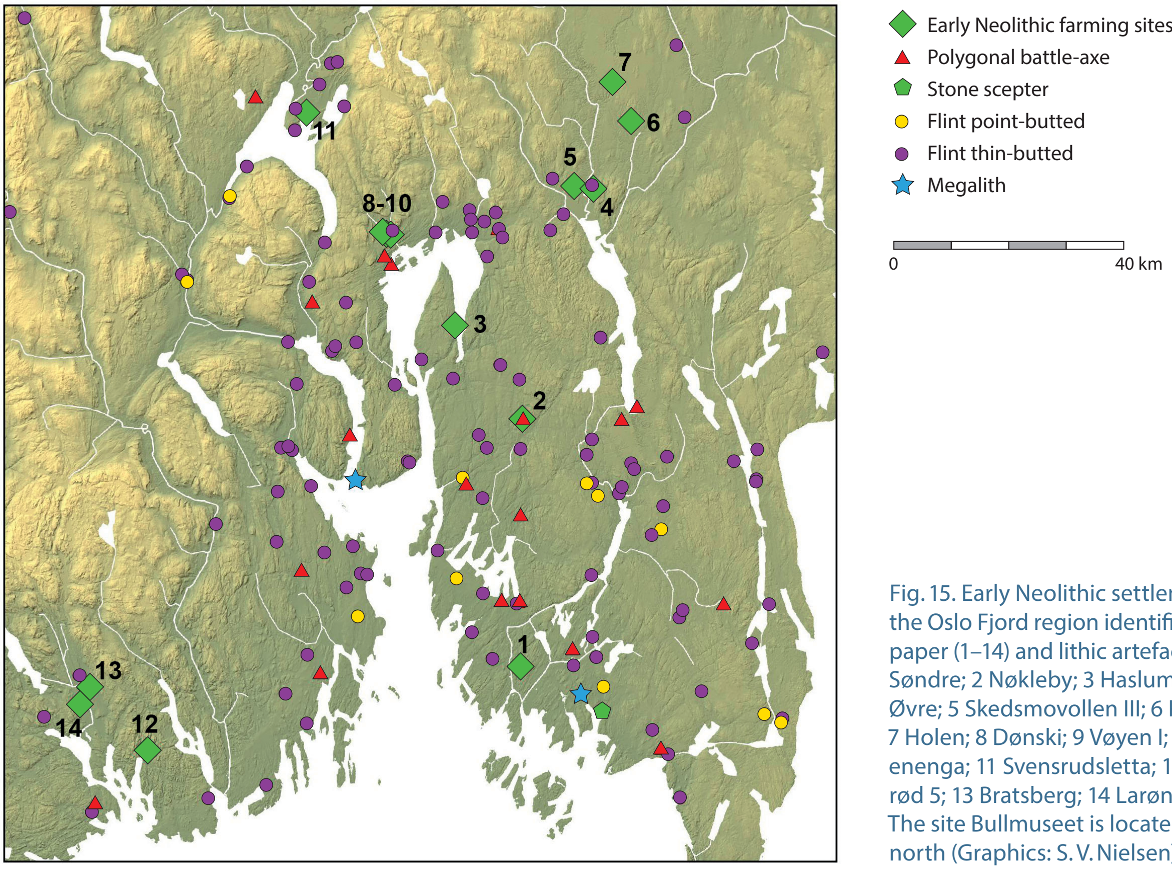


Fig. 15. Early Neolithic settlements in the Oslo Fjord region identified in this paper (1–14) and lithic artefacts: 1 Veum Søndre; 2 Nøkleby; 3 Haslum; 4 Asak Øvre; 5 Skedsmovollen III; 6 Kåstad; 7 Holen; 8 Dønski; 9 Vøyen I; 10 Vøy-enenga; 11 Svensrudsletta; 12 Gunnars-rød 5; 13 Bratsberg; 14 Larønningen. The site Bullmuseet is located further north (Graphics: S. V. Nielsen).

