Teemu Mökkönen & Kerkko Nordqvist

KIERIKKI WARE AND THE CONTEMPORARY NEOLITHIC ASBESTOS- AND ORGANIC-TEMPERED POTTERIES IN NORTH-EAST EUROPE

Abstract

In the 1960s, a Neolithic asbestos-tempered pottery type called Kierikki Ware was introduced through materials found at the Kierikkisaari site in northern Finland. Since its initial description, no comprehensive studies related to the type have been undertaken. This article presents the research history and properties of pottery termed as Kierikki Ware, and introduces the first AMS dates from the eponym site. After this, Kierikki Ware is placed both into local and wider, north-east European context by comparing it with other contemporary potteries from Finland and the Republic of Karelia (Russia). It is argued that the ceramic assemblage accumulated at the eponymous Kierikkisaari site during the half a millennium of its use does not represent a coherent pottery type, but is rather the outcome of site's special function and reflects qualities also common to many other contemporary pottery types in north-east Europe. Therefore, Kierikki Ware does not exist in the form it is traditionally perceived in Finnish archaeology, and the further use of this concept requires its re-evaluation against the diversity present in the currently known archaeological materials.

Keywords: Stone Age, Neolithic, asbestos- and organic-tempered pottery, Kierikki Ware, Finland

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INTRODUCTION

During the 1960s, excavations on the Kierikkisaari Island in Northern Ostrobothnia, Finland (Fig. 1), produced pottery that was different from the previously identified Neolithic asbestos-tempered ceramics. Because no typological counterparts were known, the new pottery type was introduced on the basis of this material and named Kierikki Ware (Siiriäinen 1967). Although the first description has not been followed by any comprehensive studies, Kierikki Ware has solidified its place among the Finnish Neolithic pottery types.

Kierikkisaari is an exceptional location with only a few parallels. The site contains the largest known assemblage commonly assigned to Kierikki Ware, and includes a number of imported amber items and long and narrow willow leaf -shaped flint points. Its location on a low island in a river, by rapids and susceptible for flooding, is quite special (see Appendix 2, Fig I). Parallel rows of posts found there have been interpreted as probable remains of pile settlement, fortification, or stationary fishing structures (Siiriäinen 1967; 1984; 1986, Koivunen 2002; Koivisto & Nurminen 2015). Similar pile constructions are rarely met in Finland (see Siiriäinen 1983; 1986), where contemporary Neolithic settlements are dominated by semi-subterranean pithouses (see Pesonen 2002; Vaneeckhout 2009a; Mökkönen 2011).

The aim of this article is to understand Kierikki Ware: its properties, dating, and rela-

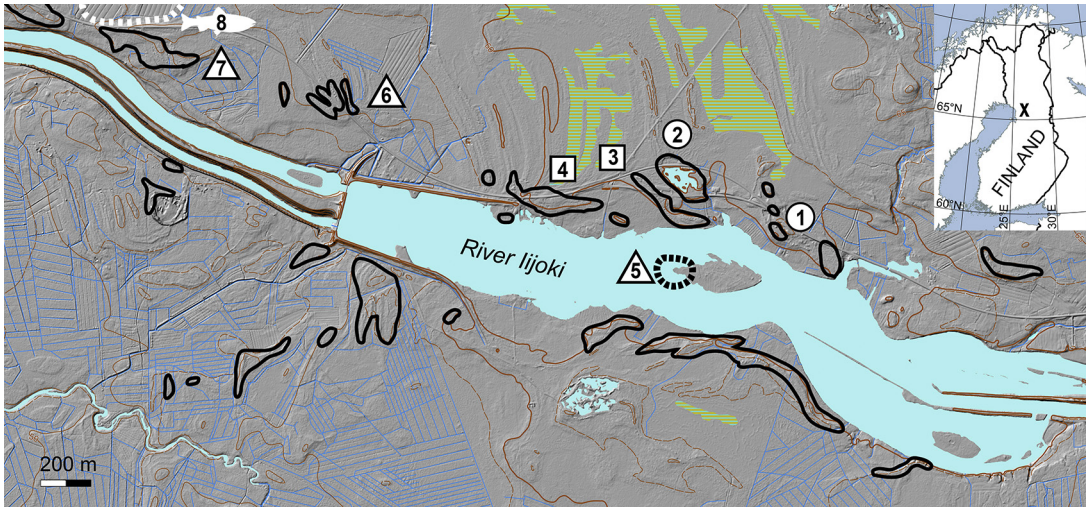

Fig.1 Archaeological sites in the Kierikki micro-region 3900–2800 calBC; Sites with Comb Ware only: 1) Kierikin Sorakuoppa, 2) Kierikinkangas North; Sites with Comb Ware and Kierikki Ware: 3) Kierikinkangas South, 4) Kuuselankangas; Sites with asbestos-tempered pottery only: 5) Kierikkisaari Island, 6) Voima-Kuusela, 7) Purkajasuo-Korvala; Wooden fishing structures: 8) Purkajasuo. Map: T. Mökkönen. Base map © the National Land Survey of Finland 10/2016.

tion to other synchronous pottery types in north-east Europe. This is done by analysing Kierikki Ware from four sites located in different parts of Finland, and by presenting the AMS dates currently available for Kierikki Ware. The analysed pottery materials are then compared with other ceramic assemblages both on local (Kierikki micro-region) and on north-east European scale (Finland, the Karelian Republic in north-west Russia). Karelian asbestos- and organic-tempered wares are of great interest here, as their research has advanced significantly since the 1990s. Thus, the final aim is to re-evaluate the concept of Kierikki Ware in the context of asbestos- and organic-tempered potteries of the 4th and 3rd millennia calBC.

SHORT HISTORY OF KIERIKKI WARE

Kierikkisaari Island is located by the Kierikkikoski Rapids in the middle of River Iijoki, once situated at the Neolithic estuary of the river (Fig. 1). A large number of other excavated Stone Age sites in the vicinity of the island makes the Kierikki micro-region one of the most extensively studied Neolithic settlement areas in all of Finland. The Kierikkisaari site was discovered in 1961, and because of the plans to construct a new hydroelectric power plant, the site was excavated between 1962 and 1964 (see Siiriäinen 1967).

The site was published in 1967 by Ari Siiriäinen, who was one of the field leaders on the Kierikkisaari Island. The asbestos-tempered pottery discovered at the site was different from the other asbestos-tempered ceramic types known at that time – Early Asbestos (or Kaunissaari) Ware, Pöljä Ware and Jysmä Ware (Pälsi 1915: 160; Meinander 1954: 165; Edgren 1964) – and Siiriäinen took this assemblage as the body for a new pottery type, which he named Kierikki Ware. Even if this initial definition (or description) was meant to be only tentative (Siiriäinen 1984), it was adopted into use (see also Carpelan 1979).

Ceramic material from the Kierikkisaari site is quite small, consisting of 1006 pottery sherds (less than 4 kg). In the original paper (Siiriäinen 1967) its treatment was descriptive, and included a written presentation of each vessel and a short summary of their common features. In order to define the chronological position of Kierikki Ware, Siiriäinen identified other sites with similar pottery and studied the artefacts found at

the Kierikkisaari site. He saw that stylistic and technological features connected Kierikki Ware both with Typical Comb Ware (especially style II:1) and Pöljä Ware, phases indicated also by the associated artefacts, and the sites' elevations in relation to paleoshorelines.

Based on his analysis, Siiriäinen (1967) proposed a developmental sequence in which Kierikki Ware continues Typical Comb Ware tradition and Pöljä Ware develops from Kierikki Ware; the latter two could have been partly contemporary, although the use of Pöljä Ware would have continued longer (see also Siiriäinen 1984). Even though other genealogical lines of succession have been suggested (Carpelan 1979; 1999), the close (typological) relationship between Kierikki Ware and Typical Comb Ware, as well as the chronological order of Kierikki and Pöljä Wares has never been questioned since.

PROPERTIES OF KIERIKKI WARE

Roughly half of Kierikki Ware analysed within this study originates in the eponymous Kierikkisaari site. In order to reveal variation, three other sites with pottery labelled as Kierikki Ware – Kuuselankangas adjacent to the Kierikkisaari Island, Pirttijoki 1 in central Finland, and Salkoniemi in the Lake Saimaa area in eastern Finland – were chosen as reference material. During the study, the number and weight of all sherds were recorded, and only the pieces exceeding 3 cm in length or width were studied more closely. As the purpose was to gather data on the frequency of different features, several variables (temper, ornamentation elements, surface treatment, rim shape, etc.) were recorded individually for each sherd. Material was not divided into separate vessels and the number of individual pots was estimated only on general level. Due to fragmentary material, decorative patterns beyond individual ornamentation elements were not recorded either, although the general appearance was documented in written notes and by photographing.[1]

The analysed materials of Kierikki Ware are rather limited. The Kierikkisaari assemblage originates from c 15 vessels (Siiriäinen 1967), the others from a couple of vessels per site only. The low number of Kierikki Ware can be partially explained by differences in the production of material culture (its amount is general very small, for example, in comparison with the contemporary Comb Ware), but also by the lack of research at sites belonging to this phase. In addition, the definitions and criteria employed in Finnish archaeology are likely to conceal the presence of Kierikki Ware in the assemblages. Due to the properties of the Kierikkisaari assemblage, asbestos temper became an integral part of Kierikki Ware's definition from the beginning (Edgren 1964; Siiriäinen 1967; Carpelan 1979; Pesonen 1996). Consequently, only pottery with asbestos temper has been usually classified as Kierikki Ware. However, the contemporary potteries in north-west Russia include also organic-tempered variants or combinations of asbestos and organic tempers (see Zhul'nikov 1999; 2005), a topic rarely discussed in Finland (see Edgren 1964; Huurre 1986a: 60; and below).[2]

In the Kierikki micro-region, pottery reported as Kierikki Ware has basically always asbestos and related minerals (talc and/or mica) as the main tempering agent. At the more southern sites (Pirttijoki 1 and Salkoniemi), other tempers (sand, organic matter) are more often present alongside asbestos (Appendix 1).[3] Asbestos is usually chopped into short fibres, although occasionally larger, stick-like or grainy pieces, as well as longer fibres are present. The amount of temper varies, but is usually fairly generous. Asbestos-tempered sherds are well-burnt with hard and dense clay mass.

Material is fragmented. Measured in numbers, only less than third of the sherds exceed 3 cm in some dimension and are included in the more accurate analysis. In weight, however, the amount of analysed pieces reaches even 75% of all material. Large pieces (> 6 cm) are very rare and amount to only a few percent. Surfaces indicate also the poor preservation: less than 50% of the sherds have both surfaces intact, Pirttijoki 1 being an exception with c 90% with preserved surfaces.

Fragmentation naturally reduces the information available on the decoration. In best cases, ornamentation is present on c 50% of the pieces, but usually the share of decorated sherds is smaller. At the Salkoniemi site only a few pieces bear any recognizable imprints (Fig. 2). Decoration is almost exclusively applied on the outer surface. The most common ornamentation ele-

Fig. 2. Asbestos- and organic-tempered pottery from the Salkoniemi site; a) KM 33624:233, b) KM 33624:665, c) KM 33624:674, d) KM 33624:590. Scale 3 cm. Photos: T. Mökkönen.

ment is comb stamp, followed by shallow pits, drawn lines and other stamp imprints (e.g. stick impressions). Comb stamps may be very thin (as narrow as 1 mm), but also wide stamps (over 5 mm) are present. Decoration patterns include horizontal rows of vertical or diagonal stamps, loose rows of shallow pits and impressions, and horizontal zigzags or triangles of drawn lines. Occasionally the vessels are decorated with fields of vertical zigzag lines and, at the Kierikkisaari site, with 'checkerboard' pattern formed by pairs of vertical short comb stamps and equally-sized empty spaces. Decoration is weakly applied and shallow and different ornamentation elements occur rarely together on one sherd.

The large amount of completely undecorated sherds or empty space on decorated pieces show that the compositions were open or that some pots were completely undecorated. Most of the sherds do not have any clear marks of surface treatment, and the ones bearing such traces usually exhibit striation marks on the inner surface. Yet, surface treatment is a common feature in many other contemporary assemblages of asbestos- and organic-tempered wares (see Zhul'nikov 1999) and in fact, a hypothesis presented at Christian Carpelan's lectures on Finnish Stone Age pottery at the University of Helsinki in the early 1990s proposes that Kierikki Ware can be divided into decorated vessels and undecorated vessels with striated or totally plain surfaces (Carpelan in Pesonen 1999a). Still, in the analysed materials undecorated vessels do not clearly stand out as a separate group, and the treatment of (outer) surface does not rule out the presence of (sparse) ornamentation.[4]

The relatively few rims are in over half of the cases either straight or slightly rounded and without significant bulges. Inwards-thickened rims amount to 20–25%, but rims sloping inwards, thickening both in- and outwards, or with an inwards-bent list occur only in individual

Lab-index	Region	Site (sample)	BP	±	calBC (2σ)	δ13C	Material (surface)	Reference
Hela-465	Karelian Isthmus	Väntsi (KM 9406:188)	4870	85	3935–3379	-25.50	charred crust	Huurre 2003
Hela-51	N Ostrobothnia	Kuuselankangas	4800	115	3937–3347	-23.40	charred crust	Jugner & Sonninen 2004; Pesonen 2004
GrA-63502	N Ostrobothnia	Kierikkisaari (KM 16554:856)	4765	35	3640–3382	-23.64	charred crust (inner)	This study
GrA-63495	N Ostrobothnia	Kierikkisaari (KM 16139:2515)	4705	35	3632–3372	-25.89	charred crust (inner)	This study
GrA-63500	N Ostrobothnia	Kierikkisaari (KM 16141:905)	4705	35	3632–3372	-25.74	charred crust (inner)	This study
GrA-63493	N Ostrobothnia	Kierikkisaari (KM 15241:146)	4675	35	3625–3366	-28.34	charred crust (inner)	This study
GrA-63498	N Ostrobothnia	Kierikkisaari (KM 16140:1181+1292)	4675	35	3625–3366	-28.73	charred crust (inner)	This study
GrA-63499	N Ostrobothnia	Kierikkisaari (KM 16140:1533)	4645	35	3519–3358	-26.44	birch bark tar (rim)	This study
GrA-63494	N Ostrobothnia	Kierikkisaari (KM 16139:1860)	4540	35	3366–3102	-28.62	charred crust (inner)	This study
GrA-63947	N Ostrobothnia	Kierikkisaari (KM 16140:75)	4490	35	3349–3033	-28.61	charred crust (inner)	This study
Hela-138*	Kainuu	Kalmosärkkä (KM 14829:106)	4485	100	3498–2906	-29.00	charred crust	Pesonen 2004
Hela-360	S Karelia	Ahvensaari (KM 13391:37)	4450	60	3341–2929	-28.70	charred crust	Pesonen 2004
Hela-52	N Ostrobothnia	Kuuselankangas	4420	90	3358–2902	-23.20	charred crust	Jungner & Sonninen 2004; Pesonen 2004
Hela-139*	Kainuu	Kalmosärkkä (KM 14829:103, 116)	4370	90	3354–2872	-27.20	charred crust	Pesonen 2004
Hela-769	S Savonia	Salkoniemi (KM 34311:54)	4300	60	3097–2698	-	charred crust	Lesell 2005

Table 1. AMS dates connected with Kierikki Ware from Finland and the Karelian Isthmus (Russia). Organic-tempered sherds marked with an asterisk. All dates in this table and the whole paper are calibrated using the software OxCal 4.2. and given a 2-sigma confidence level.

cases. Again, the Pirttijoki 1 site deviates from the rest, as here half of the rims are inwards-thickening and -sloping. In the Kierikki micro-region, less than half of the rim tops are decorated, while at the more southern sites almost all rim tops are without ornamentation. Comb stamp dominates on the rim, but also drawn lines and shallow impressions are present.