The rise and fall of a Neolithic mode of production

The interpretation of the 15 sites as places for farming in the Early Neolithic enables the construction of a model of economic transitions for this period (Fig. 16). We can confirm the transition around 3900 cal BCE, when pottery appears on coastal forager sites in the region. This is usually taken to mark the Neolithic transition in Eastern Norway, although it does not represent an economic transition. The lithic tool inventories on the forager sites are very similar to those documented at sites from the Mesolithic Phase 4, but the stone axes are now thin-butted in shape, there are finds of fragments from polished flint axes, and pottery decorated with cord or stick imprints are occasionally found. As argued by H. Glørstad (2009, 154–55; Glørstad/Sundström 2014), the sudden appearance of pottery in the Oslo Fjord region around 3900 cal BCE was directly related to developments in ceramic traditions in Southern Scandinavia, i.e. the transition from Ertebølle pottery to Funnel Beakers.

In the period from 3850–2900 cal BCE, hinterland or inland oriented sites around the Oslo Fjord were inhabited. Some were located relatively near the coast, such as Veum Søndre, Haslum and the Bærum sites of Vøyenenga, Dønski and Vøyen 1, while others were located in places with inland orientation, such as Kåstad, Holen and Skedsmovollen III. There is also evidence of longhouses similar to Early Neolithic houses from Scania and Eastern Denmark. The frequency of radiocarbon dates from the farming sites increases around 3700–3600 cal BCE, when sites on the far western side of the Oslo Fjord were also inhabited, i.e. Gunnarsrød 5, Bratsberg and Larønningen. A negative trend seems to intrude after the erection of the megalithic monuments on the western and eastern sides of the Oslo Fjord, shortly after 3500 cal BCE (Østmo 2007; Reitan 2012). There is then a general decline in radiocarbon dates within the region from both farming and foraging sites. In the period from 3100–2900 cal BCE, numerous sites with pottery, many of which were probably used for foraging purposes, re-appear in the region (Fig. 14, right).

This development formed the core argument for the ‘de-Neolithisation hypothesis’ formulated by Hinsch (1955). The hypothesis stated that the first farming-based society in Eastern Norway collapsed at the end of the Early Neolithic, and that the (Middle Neolithic) population turned back to foraging as its primary economic strategy. Figure 16 shows this development in the radiocarbon date record. However, the group called ‘Middle Neolithic foragers with pottery’ is represented solely by dates from Auve, a coastal forager site located on the western side of the Oslo Fjord (Østmo 2008). Although several Middle Neolithic coastal forager sites with pottery are known from within the region, few have been professionally excavated and thus radiocarbon dated (Østmo 1988). Characteristic finds from these sites are comprised of cord-stamp ornamented pottery, as well as a wide repertoire of lithic arrowheads, spears and knives made from flint and slate (Nielsen et al. 2019; Nielsen/Persson 2020; Østmo 2008; 2010). The discovery of Early Neolithic farming sites around the Oslo Fjord supports the de-Neolithisation hypothesis, because now we can register the transition towards increased foraging in the Middle Neolithic more clearly than before.

Demic transmission or acculturation

Was farming introduced in Eastern Norway through migrating farmers (demic transmission) or by foragers who learned how to grow crops (acculturation)? These theories are often presented in research as opposing models, as ‘migrationism’ versus ‘indigenism’, and both models have been discussed in Norwegian research (Færø Olsen 2020, 29; Glørstad 2006, 211; Sørensen, L. 2014, 18).

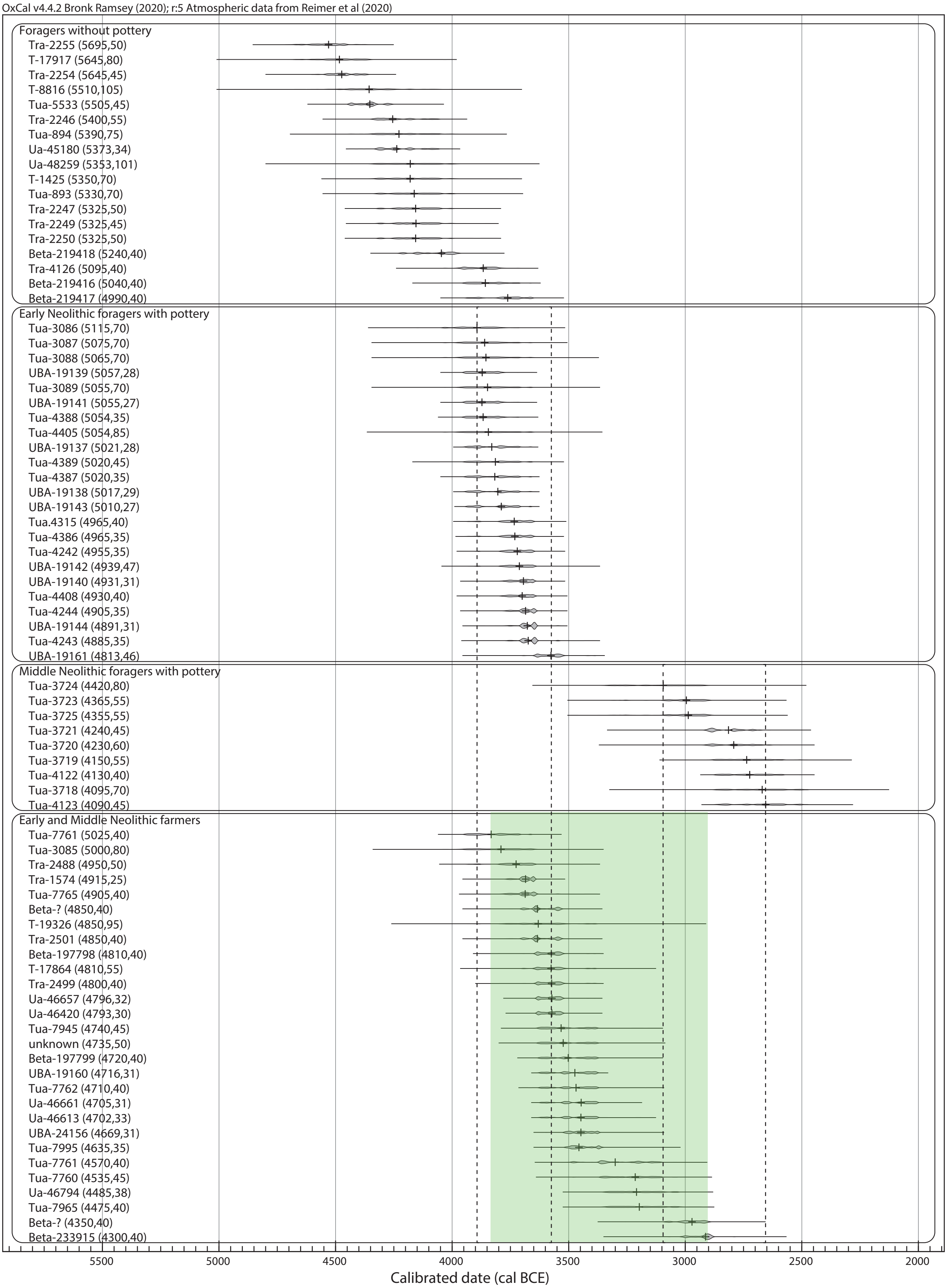


Fig. 16. Radiocarbon dated charcoal and burnt bone from Late Mesolithic (Phase 4) forager sites, Early and Middle Neolithic forager sites with pottery, and Early and Middle Neolithic farming sites (grey column) in the Oslo Fjord region (for the OxCal code see Supplement 2).

Comparing the trajectory described above in the Oslo Fjord region with developments in Southern Scandinavian regions can offer some perspective. Although farming was introduced around 4000 cal BCE, it did not reach a hegemonic status in Southern Scandinavia before ca. 3700 cal BCE (Andersson et al. 2016; Gron/Sørensen 2018; Warden et al. 2017). M. Furholt (2010) has even argued that the process of Neolithisation was not completed before the erection of megalithic graves around 3500 cal BCE, and he terms the period before 3500 cal BCE the 'latest Mesolithic'. Continuity in settlements from the Ertebølle period until the end of the EN I in regions of Denmark supports this model (Schülke 2009). However, that the first farming sites in Denmark appear in the hinterland has been interpreted by some as reflecting the behaviour of farmers attempting to avoid contact with indigenous foragers (Sørensen, L. 2020, 308; for a more nuanced interpretation, see Schülke 2019). K. J. Gron and L. Sørensen (2018, 968) have also suggested that the period from 4000–3700 cal BCE represented a negotiation stage in the Neolithisation process in Denmark, where negotiation points to contact between local foragers and immigrant farmers from Northern Germany (see also Zvelebil/Rowley-Conwy 1984; Müller 2008).