Data available on the dimensions, shaping and construction of the vessels is equally slim. The bodies seem to have been non-profiled, bottoms are practically missing (only one piece of a round bottom from an organic-tempered pot is present in the Kierikkisaari material; KM 16139:2276). The exact measures and volumes of the vessels remain unknown. Sizes seem to vary from large pots with a rim diameter of 40–50 cm to small cups, although apart from the Kierikkisaari assemblage the temporal context of these (non-tempered and undecorated) small cups it is not always entirely clear. Thickness of walls varies between 5 and 13 mm, of rims between 9 and 17 mm. Materials from the Kierikkisaari and Pirttijoki 1 sites include occasionally pieces with u-joints.

AMS DATES

The chronological position of Kierikki Ware is currently determined by 15 AMS dates made of charred residues and birch bark pitches attached on pottery sherds (Table 1; Fig. 3). The datings derive from the geographical extremes of Kierikki Ware's distribution – from Northern Ostrobothnia and Kainuu in the north and the southern Lake Saimaa area and the Karelian Isthmus in the south – and no dates exist from the vast middle area (Fig. 4). Eight dates published here are the first radiometric dates obtained for the Kierikkisaari Island itself. In addition, a few more crust dates are mentioned

in literature (Hallgren 2008: Fig. 10.32), although their connection with Kierikki Ware cannot be confirmed.[5]

The newly-obtained AMS dates do not change considerably the earlier suggestions for the age of Kierikki Ware, placed between 3800 and 2700 calBC (Carpelan 1999; Pesonen 2004; Pesonen & Leskinen 2009). However, when the dates with large standard deviations (≥ ±70 years) are excluded, the timeframe narrows down slightly to 3650–2700 calBC. Still, the dates markedly emphasize the second half of the 4th millennium calBC, and only the youngest sample dates clearly to the 3rd millennium calBC. The utilization of the Kierikkisaari Island dates to the centuries around and after the mid-4th millennium calBC, and the data suggests two main occupation phases: 3640–3350 calBC (6 dates) and 3370–3030 calBC (2 dates).

Judging by the modern bulk stable isotope values, three dates from the Kierikki area (with the $\delta^{13}C$ values above -24) connect likely with salmon and seals of the northern Baltic Sea (Mänttäri 2011; Torniainen et al. 2013), and may therefore be affected by marine reservoir effect. Still, the origins of the other dated crusts and the possible presence of reservoir effect cannot be solved based on the $\delta^{13}C$ values alone (Philippsen 2015). In previous studies, reservoir effects in the non-calcareous bedrock areas of the northern Baltic Sea and the Finnish and north-west Russian inland lake districts have been estimated to be nearly nonexistent or, at the most, just some centuries (Pesonen et al. 2012; Zhulnikov et al. 2012; see also Nordqvist & Mökkönen 2018). Dates of different materials but giving similar ages from the Purkajasuo-Korvala site (birch bark from the wall of a housepit and foodcrust on Pöljä Ware from the same context; see Appendix 2, Table I) suggest that the offset may not be always present in the Kierikki area. Still, the possible magnitudes of marine and freshwater reservoir effects present in the datings of Kierikki Ware cannot be estimated reliably, as specific studies or baselines have not been published for Finland thus far.

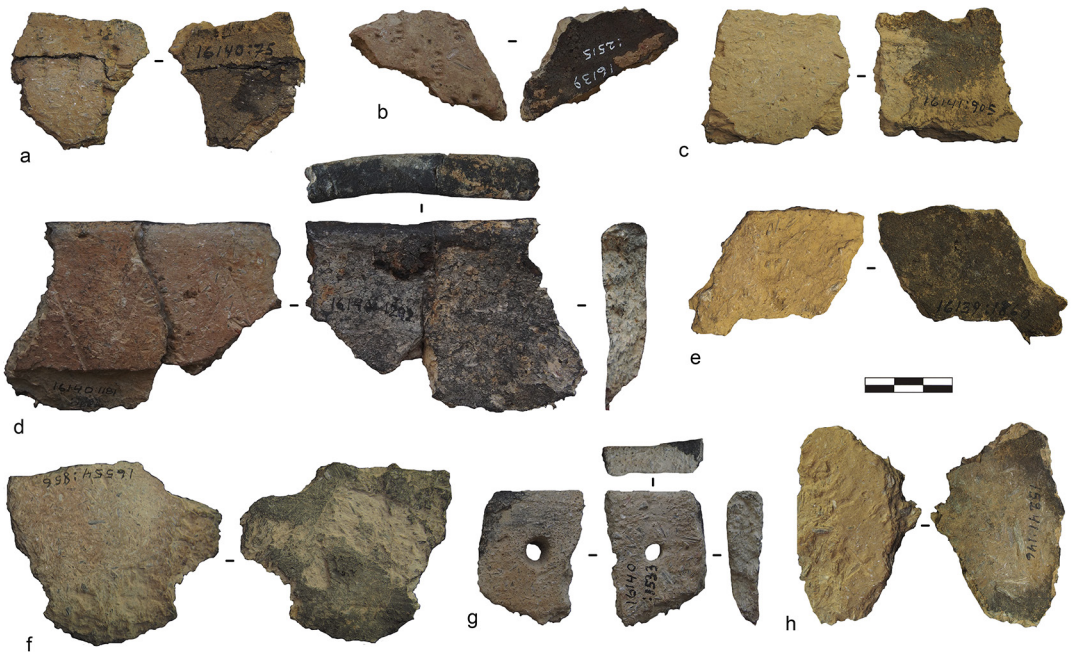

Fig. 3. Dated sherds of Kierikki Ware from the eponymous site of Kierikkisaari Island; a) KM 16140:74 (GrA-63947), b) KM 16139:2515 (GrA-63495), c) KM 16141:905 (GrA-63500), d) KM 16140:1181, 1292 (GrA-63498), e) KM 16139:1860 (GrA-63494), f) KM 16554:856 (GrA-63502), g) KM 16140:1533 (GrA-63499), h) KM 15241:146 (GrA-63493). Scale 3 cm. Photos: T. Mökkönen.

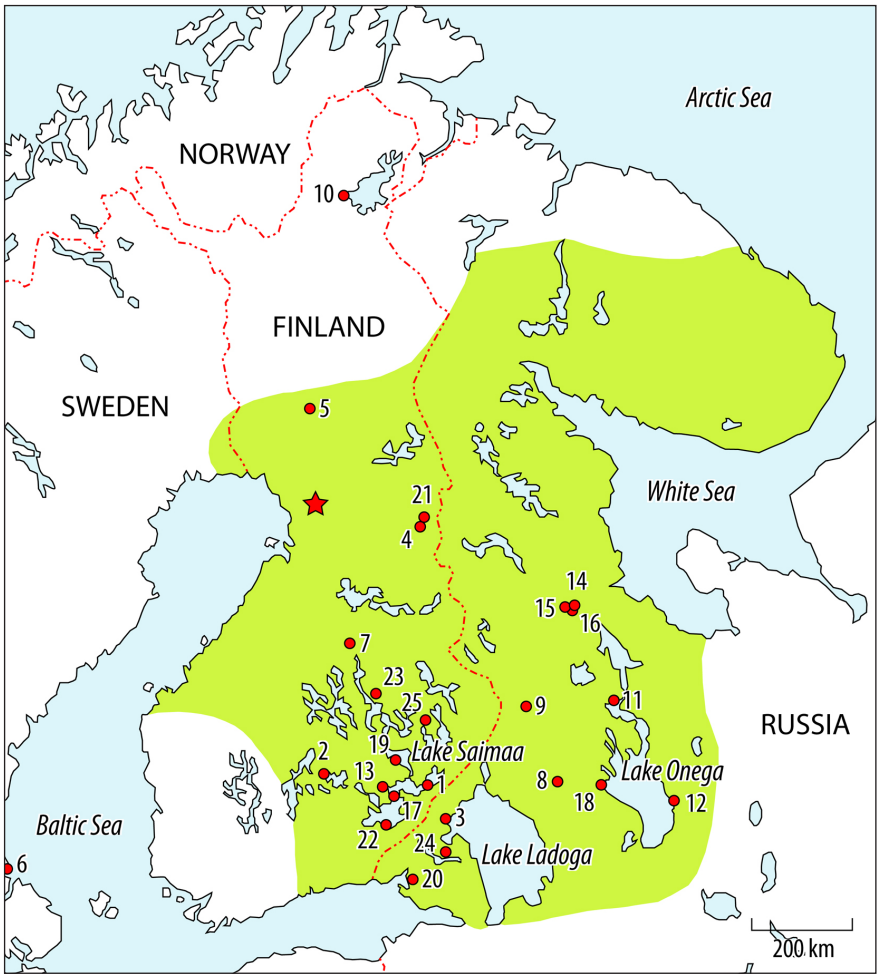

Fig. 4. Distribution of the 4th- and 3rd-millennia calBC asbestos-tempered potteries in north-east Europe, and the sites mentioned in the text (located outside the Kierikki area): 1) Salkoniemi, 2) Pirttijoki 1, 3) Kuuppala, 4) Joenniemi, 5) Kärräniemi, 6) Västra Mårtsbo, 7) Siltala, 8) Lakhta III, 9) Chudozero IV, 10) Vuopaja, 11) Voynavolok XXVII, 12) Pervomayskaya I, 13) Otamo 1, 14) Berezovo XIV, 15) Tunguda IV, 16) Tunguda XV, 17) Kärmelahti, 18) Solomennoe V, 19) Pirskanlahti B, 20) Väntsi, 21) Kalmosärkkä, 22) Ahvensaari, 23) Pöljä, 24) Seppälä 4 (Novoselki 5), 25) Kangasranta 1. Location of the Kierikki micro-region marked with a star. Map: K. Nordqvist.

CONTEMPORARY CONTEXT

The Kierikki micro-region

The Kierikki micro-region is very suitable for studying the local (stratigraphic, typological, chronological) context of Kierikki Ware, as it offers one of the most comprehensive archaeological datasets available in Finland. In addition to the Kierikkisaari site, the materials used in this study originate in five adjacent housepit sites.[6] The results of this inquiry are shortly presented in this chapter – more detailed description can be found in Appendix 2.

In the Kierikki micro-region, Typical Comb Ware (3900–3400 calBC) and Pöljä Ware (3400–2500/1900 calBC) have been reported to be present alongside Kierikki Ware (Halinen et

al. 1998; Núñez & Okkonen 2005; Vaneeckhout 2009a), but Late Comb Ware (3600–3200/2800 calBC) has not been detected in the area. In addition, the analysed assemblages include another variant of Comb Ware, called here sparsely decorated Comb Ware (Fig. 5). This sparsely decorated pottery resembles (organic-tempered) Typical Comb Ware (style II:1) in some respects, but differs from it most notably through the more sparse and weak ornamentation and simpler rim shapes. Occasionally, sparsely decorated pottery may even resemble the organic-tempered variant of Kierikki Ware (Fig. 6; Appendices 1–2), yet due to the high fragmentation rate, this pottery is cumbersome to study in detail. In previous research it has been customarily placed under the umbrella of Typical Comb Ware (Halinen et al. 1998; Vaneeckhout 2009a; 2009b), even though their dissimilarity and sparsely decorated pottery's likeness to Kierikki Ware has been noted in some excavation reports (Katiskoski 1995).

Organic-tempered Typical Comb Ware, with decoration sometimes resembling the geometric style found, for example, in the Lake Saimaa area, is the prevailing pottery type at the sites located on higher elevations than the sites with Kierikki Ware. At the lower elevations, the ceramic assemblages contain Typical Comb Ware, Kierikki Ware and sparsely decorated pottery. Kierikki and Pöljä Wares are not encountered at the same sites in the micro-region, as Pöljä Ware is found only at lower elevations than any pottery assigned to Kierikki Ware.[7]

The settlement in the River Iijoki estuary during the Stone Age did not locate in a similar way in relation to the regressive shoreline as has been expected based on observations made at the seashore. The main reasons for this discrepancy

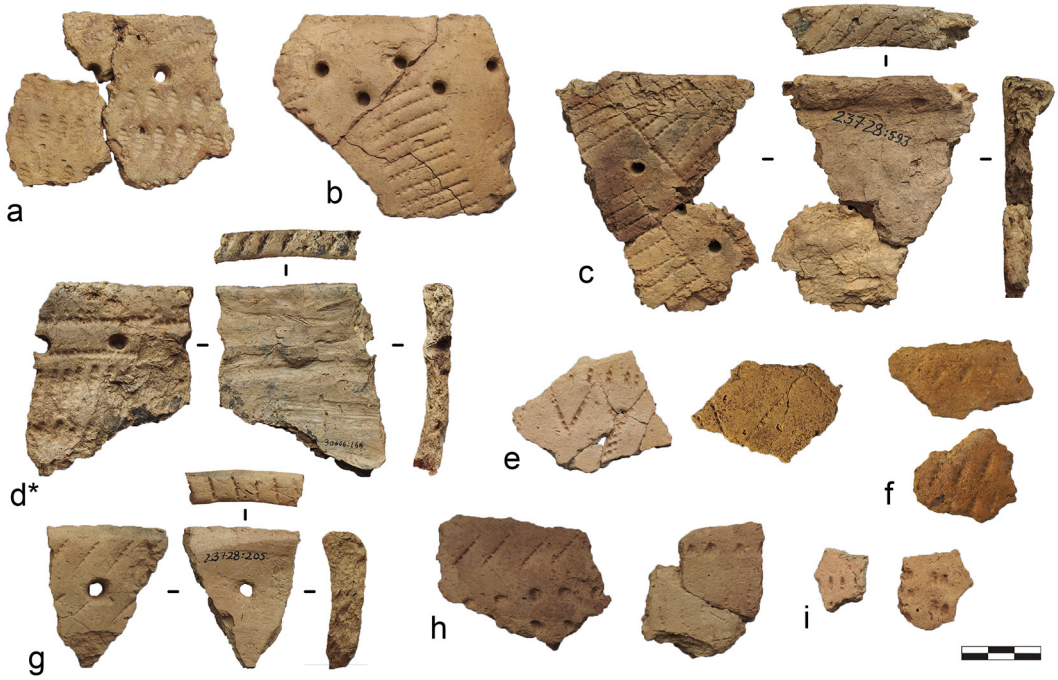

Fig. 5. Organic-tempered Typical Comb Ware and sparsely decorated Comb Ware from the Kierikin Sorakuoppa (a–c, g, h), Kuuselankangas (d, e, i) and Kierikinkangas South (f) sites. Typical Comb Ware, style II:1 (a), Typical Comb Ware, style II:2 (b), Typical Comb Ware, geometric style (c), Comb Ware with asbestos temper (d), sparsely decorated Comb Ware (e–i); a) KM 23431:204, b) KM 23728:544, c) KM 23728:593, d) KM 30666:166, e) KM 30667:461, 572, f) KM 39673:67, 71, g) KM 23728:205, h) KM 23728:194, 200, i) KM 30667:284. The sherd with asbestos temper is marked with an asterisk. Scale 3 cm. Photos: T: Mökkönen.

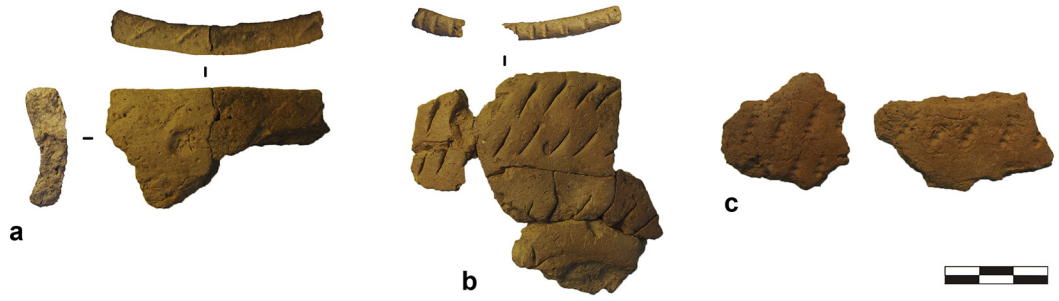

Fig. 6. Organic-tempered Kierikki Ware (a–b) and organic-tempered pottery that could be labelled both as sparsely decorated Comb Ware and as organic-tempered Kierikki Ware (c) from the Kierikinkangas site; a) KM 39673:376, b) KM 40344:227, c) KM 39673:67, 71. Scale 3 cm. Photos: T. Mökkönen.

can be found in the riverine environment: sites located by the river simply did not follow the regressive seashore slavishly. Recurrent riverine processes created new land by accumulating alluvial sediments, and re-shaped the estuary further until the stabilization point was reached. As a result, settlement sites of different ages may be situated at the same elevations (m a.s.l.), irrespective of the land uplift. This challenges also the interpretation of archaeological record and find contexts.

Pottery has been rarely encountered inside the housepits in the Kierikki micro-region (Vaneeckhout 2009a; Viljanmaa 2010), and the dwelling structures are usually linked with pottery found from outside (mostly Comb Ware; see Vaneeckhout 2009a). However, there is also evidence demonstrating that the utilization of some housepits may have been connected with other phases (most probably Kierikki Ware) than indicated by the pottery found outside the houses. Radiocarbon dates, find materials and stratigraphic observations (Appendix 2) further suggest that the major housepit villages, Kierikinkangas and Kuuselankangas, have faced several occupation phases and cannot be seen as the remains of one simultaneous building or habitation event (also Halinen et al. 1998; Pesonen 2002; Mökkönen 2009; 2010; cf. Vaneeckhout 2009a; 2009b; Costopoulos et al. 2012).

There are also marked differences in the quantities of different pottery types discovered at the sites. Typical Comb Ware and sparsely decorated pottery are much more abundant than the asbestos-tempered potteries. In this respect, the Kierikkisaari site is exceptional; as it is the only site in the area that has produced almost exclusively asbestos-tempered pottery. This, in addition to other finds (e.g. the numerous slate and flint points, amber), anomalous location (island), and specific structures (posts and piles), further indicates that the function and status of the Kierikkisaari Island was deviant from the remaining sites in the micro-region. If the island has been a special purpose (aggregation) site attracting people and material from near and far during the half a millennia of its use, the accumulation history and composition of its assemblage may not comply with the 'normal' assemblages either. This may explain why it is so difficult to find close parallels for the Kierikkisaari assemblage, and also questions if the assemblage can be used as the typological basis for a pottery type (also Siiriäinen 1984; Appendix 1).

AMS dates of substances adhered on pottery, as well as reliable context dates of charcoal, enable building a local Neolithic chronology for the Kierikki micro-region. Accordingly, the following chronological frame is proposed: Typical Comb Ware 3900–3400 calBC, Kierikki Ware 3650–3050 calBC, and Pöljä Ware 3350–2950 calBC (Fig. 7). The current restrictions in data, and the several peaks in the calibration curve between 3650 and 3350 calBC, do not allow final comments on the coexistence of Comb Wares and asbestos- and organic-tempered potteries, although Typical Comb Ware and Kierikki Ware seem to have some temporal overlap in the area.

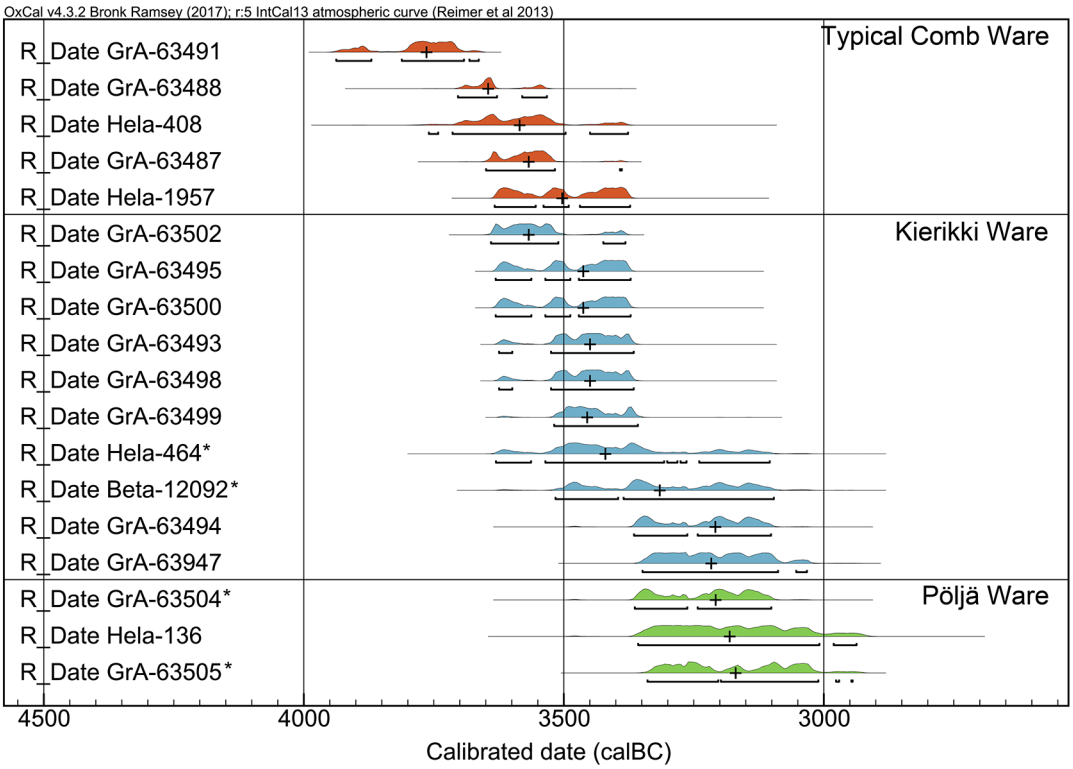

Fig. 7. AMS dates connected with different pottery types in the Kierikki area. Datings of birch bark tar and charred residues attached on sherds, as well as chewing resins and charcoals from clear contexts (structures) are shown in the figure. Datings of charcoal from cultural layer without any specific context and dates with standard deviation larger than ±70 years are excluded. Context dates are marked with an asterisk. For dates, see Appendix 2.

Also Kierikki and Pöljä Wares overlap a few centuries in the River Iijoki area, although – as mentioned above – they are not encountered at the same sites. Thus for example, the end of activities on the Kierikkisaari Island is contemporary with Pöljä habitation 2.5 kilometres further downstream.

The wider context: north-east Europe

Stone Age asbestos-tempered potteries are a speciality of north-eastern Europe, where local asbestos deposits were utilized in pottery production. In Finland, the incompleteness of the definitions concerning the asbestos-tempered pottery types is widely recognized (Siiriäinen 1984; Lavento 1992; Pesonen & Leskinen 2009; O'Ceallacháin 2014), but no serious attempts to resolve the problems have been taken. After the initial publications, which introduced ideas rather than defined types (Meinander 1954; Edgren 1964; Siiriäinen 1967), only a few papers and unpublished theses discuss the topic particularly (Carpelan 1979; Pesonen 1995a; 1996; Lavento & Hornytzkyj 1996; Miettinen 1998; O'Ceallacháin 2014; see also Pesonen 1995b; 1996 for Early Asbestos Ware).

The application of inadequate definitions has in many cases resulted in definitions-by-exclusion: if an asbestos-tempered sherd is clearly different from Pöljä Ware (or Early Asbestos Ware), then, in the absence of other alternatives, it becomes easily labelled as Kierikki Ware. Still, one can find many examples of sherds that have not been labelled at all, or called only Kierikki/Pöljä Ware or Middle/Late Neolithic

asbestos pottery (Huurre 1983: 153; 1986a: 60; Lavento 1992; Lavento & Hornytzkyj 1996; Pesonen 2001; Ruonavaara 2005; Seitsonen et al. 2012). This has been thought to result from the impressionistic descriptions of small assemblages and non-comparable criteria used in the definitions of these pottery types (Siiriäinen 1984; O'Ceallacháin 2014: 73), although the present authors see that part of the problem lies in the fragmentary nature and variation present in the pottery assemblages, which complicate the creation of meaningful typological entities.

In Russia, the asbestos- and organic-tempered pottery was for a long time discussed under the heading 'asbestos ware', occasionally called also 'Classical ceramics' (Gurina 1961; Kosmenko 1992), and only quite recently the material was divided into individual types (Zhul'nikov 1991; 1993; 1999; 2005; 2007). The first three of these, Voynavolok (3600–3400/2900 calBC), Zalavruga (3500–3100 calBC) and Orovnavolok (3400–2900 calBC) Wares, are practically contemporaneous with Kierikki Ware and the early part of Pöljä Ware, whereas the fourth type, Palayguba Ware (2500–2000 calBC), is synchronous with – or possibly even younger – than the later part of Pöljä Ware (for AMS dates, see Tarasov et al. 2017; Nordqvist & Mökkönen 2018; for conventional dates with much wider timeframes, see Zhul'nikov 1999; Zhulnikov et al. 2012; Tarasov & Khoroshun 2016).

The Russian pottery types possess problems as well, even if their definition has been more methodological than their Finnish counterparts'. Especially the Voynavolok and Orovnavolok types overlap typologically and chronologically, and some articles even discuss so-called 'transitional type' (Zhul'nikov & Tarasov 2014; Tarasov 2015), which includes qualities of both types, still without being neither of them. The same issue is visible also in the dating of Voynavolok Ware: all AMS dates connected with the type but dating younger than c 3400 calBC derive from sherds that could also be classified as Orovnavolok Ware (the reverse applies to the oldest dates connected with Orovnavolok Ware; Tarasov et al. 2017; Nordqvist & Mökkönen 2018).

Two main reasons can be given for the current situation, characterized by the simultaneous presence of several broadly alike but differently named and defined pottery types in Finland and north-west Russia. First, culture-historical reasons: during the Stone Age, connections and common traditions within this area resulted in resembling but still non-identical material culture. However, the second reason, the lack of discussion between Finnish and Russian research traditions, has prevented effectively any inter-regional studies and resulted in distribution maps suspiciously following the Finnish-Russian border, especially in the areas north of Lake Ladoga (see Carpelan 1979: Fig. 1; Pesonen 1999a; Nordqvist 2015: Figs. 2–4). Of course, parallels between the Russian and Finnish pottery types have been recognized, and these remarks are often accompanied with warnings against making direct equations between the types (Zhul'nikov 1999: 46, 51; Nordqvist 2015). In the following, observations of the relationships between these types, particularly in relation to Kierikki Ware, are presented. The aim is not to pursue comprehensive analysis here, but to demonstrate similarities and differences. The examples are taken from the Finnish and Russian materials analysed by the present authors, as well as from the research literature.[8]

Similarities have been pointed out between Comb Ware from the Kierikki area and Zalavruga Ware of the southern White Sea region and the northern Karelian Republic (Zhul'nikov 2007). Zalavruga Ware is predominately an organic-tempered descendant of Comb Ware tradition (Zhul'nikov 1999: 48–9; 2007) and is dated to the same time period as Kierikki Ware. Zalavruga Ware, sparsely decorated Comb Ware, and Kierikki Ware have a lot of in common, but their mutual relationships remain unresolved so far.

Voynavolok Ware is similarly perceived as the successor of Comb Ware tradition in the Karelian Republic (Zhul'nikov 1993; 1999: 46). Therefore likenesses with Kierikki Ware are expectable and occasionally noticed (Zhul'nikov 1999: 46; Zhulnikov et al. 2012). They are connected with overlapping use periods and similar tempers (asbestos, occasional use of organic tempers). Rims are predominately straight and may be thickened, although Γ-shaped rims, which occur in Voynavolok Ware, are included in the analysed Kierikki assemblages only once (KM 16141:927). Decoration of rim tops, executed with comb stamps and drawn and impressed

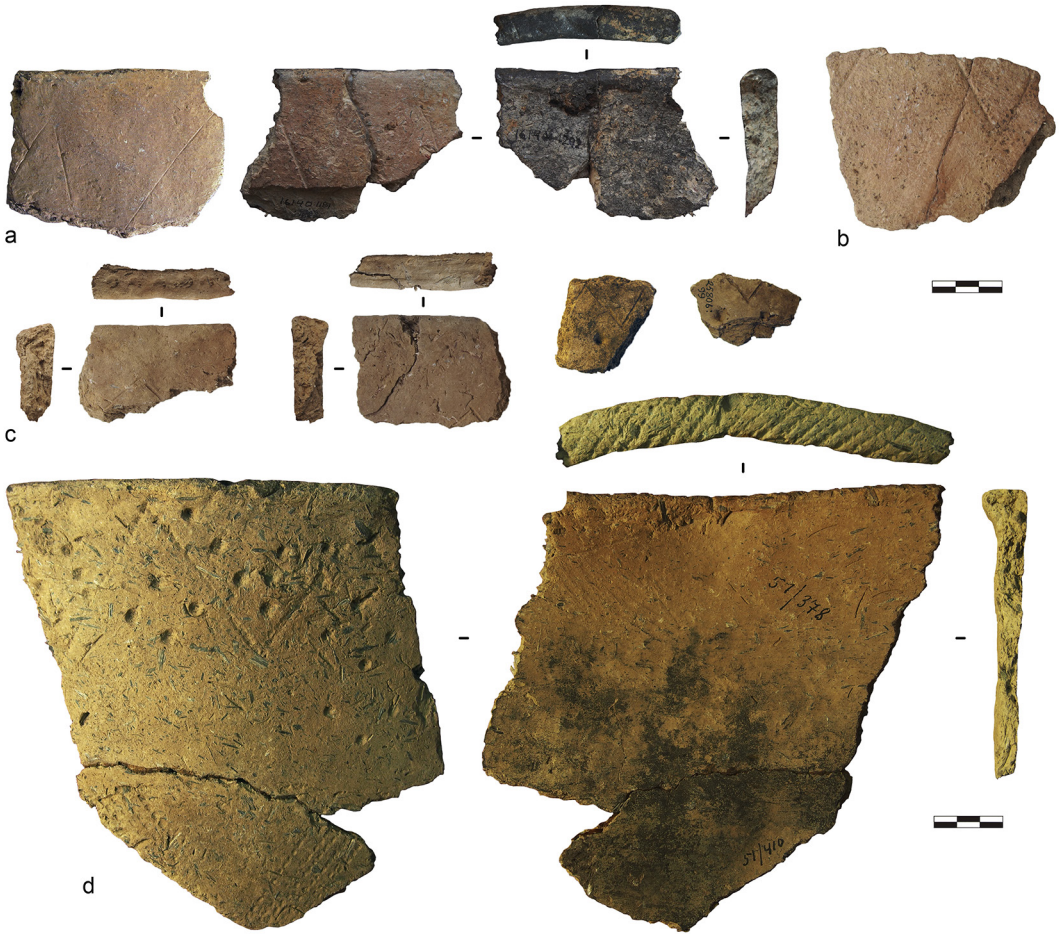

Fig. 8. Kierikki Ware from the Kierikkisaari (a), Siltala (b) and Pirttijoki 1 (c) sites and Voynavolok Ware from the Lakhta III site (d). The zigzag lines on Kierikki Ware are implemented with drawn line and on Voynavolok Ware with comb stamp; a) KM 16141:832, 16140:1181, 1292, b) KM 15184, c) KM 25806:76, 240, 419, 99, d) AM (Archaeological museum, the Institute of Language, Literature and History, Karelian Research Centre,) 51/378, 410. Scales 3 cm (a–c), and 6 cm (d). Photos: T. Mökkönen, except Kierikkisaari (a, KM 16141:832) after Pesonen (1999a).

lines, is roughly similar in both types, but undecorated rim tops are often present, too. Decoration on the body is usually weakly applied, and consists mainly of comb stamps, shallow pits and other occasional stamps and impressions. It has been suggested (Zhul'nikov 1999: 46) that Kierikki Ware would represent the Finnish variant of asbestos-tempered pottery with geometric designs, but even if these are common in Voynavolok Ware, they are not too characteristic of the analysed Kierikki assemblages.

Thus, despite the common elements, Kierikki and Voynavolok Wares display rather diverse ornamentation patterns. Some parallels, however, exist: a wide, simple horizontal zigzag line below the rim accompanied by little or no other decoration is often found in Kierikki Ware and present occasionally in Voynavolok Ware (Fig. 8). The weakly imprinted vertical zigzag patterns are also present in both types, although also commonly present in other asbestos-tempered pottery types (Fig. 9). Some vessels

Fig. 9. Kierikki Ware from the Kuuselankangas (a, not to scale) and Chudozero IV (b) sites; a) KM 30665:269; 30666:290, 336, 402, 475, b) AM 30/355, 147, 354, 349. Scale 3 cm. Photos: T. Mökkönen.