Considering continuity in population, the level of accuracy in analysis has changed considerably with the advent of aDNA studies. Although there must have been movement of people in Eastern Norway in the Early Neolithic, we simply do not have the empirical means to discuss it for the time being. For a long time, the skull discovered in the midden site of Rødhals at Sejerø in Denmark was presumed to represent evidence of continuity in population from the Late Mesolithic to the Early Neolithic (Fischer 2002, 361). More recently, the genome of an individual (age reported as 3910–3710 cal BCE) from Syltholm at Lolland confirmed this presumption (Jensen et al. 2019). In contrast, a study of one individual (age reported as 3945–3647 cal BCE) from Saxtorp in Western Scania found kinship with Early Neolithic farmers in Europe (Mittnik et al. 2018). This was also detected in one individual (age reported as 3100–2920 cal BCE) from Kainsbakke on Eastern Jutland (Allentoft 2020), and in several individuals buried in megalithic graves at Falbgygden in Sweden (Persson/Sjögren 2001; Skoglund et al. 2014). Conversely, individuals from Middle Neolithic sites in Eastern Sweden have repeatedly demonstrated continuity in kinship from the Late Mesolithic (Malmström et al. 2009; 2015).

In the case of Eastern Norway, an interpretation in the direction of demic transmission or acculturation must account for a premise put forward by E. Mikkelsen in 1984, which maintained that if acculturation is to be supported (or not) for the Oslo Fjord region, continuity in cultural traditions and population into the Early Neolithic must be demonstrated (or not). For the Oslo Fjord region, the data presented here suggests farming was introduced around 3900–3800 cal BCE. During the following ~200 years, places for crop growing were located on the eastern and upper sides of the Oslo Fjord. Around 3700 cal BCE, such locations also appear on the far western side of the fjord and in the valleys further north. As mentioned, funnel beaker pots, fragments of polished flint axes, and arrowheads appear on both foraging and farming sites in Eastern Norway in the Early Neolithic. There is also some evidence suggesting a close affiliation between the polygonal battle-axes and coastal forager sites (Nielsen/Persson 2020). Therefore, a dualistic model, such as that proposed by some scholars for Southern Scandinavia, does not fit the settlement data from Eastern Norway.

The evidence of acculturation from the Late Mesolithic Phase 4 to the Early Neolithic forms a strong argument against 'migrationism' as a primary explanatory factor. As mentioned, there was probably movement of people in the Oslo Fjord region in the early fourth millennium BC, and this could have contributed to the appearance of farming, but the archaeological evidence of continuation suggests that 'indiginism' probably played a significant part as well. Consequently, this paper argues that all Early Neolithic settlements in the Oslo Fjord region were probably inhabited by a population of foragers with an intimate knowledge of the landscape – the coast, the hinterland and the high mountains –, which during the course of this period came to adopt farming. As shown in Figure 17, the forager and farming sites in the Oslo Fjord region interconnected along the prehistoric coastline and the inland watercourses. How the sites were connected in the Early Neolithic, e. g. through seasonal patterns as suggested by Mikkelsen (1984), is difficult to discuss due to the sparse data recovered from the farming sites. It will be a task for future investigations to document sites suspected as places for early farming in line with a more rigorous and methodologically focused sampling strategy.