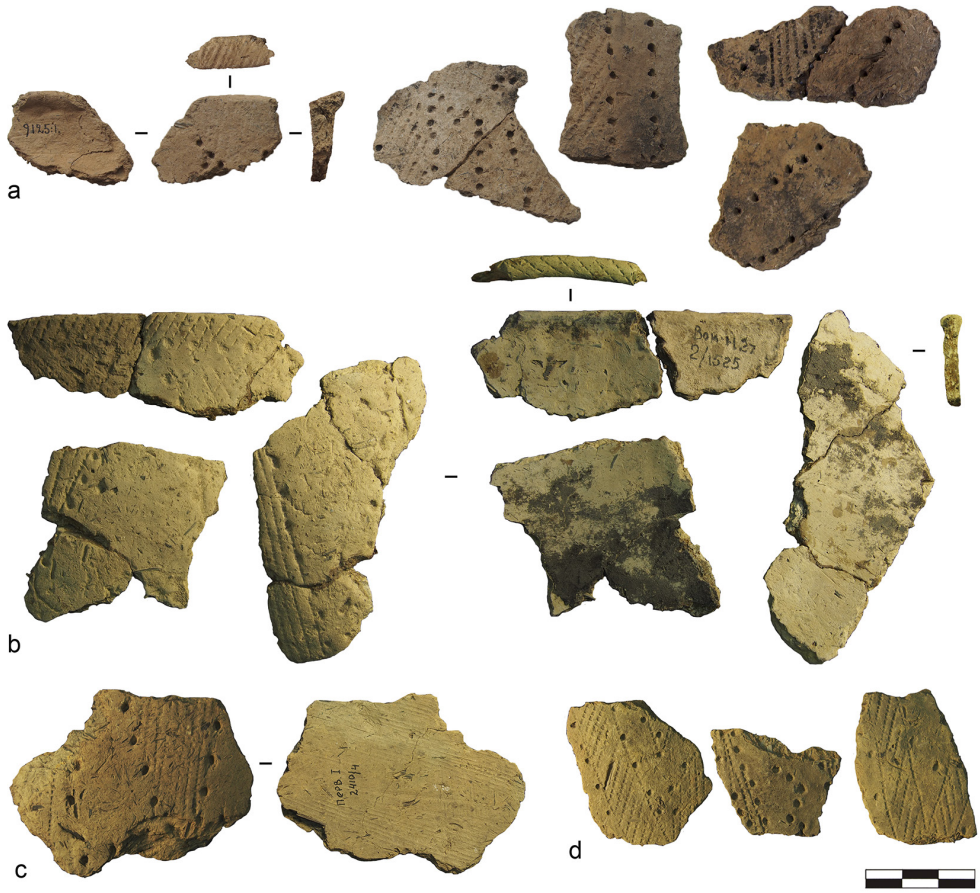

Fig. 10. Voynavolok Ware from Finland (a) and Russia (b–d); a) Vuopaja, KM 9125:1, b) Voynavolok XXVII, AM 2/1527, 1458, c) Pervomayskaya I, AM 2410/4, d) Pervomayskaya I, AM 2410/269, 409, 478. Scale 6 cm. Photos: T. Mökkönen.

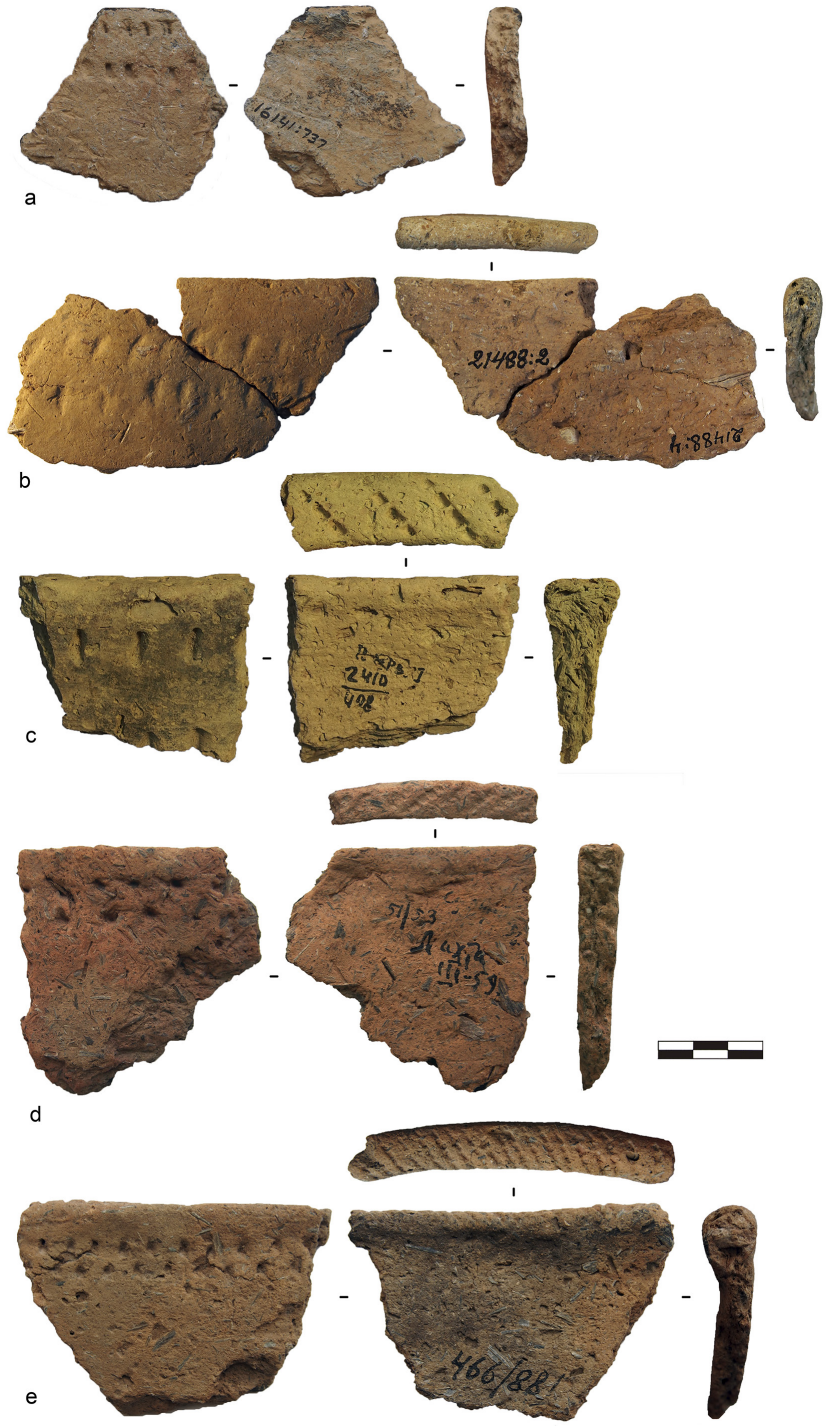

Fig. 11. Kierikki Ware from the Kierikkisaari (a) and Otamo 1 (b) sites, Orovnavolok Ware from the Pervomayskaya I site (c) and Voynavolok Ware from the Lakhta III (d–e) site; a) KM 16141:737, b) KM 21488:2, 4, c) AM 2410/498, d) AM 51/53, e) AM 466/881. Scale 3 cm. Photos: T. Mökkönen.

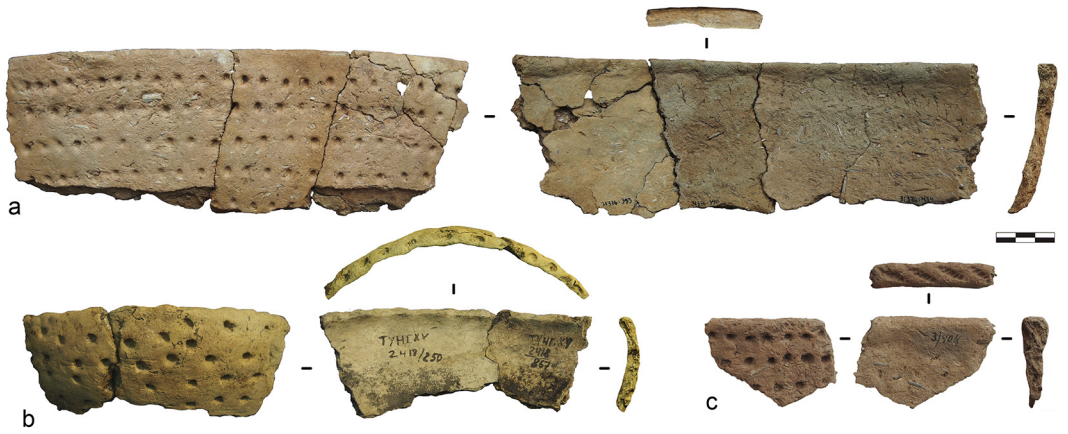

Fig. 12. Orovnavolok Ware from the Kärmelahti (a), Tunguda XV (b) and Solomennoe V (c) sites; a) KM 31376:434, 390, 393, b) AM 2418/250, 867, c) AM 3/406. Scale 3 cm. Photos: T. Mökkönen.

previously called Kierikki Ware in Finland are a complete match to Voynavolok type – the best example is the specimen found at the Vuopaja site in northern Lapland (Carpelan 2004; Pesonen 2004) (Fig. 10).[9]

Orovnavolok Ware is divided on typological grounds into two groups, early and late (Zhul'nikov 1999: 50). Especially the former group has properties in common with Kierikki Ware, while the latter one features elements that are more alien to it (Г-shaped rims, flat bottoms, etc.). Strongly imprinted decoration is often based on comb stamp, but geometric motifs are practically lacking and ornamentation is characterized by horizontal or diagonal rows or zones. A common feature for both groups of Orovnavolok Ware – as well as for Kierikki Ware – is the looseness of composition and incorporation of empty spaces into decoration, a feature not totally unknown in Voynavolok Ware either. For example, vessels decorated sparsely with horizontal rows of vertical notches or stamps are present in all types (Fig. 11). The Kärmelahti site in the Lake Saimaa area presents a good match to Orovnavolok Ware in Finland – the vessel illustrated in Fig. 12 and decorated with horizontal lines of round shallow pits has been previously labelled as undefined asbestos-tempered pottery (Katiskoski 2002; see also parallels from the sites Berezovo XIV and Tunguda IV in Zhul'nikov 2005: Figs. 65:5, 73:2).

Some pottery cannot be placed into any of the currently identified types. For example, the Salkoniemi assemblage has been termed as Kierikki Ware apparently because it does not fit the criteria of Pöljä Ware. Nevertheless, it differs in some respects (most notably in temper and decoration) from the eponym assemblage of the Kierikkisaari Island (see Appendix 1), and does not fit easily the definitions of Voynavolok or Orovnavolok Wares either. This is not exceptional, and the Salkoniemi pottery can be considered as an example of mixing of different traditions, characteristic of the time period discussed in this paper. In other words, potteries at different sites and in different regions share certain common technological and stylistic elements but combine and blend them in various ways with local traditions, resulting in quite heterogeneous archaeological image.[10]

The asbestos- and organic-tempered wares of Finland and Russia are not strictly defined exclusive types, but rather polythetic and overlapping entities. Even if the Finnish research has largely focused on individual features – and even if some such features may be more specific for either Kierikki (shallow pits, thicker walls) or Pöljä Ware (Г-shaped rims, vertical zigzag pattern made with comb or wound-cord stamps) – types cannot be distinguished based on such individual features only. For example, although Г-shaped rims have been the characterizing ele-

ment of Pöljä Ware, not all Pöljä vessels come with an inwards bent list.[11]

Similarly, the way of using asbestos has been suggested to be one separating criteria between the Kierikki (short chopped asbestos fibres) and Pöljä Wares (long fibres) (Edgren 1964; Siiriäinen 1967). Even if such notions may reflect some general tendencies, there is plenty of variation both in the volume and length of the used asbestos fibres (see also O'Ceallacháin 2014: 31–5). Instead, a more clear division seems to appear in the asbestos types utilized in different regions. In Karelia, dark-coloured actinolitic asbestos (customarily given an eastern/Karelian origin) is prevailing with two-thirds' share, but is rarely encountered in Finland where pottery is predominantly tempered with antophyllitic asbestos (assigned northern Lake Saimaa origin) (Lavento & Hornytzkyj 1996; also Zhul'nikov 1999: 43). This indicates the use of local asbestos deposits, but also the existence of wide contact and exchange networks, even if the amount of analysed sherds is still very small (see Lavento & Hornytzkyj 1996).

KIERIKKI WARE AND THE 4TH MILLENNIUM CALBC

Kierikki Ware is a problematic concept without clear contents. The current situation is the result of face-value adoption of Siiriäinen's (1967) tentative definition, habitual use of the term to represent most non-Pöljä materials, and the lack of subsequent research. The concepts and chronological frames into which Kierikki Ware has been placed reflect the old culture-historical approach in which typological ceramic blocks ('cultures') were following each other in temporal succession. Variation beyond typology's reach, and to some extent contemporaneity, was not really part of that toolbox.

Kierikki Ware is not the only pottery type whose definition and habitual use are problematic, and it represents several issues commonly present in north-east European context. The first one is the scarcity of material-based studies. Especially in Finland, there are many archaeological phenomena whose descriptions are based on insufficient materials and/or out-dated concepts (also Nordqvist & Mökkönen 2015). The second issue is the lack of inter-regional research. In north-east Europe, archaeology has been, and partially still is, focused within the present-day nation states and only a few attempts have been made to create a genuine discourse over the Finnish-Russian border. Furthermore in Finland, materials from the inland and the north have been accumulated only relatively recently, and have not been incorporated properly into the general picture of prehistory, still structured according to the coastal materials (see Ikäheimo & Nordqvist 2017). The third issue is more particularly connected with the later 4th and 3rd millennia calBC: just like Kierikki Ware, much of the materials connectable with this period are fragmentary (stylistically, technologically, and in their present physical condition), small in numbers, and therefore, largely overshadowed by other periods and phenomena.

Although it may be claimed that Kierikki Ware does not exist in the sense it has been perceived in Finnish archaeology, the aim here is not to discard 'Kierikki Ware' completely, but rather to connect it better with the actual materials known today and with the diversity observable in these materials. The assemblages presented in this paper may be taken as guidelines until studies incorporating more material with higher spatiotemporal resolution and adopting more analytical and reproducible approach are completed. Furthermore, redefining the concept of Kierikki Ware requires also better understanding of the preceding, contemporary and subsequent asbestos- and organic tempered potteries and related phenomena in north-east Europe.

The asbestos- and organic-tempered potteries discussed in this paper are heterogeneous entities exhibiting much overlap between the archaeologically defined types. The ambivalence of material – as well as the inadequateness of present archaeological classifications – is also evidenced by ceramics that cannot be fitted easily into any of the types, even though they clearly belong to the same cultural and technological context. Thus, it may be argued that sharply bordered, narrow pottery types can hardly be generated within this temporal context.

North-west Russian asbestos- and organic-tempered potteries are present in the Finnish materials, and likewise, elements of Finnish origin can be found in Russia. When compared with the Karelian materials, Kierikki Ware seems to

have most in common with Voynavolok Ware, but shares similarities with (older) Orovnavolok Ware as well. As noted above, Finnish and Russian types are not direct parallels but due to the generous stylistic and technological overlap it is justified to consider them as regional variants of the same phenomenon or tradition, rather than totally different types. Nevertheless, in the current research situation their geographical overlap can be illustrated only through individual examples.

The local archaeological context into which Kierikki Ware appeared in Northern Ostrobothnia is fairly complicated as well. The eponymous Kierikkisaari Island is a special place, that is distinctive from the other sites in the area. This is visible in the composition of its archaeological assemblage and, consequently, in the interpretations given of its function. The Kierikkisaari assemblage cannot be considered as a representative example of Kierikki Ware, and as the site is situated in the very north-western reaches of the total distribution of asbestos- and organic-tempered wares – and outside the area of main asbestos sources – it is also unlikely that Kierikki Ware would have been 'invented' in the Kierikki region.

Kierikki Ware's area of origin remains unknown for the time being. However, the poorly-studied regions close to the Finnish-Russian border between the northern Lake Saimaa and Kainuu areas could be potential targets for future inquiries. All in all, it can be postulated that active contact networks in north-east Europe mediated strongly in the formation of asbestos and organic-tempered wares discussed in this paper. In the Kierikki micro-region, archaeological materials dating to the second half of the 4th and early 3rd millennia calBC do not indicate much contacts towards the south, whereas the eastern and south-eastern directions are evidenced by pottery, flint points (Zhul'nikov 1999: Fig. 46; Tarasov 2013), developments in semi-subterranean houses (Mökkönen 2011: 67), native copper (Ikäheimo & Pääkkönen 2009; Nordqvist & Herva 2013; Ikäheimo et al. 2015), as well as amber (Carpelan 1999; Zhulnikov 2008; cf. Okkonen 2009; see also Núñez &Franzén 2011). Also the Kierikkisaari site, with its pile constructions, has numerous contemporary parallels with resembling material culture in the boreal zone of north-east Europe (Oshibkina 1978: 111–7; Mazurkevich 2014; Nedomolkina & Piezonka 2014), and even further (see Mazurkevich et al. 2014).

The eastern contacts in the Kierikki micro region were apparently maintained via water and land routes (glacial moraine formations) towards the Kainuu and northern Lake Saimaa areas, and further towards the White Sea and the more southern parts of the Karelian Republic (Lake Onega, Lake Ladoga). This network of fairways, like a funnel connecting wide eastern areas to a few estuaries in Northern Ostrobothnia, was evidently in function already during the Stone Age. Later, these routes were prominent in the Bronze Age development of the area (Huurre 1986b), and during the Late Iron Age and historical period Karelians or Russians travelled to fish and trade in the Ostrobothnian estuaries – a phenomenon evidenced both by archaeological finds (Huurre 1983: 430–4), and written records (Julku 1967).

Final conclusions answering the questions about Kierikki Ware are beyond the scope of this contribution. It is acknowledged that resolving many of the issues raised here require studying the topic from more analytical and technological perspectives and employing anthropologically informed approaches to material culture. The emphasis has been deliberately on the presentation of archaeological materials and on exploring the general nature of pottery. Eventually, the aim has been to provide an extended outlook on the Neolithic asbestos- and organic-tempered potteries of north-east Europe and to incorporate both Finnish and north-west Russian materials into discussion – still focusing on Kierikki Ware and the Kierikki micro-region, the starting points of this paper.

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NOTES

[1] Analysed Kierikkisaari assemblage: the National Museum of Finland KM 15241:1–233, 15663:1–468, 16139:1–2580, 16140:1–1906, 16141:1–1346, 16554:1–939. The larger sherds on display at the National Museum of Finland (Helsinki), and the Kierikki Stone Age Centre (Oulu) could not be examined. The total number of sherds included in the more detailed analysis is 311 (2475 g), i.e. c 32% of all the sherds (in number); Kuuselankangas assemblage: KM 30667:20–759, 32220:1–7243. The number of more carefully analysed sherds is 22 (202 g), c 20% of all Kierikki Ware (the assemblage contains also organic-tempered Comb Ware); Pirttijoki 1 assemblage: KM 25355:1–80, 25806: 1–456. The number of sherds analysed in detail is 112 (1988.60 g), the morsels of Kierikki Ware were not separated from the morsels of other pottery types present at the site (mineral- and organic-tempered Typical/Late Comb Ware); Salkoniemi assemblage: KM 34311:1–85. The number of accurately analysed sherds is 26 (157 g) and covers c 14% of all Kierikki Ware in the sample (also mineral-tempered Typical Comb Ware, Late Comb Ware, and a few sherds of Early Asbestos Ware and Pöljä Ware are known from the site). The analyses were conducted by the authors at the premises of the National Board of Antiquities, Helsinki, in 2014–2015 and 2017, and in the Kierikki Stone Age Centre, Oulu, in 2014.

[2] In Russian literature these potteries are commonly called ‘asbestos and porous pottery’, and also in this paper the term ‘asbestos- and organic-tempered ware’ is used, although interchangeably with ‘asbestos-tempered ware’.

[3] Several sites in the Kierikki area include also unspecified organic-tempered pottery, but due to its highly fragmentary nature, it cannot be classified directly as organic-tempered Kierikki Ware (see Appendix 2).

[4] In earlier studies, the striated vessels were even seen as a link between the Kierikki and Pöljä Wares and dated to the very beginning of Pöljä Ware period (Siiriäinen 1986). Nothing in the present material supports this assumption.

[5] Kuuppala, the Karelian Isthmus, Russia (Hela-1022, 4655±45 BP); Joenniemi, Kainuu, Finland (Hela-102, 4555±80 BP); Kärräniemi (also known as Kumpuniemi and Kärrylä), Lapland, Finland (Hela-360, 4450±105 BP); and Västra Mårtsbo, Gästrikland, Sweden (Ua-14836, 4515±70 BP).

[6] The analysed sample includes the following materials: Kierikin Sorakuoppa, KM 23431:1–893, 23728:1–768; Kierikinkangas, KM 31829:2418–3116; Kuuselankangas, KM 29907:1–2085, 30666:1023–2676, 30667:20–759, 32220:1–7243; Voima-Kuusela KM 30890:1–239; Purkajasuo-Korvala KM 32134:1–2267.

[7] Undecorated body sherds are known from both Kierikki and Pöljä contexts. Thus, in principle, it is possible that some undecorated sherds from the Kierikkisaari Island might represent Pöljä Ware, but there is no solid evidence to confirm this.

[8] The Russian materials were analysed in the early 2015 and 2017 at the Institute of Language, Literature and History, Karelian Research Centre, Russian Academy of Sciences, Petrozavodsk.

[9] This vessel has been recently identified as Voynavolok Ware (Zhulnikov et al. 2012: Table 1), but numerous other attributions have been given to it during the decades as well: Typical Comb Ware (Luho 1948: 50), Pöljä Ware (Meinander 1954: 163; Edgren 1964), a local variant deriving from Säräisniemi 1 pottery tradition (Simonsen 1963: 216), and even as the sole representative of ‘Vuopaja Ware’ (Arponen & Hintikainen 1995).

[10] Pottery at the Pirttijoki 1 site carries Typical Comb Ware tradition in its rim shapes, even if temper and decoration are quite different. Similar Kierikki Ware resembling Typical/Late Comb Ware is also known, for example, at the Seppälä 4 (Novoselki 5) site on the Karelian Isthmus (Collections of the Museum of Anthropology and Ethnography named after Peter the Great, Kunstkamera, St. Petersburg). As a curiosity, a vessel found at the Kangasranta 1 site in eastern Finland is decorated with comb-stamp-made water fowl images (Edgren 1967), a feature highly characteristic of Typical Comb Ware. In the Kierikki micro-region, Kierikki Ware has similarities with the local (sparsely decorated) Comb Ware tradition, although exhibits also features alien to the area. Even the existence of two categories of Kierikki Ware, ‘pure’ and ‘mixed’,

has been suggested (Pesonen 1996). What these categories stand for remains rather unclear, but the first apparently equals to the Kierikkisaari assemblage, whereas the latter is presumably an intermediate form between Typical Comb Ware and Kierikki Ware, and possibly related to the poorly-defined Late Comb Ware of the Finnish interior.

[11] To give a few examples, Pöljä Ware from the Pirskanlahti B site includes rounded, in- and outwards thickened rims (KM 31389:126, 248 and 32004:1982), and pottery from the eponym site of Pöljä contains few sherds that with their rounded, inwards thickened rim and comb stamp decoration would actually fit Siiriäinen's (1967) original description of Kierikki Ware (KM 8981:17, 20).

REFERENCES

Unpublished sources

Annala, S. & Viljanmaa, S. 2007. Yli-Ii-11 [28] Kierikinkangas: Yleisökaivaus kivikautisella asuinpaikalla 1.6.–30.9.2006. Research report, National Board of Antiquities, Helsinki.

Annala, S. & Viljanmaa, S. 2008. Yli-Ii-11 [28] Kierikinkangas: Yleisökaivaus kivikautisella asuinpaikalla 2.5.–19.8.2007. Research report, National Board of Antiquities, Helsinki.

Franzén, P., Heinäaho, H. & Mäki-Petäys, M. 1998. Yli-Ii, Karjalankylä, Voima-Kuusela. Research report, National Board of Antiquities, Helsinki.

Katiskoski, K. 1995. Yli-Ii 43 Kuuselankangas: Kivikautisen asuinpaikan kaivaus. Research report, National Board of Antiquities, Helsinki.

Koivunen, P. & Korolainen, M. 1995. Yli-Ii 43 Kuuselankangas, Kierikki (KKK-95): Kesän 1995 kaivausraportti. Research report, National Board of Antiquities, Helsinki.

O'Ceallacháin, S. 2014. Pöljä, keramiikkaryhmä vai reunamuoto? Pöljän keramiikkaa Outokummun Laavussuolla. M.A. Thesis, Archaeology, University of Helsinki.

Pärssinen, T. 1988. Yli-Ii [27] Kierikin sorakuoppa. Research report, National Board of Antiquities, Helsinki.

Pesonen, P. 1995b. Varhainen asbestikeramiikka. Lic.Phil. Thesis, Archaeology, University of Helsinki.

Pesonen, P. 1999b. Yli-Ii [28] Kierikinkangas: Kivikautisen asuinpaikan kaivaus. Research report, National Board of Antiquities, Helsinki.

Pesonen, P. 2000. Yli-Ii [43] Kuuselankangas: Kivikautisen asuinpaikan kaivaus. Research report, National Board of Antiquities, Helsinki.

Schulz, H.-P. 2000. Yli-Ii Purkajasuo/Korvala: Kivikautisen asunpaikan kaivaus ja pyyntipaikan (entisen merensalmen) maaperätutkimus 1.8.–27.9.2000. Research report, National Board of Antiquities, Helsinki.

Schulz, H.-P. & Koivisto, S. 1997. Yli-Ii Purkajasuo: Kivikautisen pyyntipaikan ja asuinpaikkaryhmän kaivaus 25.7.–21.9 1996. Research report, National Board of Antiquities, Helsinki.

Viljanmaa, S. 2010. Yli-Ii [28] Kierikinkangas: Yleisökaivaus kivikautisella asuinpaikalla 15.5.–30.9.2009. Research report, National Board of Antiquities, Helsinki.

Viljanmaa, S. 2011. Yli-Ii [28] Kierikinkangas: Yleisökaivaus kivikautisella asuinpaikalla 15.5.–5.11.2010. Research report, National Board of Antiquities, Helsinki.

Literature

Arponen, A. & Hintikainen, E. 1995. Strandförskjutningen i Enare träsk mot bakgrunden av de arkeologiska fynden. *Finskt Museum* 100 (1993): 5–25.

Carpelan, C. 1979. Om asbestkeramikens historia i Fennoskandien. *Finskt Museum* 85 (1978): 5–25.

Carpelan, C. 1999. Käännekohtia Suomen esihistoriassa aikavälillä 5100…1000 eKr. In P. Fogelberg (ed.) *Pohjan poluilla: Suomalaisten juuret nykytutkimuksen mukaan*: 249–80. Bidrag till kännedom av Finlands natur och folk 153.

Carpelan, C. 2004. Environment, archaeology and radiocarbon dates: Notes from the Inari region, northern Finnish Lapland. In M. Lavento (ed.) *Early in the North, Volume 5*: 17–45. Iskos 13.

Costopoulos, A., Vaneeckhout, S., Okkonen, J., Hulse, E., Paberzyte, I. & Wren, C.D. 2012. Social complexity in the Mid-Holocene northeastern Bothnian Gulf. *European Journal of Archaeology* 15 (1): 41–60.

Edgren, T. 1964. Jysmä i Iidensalmi. *Finskt Museum* 71 (1964): 13–37.

Edgren, T. 1967. Einige neue Funde von kammkeramischen Vogelbildern und Tierskulpturen aus Ton. *Finskt Museum* 73 (1966):8–24.

Europaeus-Äyräpää, A. 1930. Die Relative Chronologie der Steinzeitlichen Keramik in Finnland: I–II. *Acta Archaeologica* I: 165–90, 205–20.

Franzén, P. 2009. Kevyttä ja kaunista: Yli-Iin meripihkalöydöt. In J. Ikäheimo & S. Lipponen (eds.) *Ei kiveäkään kääntämättä: Juhlakirja Pentti Koivuselle*: 151–9. Oulu: Pentti Koivusen juhlakirjatoimikunta.

Gurina, N.N. 1961. *Drevnyaya istoriya Severo-Zapada Evropeyskoy chasti SSSR*. Materialy i issledovaniya po arkheologii 87.

Halinen, P., Katiskoski, K. & Sarkkinen, M. 1998. Yli-Iin Kuuselankankaan asuinpaikan tutkimukset 1994–1996. In H. Ranta (ed.) *Kentältä poimittua* 4: 24–40. Museoviraston arkeologian osaston julkaisuja N:o 7.

Hallgren, F. 2008. *Identitet i praktik: Lokala, regionala och överregionala sociala sammanhang inom nordlig trattbägarkultur*. Coast to Coast-book 17.

Herva, V.-P. & Ylimaunu, T. 2014 Coastal cosmologies: Long-term perspectives on the perception and understanding of dynamic coastal landscapes in the northern Baltic Sea region. *Time and Mind* 7 (2): 183–201.

Huurre, M. 1983. *Pohjois-Pohjanmaan ja Lapin esihistoria.* Kuusamo: Pohjois-Pohjanmaan maakuntaliiton ja Lapin maakuntaliiton yhteinen historiatoimikunta.

Huurre, M. 1986a. Esihistoria. In *Kainuun historia* 1: 5–184. Kajaani: Kainuun maakuntaliitto.

Huurre, M. 1986b. The eastern contacts of northern Fennoscandia in the Bronze Age. *Fennoscandia Archaeologica* III: 51–8.

Huurre, M. 2003. Viipurin läänin kivikausi. In M. Saarnisto (ed.) *Viipurin läänin historia* I: *Karjalan synty*: 151–244. Joensuu: Karjalan kirjapaino.

Ikäheimo, J. & Nordqvist, K. 2017. Lost in narration: Rediscovering the Suomussalmi copper adze. *Norwegian Archaeological Review* 50 (1): 44–65.

Ikäheimo, J.P. & Pääkkönen, M. 2009. Kierikin kupariveitsi: Uusimpia tutkimustuloksia. In J. Ikäheimo & S. Lipponen (eds.) *Ei kiveäkään kääntämättä: Juhlakirja Pentti Koivuselle*: 161–74. Oulu: Pentti Koivusen juhlakirjatoimikunta.

Ikäheimo, J., Mökkönen, T. & Nordqvist, K. 2015 Kuparia Kierikin sorakuopan kivikautiselta asuinpaikalta. *Muinaistutkija* 2015 (1): 19–23.

Julku, K. 1967. Oulujoki karjalaisten kaukoliikenteen väylänä keskiajalla. *Studia historica* I: 65–98.

Jungner, H. & Sonninen, E. 2004. *Radiocarbon dates VI*. Radiocarbon Dating Laboratory, University of Helsinki, Report, No 6.

Katiskoski, K. 2002. The semisubterranean dwelling at the Kärmelahti site in Puumala, Savo province, eastern Finland. In H. Ranta (ed.) *Huts and Houses: Stone Age and Early Metal Age Buildings in Finland*: 171–200. Helsinki: National Board of Antiquities.

Koivisto, S. 2012. Subneolithic fishery in the Iijoki River estuary, Northern Ostrobothnia, Finland. *Journal of Wetland archaeology* 12: 22–47.

Koivisto, S. 2017. *Archaeology of Finnish Wetlands with Special Reference to Studies of Stone Age Stationary Wooden Fishing Structures.* Helsinki: Unigrafia.