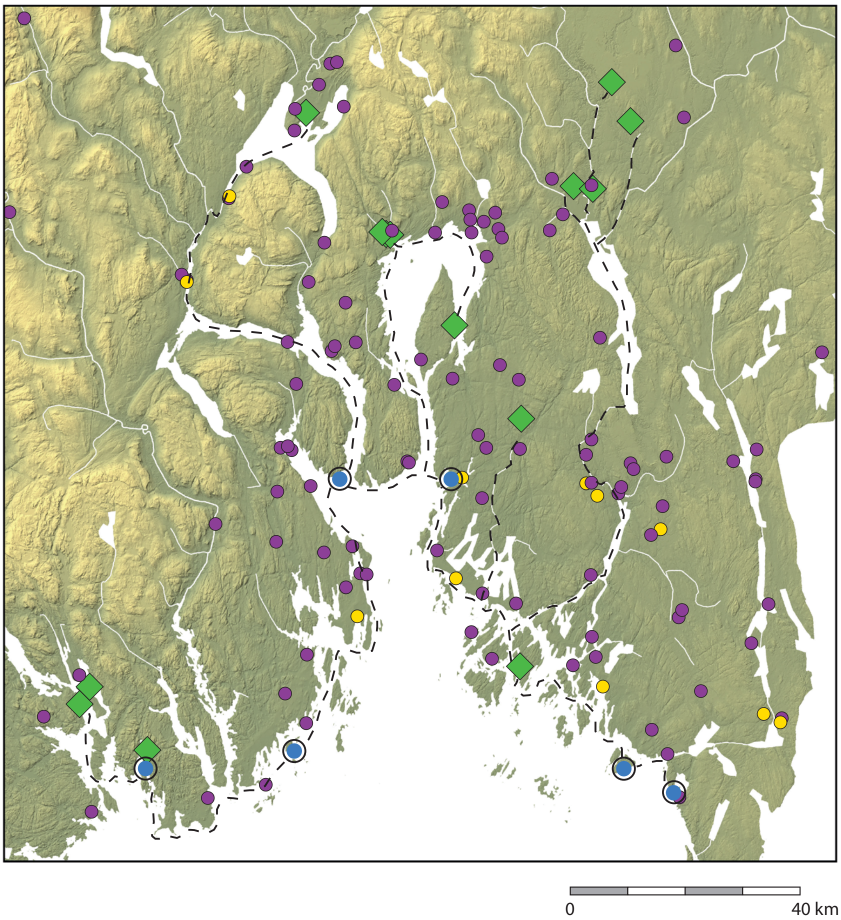


Fig. 17. Early Neolithic forager sites (blue circle) and farming sites (green square) in the Oslo Fjord region, as well as thin-butted (purple circle) and point-butted flint axes (yellow circles). Dashed lines show how the forager and farming sites are connected via waterways. The sea level is elevated by 25 m, corresponding roughly with the shape of the Early Neolithic shoreline in the region (for the numbering of the farming sites, see Fig. 15; shoreline model by Steinar Kristensen, Museum of Cultural History Oslo; graphics: S. V. Nielsen).

Conclusion

Based on an interpretation of settlement data from Eastern Norway, this paper has argued that a Neolithic mode of production appeared in the Oslo Fjord region around 3850 cal BCE. Despite the fragmented state of the available evidence, it is argued that the 15 settlements presented in this paper represent places where either farming or husbandry was practised in the Early Neolithic. However, without directly dated remains from such activities, we cannot draw secure inferences on this matter. It is likewise not possible to determine with any absolute certainty, whether local foragers adopted farming or farmers migrated into the region from Western or Eastern Sweden. Considering the observable changes in material culture on forager settlements in the Late Mesolithic and the Early Neolithic, it is conceivable that acculturation also played a significant role for the first introduction of Neolithic modes of production in this region. This investigation has also supported a de-Neolithisation hypothesis, namely that the first farmers in Eastern Norway became less reliant on farming and husbandry around the transition to the Middle Neolithic (3300–2350 cal BCE).

As long as archaeologists proceed to re-discover evidence of continuation in mobility patterns and material culture from the Late Mesolithic and into the Early Neolithic, it seems that convincing arguments against acculturation scenarios will, in the future, be based on different types of data (e. g. stable isotopes, aDNA, etc.). Another question relates to how archaeologists can manage the physical traces of a Neolithic economy in Eastern Norway. This paper has highlighted the fragmented nature of the physical remains from what is interpreted as the earliest farming activity in Norway. Left for study today are only scattered traces of houses and structures indicating waste management on settlements. One can only hope that new scientific methods or developments in field methodology in the future will be able to shed more light on this history.

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