Koivisto, S. & Nurminen, K. 2015. Go with the flow: Stationary wooden fishing structures and the significance of estuary fishing in Subneolithic Finland. *Fennoscandia Archaeologica* XXXII: 55–77.

Koivunen, P. 2002. Kierikkisaari island in Yli-Ii: a Stone Age pile settlement? In H. Ranta (ed.) *Huts and Houses: Stone Age and Early Metal Age Buildings in Finland*: 123–8. Helsinki: National Board of Antiquities.

Kosmenko, M.G. 1992. *Mnogosloynye poseleniya Yuzhnoy Karelii*. Petrozavodsk: IYaLI RAN.

Lahelma, A. 2012. Strange swans and odd ducks: Interpreting the ambiguous waterfowl imagery of Lake Onega. In A. Cochrane & A.M. Jones (eds.) *Visualising the Neolithic:*

Abstraction, Figuration, Performance, Representation: 15–33. Oxford: Oxbow Books.

Lavento, M. 1992. A preliminary analysis of the ceramics of the Ruhtinansalmi dwelling-site complex in Kainuu, northern Finland. *Fennoscandia Archaeologica* IX: 23–41.

Lavento, M. & Hornytzkyj, S. 1996. Asbestos types and their distribution in the Neolithic, Early Metal Period and Iron Age pottery in Finland. In T. Kirkinen (ed.) *Pithouses and Potmakers in Eastern* Finland: 41–70. Helsinki Papers in Archaeology N:o. 9.

Lesell, K. 2005. Keramiikan karsta-ajoituksia. In H. Ranta (ed.) *Kentältä poimittua* 6: 103–5. Museoviraston arkeologian osaston julkaisuja N:o 11.

Leskinen, S. 2003. On the dating and function of the Comb Ceramics from Maarinkunnas. *Finskt Museum* 102 (1995): 5–55.

Luho, V. 1948. *Suomen kivikauden pääpiirteet.* Helsinki: Otava.

Mänttäri, V. 2011. *Hallien (Halichoerus grypus) ja itämerennorppien (Phoca hispida botnica) ravinnonkäyttö Perämerellä.* Master's Thesis. Faculty of Science, Department of Biological and Environmental Science, Aquatic Sciences, University of Jyväskylä. <http://urn.fi/URN:NBN:fi:jyu-2011090911377>. Read 6 March 2018.

Mazurkevich, A.N. 2014. Svaynye poseleniya Severo-zapada Rossii. In A.N. Mazurkevich, M.E. Polkovnikova & E.V. Dolbunova (eds.) *Arkheologiya ozernykh poseleniy IV–II tys. do n.e.: Khronologiya kul'tur i prirodno-klimaticheskie ritmy*: 260–6. Sankt-Peterburg: GE, IIMK RAN, RGPU, UMR 8215 Trajectoires.

Mazurkevich, A.N., Polkovnikova, M.E. & Dolbunova, E.V. (eds.) 2014. *Arkheologiya ozernykh poseleniy IV–II tys. do n.e.: Khronologiya kul'tur i prirodno-klimaticheskie ritmy*. Sankt-Peterburg: GE, IIMK RAN, RGPU, UMR 8215 Trajectoires.

Meinander, C.F. 1954. *Die Kiukaiskultur*. Suomen Muinaismuistoyhdistyksen Aikakauskirja 53.

Miettinen, M. 1998. Asbestikeramikkalöytöjä Etelä-Pohjanmaalta. In H. Ranta (ed.) *Kentältä poimittua* 4: 60–71. Museoviraston arkeologian osaston julkaisuja N:o 7.

Mökkönen, T. 2009. A response to Samuel Vaneeckhout's social interpretation of the Kuuselankangas housepit site. *Muinaistutkija* 2009 (3): 70–4.

Mökkönen, T. 2010. A response to Samuel Vaneeckhout's social interpretation of the Kuuselankangas housepit site, part 2. *Muinaistutkija* 2010 (1): 77–82.

Mökkönen, T. 2011. *Studies on Stone Age Housepits in Fennoscandia (4000–2000 cal BC): Changes in Ground Plan, Site Location and Degree of Sedentism*. Helsinki: Teemu Mökkönen.

Nedomolkina, N.G. & Piezonka, H. 2014. The pile construction at the Veksa III settlement site by the River Vologda: Structure and dating. In A.N. Mazurkevich, M.E. Polkovnikova & E.V. Dolbunova (eds.) *Arkheologiya ozernykh poseleniy IV–II tys. do n.e.: Khronologiya kul'tur i prirodno-klimaticheskie ritmy*: 302–8. Sankt-Peterburg: GE, IIMK RAN, RGPU, UMR 8215 Trajectoires.

Nordqvist, K. 2015. Neoliticheskaya keramika Finlyandii: Voprosy khronologii, rasprostraneniya i terminologii. *Tverskoy arkheologicheskiy sbronik, vyp.* 10: 249–65.

Nordqvist, K. & Herva, V.-P. 2013 Copper use, cultural change and Neolithization in northeastern Europe (c. 5500–1800 BC). *European Journal of Archaeology* 16 (3): 401–32.

Nordqvist, K. & Mökkönen, T. 2015. Äyräpää's Typical Comb Ware: an Umbrella term for the early 4th millennium BC pottery in northeastern Europe? *Fennoscandia Archaeologica* XXXII: 151–8.

Nordqvist, K. & Mökkönen, T. 2018. Novye dannye po arkheologicheskoy khronologii Severo-Zapada Rossii: AMS-datirovki neolita-eneolita Karelii. *Tverskoy arkheologicheskiy sbornik, vyp.* 11: 39–68.

Nordqvist, K., Herva, V.-P. & Sandell, S. 2016. Voda i vodnye ob'ekty kak sakral'nye elementy v epohku neolita-eneolita na Severo-zapade Rossii. In A.Ya. Martynov (ed.) *Arkheologiya sakral'nykh mest Rossii*: 25–30. Solovetsk: Solovets. gos. ist.-arkhitektur. i prirod. muzey-zapovednik, IA RAN, Spaso-preobrazhen, Solovets monastyr'.

Núñez, M. & Franzén, P. 2011. Implications of Baltic amber finds in northern Finland 4000–2000 BC. *Archaeologia Lituana* 12: 10–24.

Núñez, M. & Okkonen, J. 1999. Environmental background for the rise and fall of villages and megastructures in North Ostrobothnia 4000–2000 cal BC. In M. Huurre (ed.) *Dig it All: Papers Dedicated to Ari Siiriäinen:* 105–15. Helsinki: Finnish Antiquarian Society and Archaeological Society of Finland.

Núñez, M. & Okkonen, J. 2005. Humanizing of north Ostrobothnian landscapes during the 4th and 3rd millennia BC. *Journal of Nordic Archaeological Science* 15: 25–38.

Okkonen, J. 2003. *Jättiläisen hautoja ja hirveitä kiviröykkiöitä: Pohjanmaan muinaisten kivirakennelmien arkeologiaa*. Acta Universitatis Ouluensis, Series B, Humaniora 52.

Okkonen, J. 2009. Itämeri vuorovaikutusalueena kivikaudella. In K. Alenius & A. Honkala (eds.) *Itämeren itälaidalla II*: 7–15. Studia Historica Septentrionalia 58.

Oshibkina, S.V. 1978. *Neolit Vostochnogo Prionezh'ya*. Moskva: Nauka.

Pälsi, S. 1915. *Riukjärven ja Piiskunsalmen kivikautiset asuinpaikat Kaukolassa*. Helsinki.

Pesonen, P. 1995a. Hut floor areas and ceramics: Analysis of the excavation area in the Rääkkylä Pörrinmökki settlement site, eastern Finland. *Fennoscandia Archaeologica* XII: 139–49.

Pesonen, P. 1996. Early Asbestos Ware. In T. Kirkinen (ed.) *Pithouses and Potmakers in Eastern Finland*: 9–39. Helsinki Papers in Archaeology N:o. 9.

Pesonen, P. 1999a. *Suomen esihistoriallinen keramiikka*. Electronic study materials, University of Helsinki. <http://www.helsinki.fi/hum/arla/keram/> Read 23 April 2017.

Pesonen, P. 2001. Kiteen Sarvisuo: Lisää varhaisesta asbestikeramiikasta. In H. Ranta (ed.) *Kentältä poimittua* 5: 34–56. Museoviraston arkeologian osaston julkaisuja N:o 9.

Pesonen, P. 2002. Semisubterranean houses in Finland: a Review. In H. Ranta (ed.) *Huts and Houses: Stone Age and Early Metal Age Buildings in Finland:* 9–41. Helsinki: National Board of Antiquities.

Pesonen, P. 2004. Neolithic pots and ceramics chronology: AMS-datings of Middle and Late Neolithic ceramics in Finland. In P. Uino (ed.) *Fenno-Ugri et Slavi 2002: Dating and Chronology*: 87–97. Museoviraston arkeologian osaston julkaisuja N:o 10.

Pesonen, P. & Leskinen, S. 2009. Pottery of the Stone Age hunter-gatherers in Finland. In P. Jordan & M. Zvelebil (eds.) *Ceramics before Farming: the Dispersal of Pottery among Prehistoric Eurasian Hunter-gatherers*: 299–318. Walnut Creek: Left Coast Press.

Pesonen, P., Oinonen, M., Carpelan, C. & Onkamo, P. 2012. Early Subneolithic ceramic sequences in eastern Fennoscandia: a Bayesian approach. *Radiocarbon* 54 (3–4): 661–76.

Pesonen, P., Viljanmaa, S. & Oinonen, M. 2013. An evidence of Neolithic beeswax in North Ostrobothnia, Finland, on 65° latitude. *7th International Symposium: ^{14}C and Archaeology: Book of Abstracts*: 139–40. Gent: Universiteit Gent.

Philippsen, B. 2015. Hard water and old food. The freshwater reservoir effect in radiocarbon dating of food residues on pottery. *Documenta Praehistorica* XLII: 159–70.

Ruonavaara, L. 2005. Boplatsens keramik. In H. Edgren (ed.) *Rävåsen*: 25–50. Finskt Museum 109 (2002).

Seitsonen, O., Nordqvist, K., Gerasimov, D.V. & Lisitsyn, S.N. 2012. 'The good, the bad, the weird': Stone Age and Early Metal Period radiocarbon dates and chronology from the Karelian Isthmus, north-west Russia. *Geochronometria* 39 (2): 101–21.

Siiriäinen, A. 1967. Yli-Ii Kierikki: Asbestikeraaminen asuinpaikka Pohjois-Pohjanmaalla. *Suomen Museo* 74 (1967): 5–37.

Siiriäinen, A. 1974. *Studies Relating to Shore Displacements and Stone Age Chronology in Finland*. Helsingin yliopiston arkeologian laitos, moniste N:o 10.

Siiriäinen, A. 1983. Humppilan Järvensuon kivikautinen löytöpaikka. *Karhunhammas* 7: 79–87.

Siiriäinen, A. 1984. On the Late Stone Age asbestos ware culture of northern and eastern Finland. In T. Edgren (ed.) *Fenno-Ugri et Slavi 1983*: 30–5. Iskos 4.

Siiriäinen, A. 1986. Kärräniemi in Rovaniemi: a Middle Subneolithic site with a palisade in northern Finland. In T. Edgren (ed.) *Studia praehistorica fennica C F Meinander septuagenario dedicata*: 185–98. Iskos 6.

Simonsen, P. 1963. *Varanger-funnene II: Fund og udgravninger på fjordens sydkust.* Tromsø Museums Skrifter VII (3).

Tarasov, A. 2013. Typology and cultural-chronological variability of bifacially worked implements of siliceous rocks from the territory of Russian Karelia. In K. Johanson & M. Tõrv (eds.) *Man, his Time, Artefacts, and Places*: 347–84. Muinaisaja teadus 19.

Tarasov, A.Yu. 2015. Fofanovo XIII: Primer intensivnoy proizvodstvennoy deyatel'nosti epokhi ranengo metalla v lesnoy zone. In G.A. Khlopachev (ed.) *Drevnye kul'tury Vostochnoy Evropy: Etalonnye pamyatniki i opornye kompleksy v kontekste sovremennykh arkheologicheskikh issledovaniy*: 227–57. Zamyatinskie sbornik, vyp. 4.

Tarasov, A.Yu. & Khoroshun, T.A. 2016. Radiouglerodnaya khronologiya perioda neolita i eneolita na territorii Karelii. In G.I. Zaytseva, O.V. Lozovskaya, A.A. Vybornov & A.N. Mazurkevich (eds.) *Radiouglerodnaya khronologiya epokhi neolita Vostochnoy Evropy VII–III tysyacheletiya do n.e.*: 368–87. Smolensk: Svitok.

Tarasov, A., Nordqvist, K., Mökkönen, T. & Khoroshun T. 2017. Radiocarbon chronology of the Neolithic–Eneolithic period in Karelian Republic (Russia). *Documenta Praehistorica* XLIV.

Torniainen, J., Vuorinen, P.J., Jones, R.I., Keinänen, M., Palm, S., Vuori, K.A.M. & Kiljunen, M. 2013. Migratory connectivity of two Baltic Sea salmon populations: retrospective analysis using stable isotopes of scales. *ICES Journal of Marine Science* 71(2): 336–44.

Vaneeckhout, S. 2009a. 2500 years of social evolution in a northern Finnish Stone Age village. In T. Mökkönen & S.-L. Seppälä (eds.) *Arkeologipäivät 2008*: 63–71.

Vaneeckhout, S. 2009b. *Aggregation and Polarization in Northwest Coastal Finland: Socio-ecological Evolution between 6500 and 400 cal BP.* Oulu: University of Oulu.

Vaneeckhout, S. 2010. House societies among coastal hunter-gathers: a Case study of Stone Age Ostrobothnia, Finland. *Norwegian Archaeological Review* 43 (1): 12–25.

Vermeer, M., Kakkuri, J., Mälkki, P., Boman, H., Kahma, K.K. & Leppäranta, M. 1988. Land uplift and sea level variability spectrum using fully measured monthly means of tide gauge readings. *Finnish Marine Research* 256: 3–75.

Viljanmaa, S. 2009. Punamultahauta Yli-Iin Kierikinkankaan kivikautiselta asuinpaikalta. In J. Ikäheimo & S. Lipponen (eds.) *Ei kiveäkään kääntämättä: Juhlakirja Pentti Koivuselle*: 175–82. Oulu: Pentti Koivusen juhlakirjatoimikunta.

Zhul'nikov, A.M. 1991. Problemy khronologii i periodizatsii pozdnego eneolita Karelii. In S.I. Kochkurkina (ed.) *Khronologiya i periodizatsiya arkheologicheskikh pamyatnikov Karelii*: 126–47. Petrozavodsk: IYaLI RAN.

Zhul'nikov, A.M. 1993. Eneoliticheskoe poselenie Voynavolok XXVII. *Rossiyskaya Arkheologiya* 1993 (2): 140–53.

Zhul'nikov, A.M. 1999. *Eneolit Karelii*. Petrozavodsk: IYaLI RAN.

Zhul'nikov, A.M. 2005. *Poseleniya epokhi rannego metalla Yugo-Zapadnogo Pribelomor'ya*. Petrozavodsk: PGU, KGKM.

Zhul'nikov, A.M. 2007. Pamyatniki s keramikoy typa Zalavruga 1 v Pribelomor'e i nekotorye voprosy izucheniya belomorskikh petroglifov. In L.G. Shayashmetova (ed.) *Kol'skiy sbornik: Vladimir Shumkin Festschrift*: 102–37. Saint-Petersburg: IIMK RAN.

Zhulnikov, A.M. 2008. Exchange of amber in northern Europe in the III millennium BC as a factor of social interactions. *Estonian Journal of Archaeology* 12 (1): 3–15.

Zhul'nikov, A.M. & Tarasov, A.Yu. 2014. K voprosu o keramike 'perekhodnogo' tipa (po materialam poseleniya Fofanovo XIII). In A.G. Sitdikov, N.A. Makarov & A.P. Derevyanko (eds.) *Trudy IV (XX) vserossiyskogo arkheologicheskogo s''yezda v Kazanii 2014, tom* I: 259–62. Kazan': IA AN RT, KFU, IA RAN and IAET SO RAN.

Zhulnikov, A., Tarasov, A. & Kriiska, A. 2012. Discrepancies between conventional and AMS-dates from complexes with asbestos and porous ware: a Probable result of 'reservoir effect'? *Fennoscandia Archaeologicia* XXIX: 125–32.

APPENDIX 1. ANALYSED KIERIKKI WARE

		Kierikkisaari	Kuuselankangas	Salkoniemi	Pirttijoki 1
Sherds					
/ analysed	pcs	32.0% (311)	20.0% (22)	14.1% (26)	-% (112)
	weight (g)	72.0% (2475)	75.5% (202.1)	34.4% (156.7)	-% (1988.60)
/ morsels	pcs	68.0% (662)	80.0% (88)	85.9% (159)	-
	weight (g)	28.0% (959.4)	24.5% (65.7)	65.6% (299.1)	-
Of the analysed					
Size class	< 3 cm	7.1%	13.6%	0.0%	4.5%
	4–6 cm	87.1%	54.5%	100.0%	70.5%
	7–9 cm	5.5%	31.8%	0.0%	24.1%
	>10 cm	0.3%	0.0%	0.0%	0.9%
Temper	sand + asbestos/talc/ mica	0.3%	0.0%	23.1%	7.1%
	sand + organic	0.3%	0.0%	0.0%	0.0%
	sand + asbestos/talc/ mica + organic	0.0%	0.0%	34.6%	0.0%
	asbestos/talc/mica	95.2%	100.0%	42.3%	91.1%
	organic	4.2%	0.0%	0.0%	1.8%
Surfaces present	both	48.6%	27.3%	34.6%	90.2%
	outer	12.2%	18.2%	19.2%	4.5%
	inner	30.2%	45.5%	19.2%	5.3%
	one	5.5%	4.5%	15.4%	0.0%
	none	3.5%	4.5%	11.5%	0.0%
Surface treatment	not present/not clear	78.1%	72.7%	100.0%	27.7%
	outer surface treated/ striated	1.3%	0.0%	0.0%	0.0%
	inner surface treated/ striated	19.0%	22.7%	0.0%	49.1%
	both surfaces treated/ striated	1.6%	4.6%	0.0%	23.2%
Decorated sherds / body	yes	34.1%	50.0%	3.8%	42.0%
	no	65.9%	50.0%	96.2%	58.0%
Decorated sherds / rim top	yes	40.6%	40.0%	0.0%	10.0%
	no	59.4%	60.0%	100.0%	90.0%
Location of decoration / body	on outer surface	95.3%	100.0%	100.0%	100.0%
(% of decorated sherds)	on inner surface	1.9%	0.0%	0.0%	0.0%
	on both surfaces	2.8%	0.0%	0.0%	0.0%

		Kierikkisaari	Kuuselankangas	Salkoniemi	Pirttijoki 1
Elements of decoration / body	comb stamp	49.1%	364.%	100.0%	10.6%
(% of decorated sherds)	shallow round or oval pit	9.4%	18.2%	0.0%	19.1%
	round pit	2.8%	0.0%	0.0%	2.1%
	drawn line/groove	27.4%	0.0%	0.0%	12.8%
	other element	6.6%	36.4%	0.0%	51.1%
	unclear	9.4%	9.1%	0.0%	31.9%
Elements of decoration / rim top	comb stamp	84.6%	0.0%	0.0%	0.0%
(% of decorated sherds)	drawn line/groove	15.4%	0.0%	0.0%	0.0%
	other element	9.9%	100.0%	0.0%	100.0%
Rim shape	straight/rounded	56.3%	80.0%	0.0%	50.0%
	straight/rounded, inwards thickening	25.0%	20.0%	0.0%	0.0%
	straight/rounded, inwards thickening and slanting	6.3%	0.0%	0.0%	50.0%
	straight, inwards and outwards thickening	3.1%	0.0%	0.0%	0.0%
	straight, inwards bent list	3.1%	0.0%	0.0%	0.0%
	unclear	6.3%	0.0%	100.0%	0.0%
Bottom shape	round	100.0%	-	-	-
Thickness / body	unknown	52.1%	86.4%	46.2%	9.8%
	<5 mm	0.0%	0.0%	0.0%	0.0%
	5–8 mm	39.2%	4.5%	38.5%	36.6%
	8–14 mm	8.7%	9.1%	15.4%	53.6%
	>14 mm	0.0%	0.0%	0.0%	0.0%
Thickness / rim	unknown	62.5%	40.0%	100.0%	10.0%
	<5 mm	0.0%	0.0%	0.0%	0.0%
	5–8 mm	0.0%	0.0%	0.0%	0.0%
	8–14 mm	34.4%	60.0%	0.0%	60.0%
	>14 mm	3.1%	0.0%	0.0%	30.0%
Thickness / bottom	unknown	100.0%	-	-	-

The properties of Kierikki Ware from the Kierikkisaari, Kuuselankangas, Salkoniemi, and Pirttijoki 1 sites analysed within the present study.

APPENDIX 2. KIERIKKI MICRO-REGION: ARCHAEOLOGICAL CONTEXT

One of the basic assumptions in Finnish archaeology is that potteries of different age are found at different elevations (m a.s.l.), following the changes in the Stone Age (marine) shoreline (Europaeus-Äyräpää 1930; Siiriäinen 1974). Generally speaking, this seems to work also in the Kierikki micro-region (see Vaneeckhout 2009a; 2009b; 2010), where the shoreline has been regressive since the Ice Age: the oldest Typical Comb Ware site (Kierikin Sorakuoppa) is located at the elevation 61.0–63.0 m a.s.l., the sites containing both Typical Comb Ware and Kierikki Ware (Kuuselankangas and Kierikinkangas) at 59.5–61.0 m a.s.l., whereas the settlements at lower elevations have produced only Kierikki (Voima-Kuusela, 56.0–57.5 m a.s.l.) or Pöljä Ware (Purkajasuo-Korvala, 51.5–55.0 m a.s.l.) (Fig. 1). The Kierikkisaari site (54.0–57.0 m a.s.l., only Kierikki Ware) with its pile constrictions erected on shallow water or wetlands is anomalous and not comparable in this discussion.

Nevertheless, the straightforward connection of pottery types and elevations does not work without problems in the Kierikki micro-region. The first pitfall has to do with the characteristics of pottery discovered at the sites and the utilized typologies, the second one with understanding the dynamics of the inhabited riverine settings. These topics will be discussed in this Appendix, which aims to give additional background information on the results presented in the body text. Other presented themes include the datings of the housepits in the area, and the special character of the Kierikkisaari Island.

COMB WARE AND KIERIKKI WARE

In the Kierikki micro-region, pottery classified as Typical Comb Ware is not similar at sites located at different elevations. At sites situated further upstream and at higher elevations, that is sites older-by-default (Kierikin Sorakuoppa and the northern settlement area of the Kierikinkangas site, i.e. Kierikinkangas North), pottery corresponds mostly with Typical Comb Ware style II:1, and has also some similarities with the so-called geometric style. Decoration is fairly dense and consists of horizontal zones of comb stamps and pits. In addition to various geometric motifs, also lozenge-shaped, open-ended patterns composed of comb stamps, considered to be the most diagnostic feature of style II:2 (Leskinen 2003), are sometimes present. However, the generally thinner comb stamps, occasional looseness of compositions and especially the absolute prevalence of organic tempers separate this pottery from the pottery found in the more southern areas of Finland (Fig. 5).

At lower elevations and closer to the river (the southern part of the Kierikinkangas site, i.e. Kierikinkangas South, and Kuuselankangas), Comb Ware is present together with Kierikki Ware. Comb Ware at these sites is usually more weakly and sparsely decorated than style II:1. Zigzag lines are still occasionally present but other geometric motifs are missing, comb stamps tend to get thinner or notably short, and large pits are mostly replaced by notches, shallow depressions and imprints. In addition, pottery is slightly thinner and more fragmentary (the average size of the sherds is smaller and intact surfaces are less often present), the rim shapes are constantly simpler and decoration on rim tops rarer.[1] This kind of pottery has been in previous research usually called also Typical Comb Ware, but in this paper it is separately termed as 'sparsely decorated Comb Ware' to facilitate discussion of different Comb Ware variants in the area.

Although sparsely decorated Comb Ware is predominately present at sites located at slightly lower elevations, some sherds are present in the Kierikin Sorakuoppa assemblage, and *vice versa*, a few sherds with more punctilious decoration or geometric motifs are known at the Kierikinkangas, and apparently at the Kuuselankangas sites (Katiskoski 1995), too. Thus, it is possible that the temporal difference between these Comb Ware variants may not have been that large, although if the elevations are to be trusted, the sparsely decorated variant stayed longer in use.

However, it is also possible that the older site upstream by the rapids (Kierikin Sorakuoppa) was reused later, when sparsely decorated pottery was prevailing and the focus of settlement was already at the lower elevations.

Altogether six AMS dates of residues on organic-tempered Comb Ware exist from the Kierikki micro-region (see Table I; Fig. 7). Datings from the Kierikin Sorakuoppa and Kuuselankangas sites (GrA-63487, GrA-63488, GrA-63491) represent Typical Comb Ware style II:1, whereas two dated sherds from the Kierikinkangas North site (Hela-408, Hela-409) have been connected with style II:2 (Pesonen 2004). However, it is unclear if the latter sherds actually represent style II:2. The material from Kierikinkangas North generally represents style II:1, and the determination may be based on the presence of thin comb stamps and organic temper, which are commonly connected with style II:2 but which, as said above, are characteristic of all Comb Ware in this area. Be this as it may, the datings place the use of Typical Comb Ware in the Kierikki micro-region to 3900–3400 calBC. Only one dating from the Kierikinkangas South site (Hela-1957) may be connected to sparsely decorated pottery.

Previously, the development of Comb Ware in Northern Ostrobothnia has been discussed only cursorily. The both styles of Typical Comb Ware are present in the area, but the volume of materials is lower than in the southern part of Finland (Huurre 1983: 146–8; also Lavento 1992: 26). In addition pottery, which does not fit directly into any types, has been detected in Northern Ostrobothnia and Kainuu (Huurre 1983: 146), and also some excavation reports from the Kierikki area mention ceramics, which are neither Typical Comb Ware nor asbestos-tempered Kierikki Ware (Katiskoski 1995; Koivunen & Korolainen 1995; Annala & Viljanmaa 2008). Still, regardless of the observations presented in the reports, in publications this (sparsely decorated) organic-tempered pottery has been handled together with 'proper' Typical Comb Ware without further problematization (Halinen et al. 1998; Pesonen 2000; Vaneeckhout 2009a; 2010).

The references to these 'deviant ceramics' seem to mostly indicate pottery, which is called here sparsely decorated Comb Ware. Its relationship with Typical Comb Ware requires further clarification. Despite some resemblance, sparsely decorated pottery differs in decoration and certain other properties from style II:1. Instead, it has some elements that have been connected with style II:2, such as thinner comb stamps and shallower pits, more weakly applied ornamentation, loose composition, and less-thick walls (see Europaeus-Äyräpää 1930; Leskinen 2003). Sparsely decorated pottery may also share roughly similar temporal position with style II:2 and could, in fact, be seen as a local parallel to the development, which in the more southern areas manifests itself as younger Typical Comb Ware – although sparsely decorated pottery and style II:2 are not one and the same thing. Furthermore, sparsely decorated pottery overlaps with Kierikki Ware, sharing especially the scarcity of ornamentation, certain decoration motifs, as well as simpler, rounded or straight rim shapes. In the fragmentary assemblages containing both organic-tempered Comb Ware and possibly organic-tempered Kierikki Ware it may be even difficult to separate these types from each other, as exemplified by a few sites in the Kierikki micro-region, as well.

The question of whether sparsely decorated pottery should be discussed separately or, for example, be equalled directly with style II:2, is related to the wider problem of identifying local variants or manifestations of Typical Comb Ware (see also Nordqvist & Mökkönen 2015). Similarly, Typical Comb Ware style II:1 encountered in Northern Ostrobothnia and Kainuu differs in its qualities from the common characteristics given to the type more south (see Huurre 1983; 1986a), and the organic tempers (vegetal fibre, hair, bone) predominately used the north instead of the mineral ones (sand, crushed stone) have been seen as local, environment-induced speciality (Leskinen 2003; Pesonen & Leskinen 2009). Nevertheless, the answer is not this simple, and there are also other differences in the general properties that should be taken into closer scrutiny. At present, sparsely decorated pottery must be held as a local variant of Comb Ware, which developes after the appearance of Typical Comb Ware style II:1, but temporally overlaps with it. At the same time, it links Comb Ware and Kierikki Ware in the micro-region, as it also overlaps with the latter one temporally and stylistically. For the time being, the relation-

AMS dates on pottery and charcoal dates from structures

Lab-index	Site	BP	±	calBC (2σ)	$\delta^{13}C$	Material	Pottery type; Context	Sample	Reference
GrA-63488	Kierikin sorakuoppa	4850	35	3704–3533	-25.54	charred crust	Typical Comb Ware	KM 23728:682	This publication
GrA-63487	Kierikin sorakuoppa	4790	35	3650–3389	-27.36	birch bark tar	Typical Comb Ware	KM 23432:782	This publication
Hela-409	Kierikinkangas North	5085	125	4229–3645	-27.2	birch bark tar	Typical Comb Ware	KM 31829:295	Pesonen 2004
Hela-408	Kierikinkangas North	4820	65	3760–3377	-27.2	birch bark tar	Typical Comb Ware	KM 31829:440	Pesonen 2004
Hela-1957	Kierikinkangas South	4715	40	3634–3373	-29.8	birch bark tar	Typical Comb Ware	-	Viljanmaa 2009
Hela-1707	Kierikinkangas South	4700	40	3632–3370	-24.8	charcoal	Typical Comb Ware or Kierikki Ware; Housepit structure	-	Viljanmaa 2009
Hela-3064	Kierikinkangas South	4580	38	3500–3106	-28.1	birch bark tar	Typical Comb Ware or Kierikki Ware; Housepit floor	KM 37797:433	Pesonen et al. 2013
GrA-63493	Kierikkisaari	4675	35	3625–3366	-28.34	charred crust	Kierikki Ware	KM 15241:146	This publication
GrA-63502	Kierikkisaari	4765	35	3640–3382	-23.64	charred crust	Kierikki Ware	KM 16554:856	This publication
GrA-63495	Kierikkisaari	4705	35	3632–3372	-25.89	charred crust	Kierikki Ware	KM 16139:2515	This publication
GrA-63500	Kierikkisaari	4705	35	3632–3372	-25.74	charred crust	Kierikki Ware	KM 16141:905	This publication
GrA-63498	Kierikkisaari	4675	35	3625–3366	-28.73	charred crust	Kierikki Ware	KM 16140:1181, 1292	This publication
GrA-63499	Kierikkisaari	4645	35	3519–3358	-26.44	birch bark tar	Kierikki Ware	KM 16140:1533	This publication
GrA-63494	Kierikkisaari	4540	35	3366–3102	-28.62	charred crust	Kierikki Ware	KM 16139:1860	This publication
GrA-63947	Kierikkisaari	4490	35	3349–3033	-28.61	charred crust	Kierikki Ware	KM 16140:75	This publication
GrA-63491	Kuuselankangas	4990	35	3938–3664	-25.91	charred crust	Typical Comb Ware	KM 30666:1083	This publication
Hela-75	Kuuselankangas	4840	110	3937–3368	-27	chewing resin	Typical Comb Ware?; Housepit floor, covered by sediment layers	-	Halinen et al. 1998
Hela-162	Kuuselankangas	4830	80	3783–3376	-27.2	chewing resin	Kierikki Ware?; Housepit No. 18, , outside	-	Halinen et al. 1998
Hela-76	Kuuselankangas	4820	100	3894–3366	-27	chewing resin	Kierikki Ware?; next to housepit No. 13	-	Halinen et al. 1998
Hela-51	Kuuselankangas	4800	115	3937–3347	-23.4	charred crust	Kierikki Ware	-	Jugner & Sonninen 2004; Pesonen 2004
Hela-164	Kuuselankangas	4780	80	3702–3371	-28	chewing resin	Kierikki Ware?; Housepit No. 18, inside	-	Halinen et al. 1998
Hela-74	Kuuselankangas	4770	100	3769–3353	-27.7	chewing resin	Kierikki Ware?; Housepit No. 12, inside	-	Halinen et al. 1998
Hela-163	Kuuselankangas	4695	85	3655–3126	-26.7	chewing resin	Kierikki Ware?; Housepit No. 18, floor	-	Halinen et al. 1998
Hela-464	Kuuselankangas	4625	70	3631–3105	-25.3	charcoal	Kierikki Ware; Housepit No. 1, posthole	-	Pesonen 2000
Hela-52	Kuuselankangas	4420	90	3350–2902	-23.2	charred crust	Kierikki Ware	-	Jugner & Sonninen 2004; Pesonen 2004

Beta-12092	Voima-Kuusela	4580	60	3517–3097	-	charcoal	Kierikki Ware; Housepit, charcoal pit (posthole?)	-	Franzén et al. 1998
GrA-63504	Purkajasuo-Korvala	4535	35	3364–3102	-27.08	birch bark	Pöljä Ware; Housepit structure	KM 32134:214	This publication
Hela-136	Purkajasuo-Korvala	4475	60	3358–2938	-28.8	charred crust	Pöljä Ware	-	Pesonen 2004
GrA-63505	Purkajasuo-Korvala	4455	35	3340–2945	-27.71	birch bark	Pöljä Ware; Houspit structure	KM 32134:199	This publication
Hel-3918	Purkajasuo	4460	100	3489–2900	-27.7	wood	Fishing structure	-	Schulz & Koivisto 1997; Koivisto 2012
Hel-3917	Purkajasuo	4340	100	3349–2681	-27.9	wood	Fishing structure	-	Schulz & Koivisto 1997; Koivisto 2012

Charcoal dates from unclear contexts

Lab-index	Site	BP	±	calBC (2σ)	$\delta^{13}C$	Material	Pottery style; Context	Sample	Reference
Hel-2472	Kierikin sorakuoppa	5180	140	4327–3705	-25	charcoal	Typical Comb Ware; Cultural layer	-	Pärssinen 1988
Hel-2466	Kierikin sorakuoppa	5130	130	4241–3657	-25.4	charcoal	Typical Comb Ware; Cultural layer	-	Pärssinen 1988
Hel-2474	Kierikin sorakuoppa	5050	130	4229–3540	-24.9	charcoal	Typical Comb Ware; Cultural layer	-	Pärssinen 1988
Hel-2475	Kierikin sorakuoppa	4890	120	3957–3377	-26	charcoal	Typical Comb Ware; Cultural layer	-	Pärssinen 1988
Hela-310	Kierikinkangas	5010	65	3955–3662	-26.6	charcoal	Typical Comb Ware or Kierikki Ware; Cultural layer (same context as Hela-311)	-	Pesonen 1999b
Hel-4405	Kierikinkangas	4910	110	3961–3382	-24.3	charcoal	Typical Comb Ware or Kierikki Ware; Cultural layer	-	Pesonen 2000
Hela-1956	Kierikinkangas	4780	40	3648–3383	-26.6	charcoal	Typical Comb Ware or Kierikki Ware; Bottom of a red ochre grave	-	Viljanmaa 2009
Hela-311	Kierikinkangas	4705	60	3634–3368	-25	charcoal	Typical Comb Ware or Kierikki Ware; Cultural layer (same context as Hela-310)	-	Pesonen 1999b
Hela-463	Kuuselankangas	4745	70	3647–3371	-26.1	charcoal	Typical Comb Ware or Kierikki Ware; Cultural layer	-	Pesonen 2002
Su-2699	Kuuselankangas	4620	50	3627–3118	-	charcoal	Typical Comb Ware or Kierikki Ware; Cultural layer	-	Halinen et al. 1998
Hel-3684	Kuuselankangas	4590	120	3636–2943	-25.7	charcoal	Typical Comb Ware or Kierikki Ware; Cultural layer	-	Jungner & Sonninen 2004
Hel-3683	Kuuselankangas	4440	110	3496–2881	-25.3	charcoal	Typical Comb Ware or Kierikki Ware; Cultural layer	-	Jungner & Sonninen 2004
Hel-2740	Purkajasuo	4770	130	3934–3111	-23.6	wood	Wooden fishing equipment; Stray find from a drainage ditch	-	Schulz & Koivisto 1997; Koivisto 2012

Table I. Radiocarbon dates from settlement sites with Typical Comb Ware, Kierikki Ware and Pöljä Ware in the Kierikki micro-region. Dates from the Kotikangas sites on the southern bank of the River Iijoki (Vaneeckhout 2009b: Appendix 1; Costopoulos et al. 2012) are excluded, as the lack of information concerning the dated material, contexts, etc. renders the data unusable for scientific purposes.

ships between these potteries cannot be held totally resolved.

RIVERINE ENVIRONMENT

Riverine environment differs in many respects from the seashore: a characterizing feature is the accumulation of alluvial sediments and the formation of sandy bars and banks in the estuary. Riverine processes not only create new land but also re-shape it further through abrasion and (periodic) floods. The landscape is stabilized only when the territory is no longer affected by floods or the surface has become covered by vegetation. Nevertheless, the effects of estuary dynamics on the settlement sites have not received much attention in the Kierikki wetland area, where the Stone Age river estuary has been perceived mainly through its rich food resources (Núñez & Okkonen 1999; Vaneeckhout 2009a; 2010; Koivisto & Nurminen 2015).

Riverine environment also explains why the correspondence between the water level elevation and the synchronously inhabited sites cannot be taken for granted in the Kierikki micro-region. For example, during the over 500 years the Kierikkisaari site was used, sea level lowered at least 3.5 m based on modern-day land uplift rate alone (c 7.125 mm/year; Vermeer et al. 1988: 63, see also Okkonen 2003). The idea that the habitation would have followed the regressive seashore systematically is also questioned by the synchronous radiocarbon dates from several sites (Kierikkisaari, Kierikin Sorakuoppa, Kierikinkangas, Kuuselankangas, and Voima-Kuusela), located at notably different elevations (Table I).

Riverine processes are further demonstrated at the large Kierikinkangas settlement site, where habitation is clustered on two adjacent alluvial ridges located at the same elevation approximately one hundred metres apart (Fig. 1). The location of the ridges in relation to each other and to the riverbed proposes that the southern ridge, situated closer to the river, was formed later than the northern one. The site Kierikinkangas North contains only Typical Comb Ware, while at the Kierikinkangas South site, Typical Comb Ware, sparsely decorated Comb Ware, as well as asbestos- and organic-tempered pottery are present. Radiocarbon dates also suggest some age difference for the habitation periods on the two ridges (see Table I).

Also some stratigraphic observations illustrate the dynamic environment. At the Kuuselankangas site, the lowest finds (including Typical Comb Ware style II:1) and the bottom level of a housepit dated to 3940–3370 calBC (Hela-75) were found to be covered by natural sediment layers (Halinen et al. 1998). In other words, the site was inhabited at the time when the ridge was still (at least occasionally) influenced by floods. Further at the Purkajasuo site, the Neolithic wooden fishing structures located at that-time river estuary had rapidly been covered by nearly one-metre-thick sand layer accumulated there by floods (Schulz 2000; Koivisto 2017: 59–60).

HOUSEPITS AND POTTERY

Connecting the excavated dwellings with particular pottery types has been difficult in the Kierikki micro-region, as ceramics have been rarely encountered inside the houses (see Halinen et al. 1998; Vaneeckhout 2009a; 2009b; Viljanmaa 2010; 2011). Two sites, Kuuselankangas and Kierikinkangas South, can be presented as an example. At both sites, Comb Ware has been found both in the lower and upper excavation layers outside the houses, whereas Kierikki Ware has been met only in the upper layers (Katiskoski 1995; Halinen et al. 1998; Pesonen 2002; Annala & Viljanmaa 2007). Mixing between the layers is at least partly explained through the erection (digging) of the pithouses.

At the Kuuselankangas site, some Kierikki Ware was found also inside two houses (Halinen et al. 1998; Pesonen 2000). The other house was dated by charcoal from a posthole to 3630–3110 calBC (Hela–464; Pesonen 2000), whereas Typical Comb Ware found outside the dwellings was dated by one crust date to 3940–3660 calBC (GrA-63491). Chewing resins found inside two other houses were dated between 3770 and 3100 calBC (see Table I; Hela-74, Hela-163, Hela-164), which makes it possible to connect them with both Comb Ware and Kierikki Ware -related habitation. However, one of the last-mentioned dwellings contained willow leaf -shaped flint points, commonly associated with the asbestos-tempered wares (Zhul'nikov 1999: Fig. 46; Tarasov 2013; see also Siiriäinen 1967),

Fig. I. The Kierikkisaari Island in 1964, the excavation area in front. The Kierikinkangas South site is visible by the riverside next to the Kierikkikoski Rapids on the left, and the Kierikin Sorakuoppa site behind the island, next to sand extraction area. Photo: Pohjolan Voima.

thus strengthening further its connection with Kierikki Ware (Halinen et al. 1998).

Similarly, at the Kierikinkangas South site, birch bark tar attached on a sherd of Comb Ware found outside a dwelling was dated to 3630–3370 calBC (median 3504 calBC; Hela-1957; Viljanmaa 2009), and a piece of birch bark tar (see Pesonen et al. 2013) from the floor area of the house (containing no pottery, but with a fragment of large willow leaf -shaped flint point) gave an age 3500–3100 calBC (median 3346 calBC; Hela-3064). While the differences between the Comb Ware and Kierikki Ware -related datings are fairly small, they – together with the associated flint points – strongly propose that the excavated housepits discussed here belong to the context of Kierikki Ware, even if Comb Ware dominates the material outside the dwellings (Pesonen 2000; see also Mökkönen 2009; 2010). Of course, this does not mean that none of the housepits at these two sites could belong to the Typical Comb Ware context (also Halinen et al. 1998).

THE KIERIKKISAARI ISLAND

The Kierikkisaari Island is one of the few known sites with wetland pile settlement structures in Finland (see Siiriäinen 1983; 1986), and in this sense an exceptional monument. However, the rarity of such sites in Finland may partially reflect the poor preservation and research situation. Similar locations are found in numbers from central Europe to northern Russia (see Mazurkevich et al. 2014), and already the initial publication (Siiriäinen 1967) noted the parallels for the material culture and structures in the east (see also Oshibkina 1978: 111–7).

The deviant find profile, in comparison with the adjacent and contemporary housepit sites,

		Kierikin Sorakuoppa	Kierikinkangas N	Kierikinkangas S	Kuuselankangas
Sherds					
/ analysed	pcs	4.1% (463)	2.7% (101)	2.4% (20)	2.5% (141)
	weight (g)	31.8% (5523.4)	27.9% (1385.2)	17.0% (99.1)	19.7% (868.0)
/ morsels	pcs	95.9% (10759)	97.3% (3590)	97.6% (813)	97.5% (5390)
	weight (g)	68.2% (11853.2)	72.1% (3577.7)	83.0% (482.3)	80.3% (3535.4)
Of the analysed					
Size class	< 3 cm	0.9%	0.0 %	0.0%	21.3%
	4–6 cm	84.4%	83.2%	100.0%	76.6%
	7–9 cm	13.4%	16.8%	0.0%	1.4%
	>10 cm	1.3%	0.0%	0.0%	0.7%
Temper	sand	0.2%	0.0%	0.0%	1.4%
	sand + organic	34.1%	11.9%	5.0%	48.3%
	organic	65.7%	88.1%	95.0%	48.9%
	no temper	0.0%	0.0%	0.0%	1.4%
Surfaces present	both	59.0%	50.5%	25.0%	39.7%
	outer	22.5%	36.6%	5.0%	39.0%
	inner	17.7%	12.9%	70.0%	15.6%
	one	0.6%	0.0%	0.0%	0.7%
	none	0.2%	0.0%	0.0%	5.0%
Surface treatment	not present/not clear	47.3%	52.5%	35.0%	80.1%
	outer surface treated/striated	0.2%	0.0%	0.0%	4.3%
	inner surface treated/striated	37.8%	47.5%	65.0%	11.3%
	both surfaces treated/striated	8.2%	0.0%	0.0%	4.3%
	outer surface polished	6.5%	0.0%	0.0%	0.0%
Decorated sherds / body	yes	79.7%	86.1%	30.0%	68.8%
	no	20.3%	13.9%	70.0%	31.2%
Decorated sherds / rim top	yes	90.6%	100.0%	100.0%	52.0%
	no	9.4%	0.0%	0.0%	48.0%
Location of decoration / body	on outer surface	96.7%	100.0%	100.0%	100.0%
(% of decorated sherds)	on inner surface	0.0%	0.0%	0.0%	0.0%
	on both surfaces	3.0%	0.0%	0.0%	0.0%
	on one surface	0.3%	0.0%	0.0%	0.0%
Elements of decoration / body	comb stamp	93.0%	87.0%	16.7%	85.6%
(% of decorated sherds)	round pit	75.9%	87.0%	100.0%	28.9%
	angular pit	7.0%	27.0%	0.0%	0.0%
	shallow round or oval pit	5.7%	0.0%	0.0%	4.1%
	vertebral impression	0.0%	36.0%	0.0%	4.1%

	stick impression	0.0%	0.0%	0.0%	1.0%
	wound-cord stamp	1.6%	0.0%	0.0%	0.0%
	drawn line	0.0%	0.0%	0.0%	1.0%
	other element/impression	1.4%	0.0%	0.0%	0.0%
	unclear	0.5%	0.0%	0.0%	3.1%
Elements of decoration / rim top	comb stamp	100.0%	100.0%	100.0%	84.6%
(% of decorated sherds)	stick impression	0.0%	0.0%	0.0%	7.7%
	other element/unclear	0.0%	0.0%	0.0%	7.7%
Rim shape	straight/rounded	17.2%	0.0%	0.0%	44.0%
	round	3.1%	0.0%	0.0%	16.0%
	straight, inwards thickening	12.5%	0.0%	0.0%	16.0%
	straight, inwards thickening and slanting	37.5%	100.0%	0.0%	0.0%
	straight, inwards slanting	17.2%	0.0%	100.0%*	0.0%
	straight, outwards thickening and inwards slanting	1.6%	0.0%	0.0%	0.0%
	unclear	10.9%	0.0%	0.0%	24.0%
Bottom shape	round	100.0%*	-	0.0%	100%*
	unclear	0.0%	-	100.0%*	0.0%
Thickness / body	unknown	42.5%	49.5%	75.0%	64.5%
	<5 mm	0.0%	0.0%	0.0%	0.0%
	5–8 mm	3.7%	5.0%	10.0%	22.7%
	8–14 mm	52.1%	45.5%	15.0%	12.8%
	>14 mm	1.7%	0.0%	0.0%	0.0%
Thickness / rim	unknown	25.6%	0.0%	0.0%	52.0%
	<5 mm	0.0%	0.0%	0.0%	4.0%
	5–8 mm	6.3%	0.0%	100.0%*	28.0%
	8–14 mm	20.3%	58.3%	0.0%	16.0%
	>14 mm	46.8%	41.7%	0.0%	0.0%
Thickness / bottom	unknown	100.0%*	-	0.0%	0.0%
	<5 mm	0.0%	-	0.0%	0.0%
	5–8 mm	0.0%	-	0.0%	0.0%
	8–14 mm	0.0%	-	100.0%*	100.0%*
	>14 mm	0.0%	-	0.0%	0.0%

*Table II. The properties of Typical Comb Ware (Kierikin Sorakuoppaa and Kierikinkangas N) and sparsely decorated Comb Ware (Kierikinkangas S, Kuuselankangas) analysed within the present study. * The material includes just 1–2 sherds.*

reflects the specific nature of the Kierikkisaari Island in its local context. Particularly the composition of pottery material is conspicuous, as Kierikkisaari is the only site that has produced only asbestos-tempered pottery. It seems to contain also more points made of flint or slates than the other sites in the micro-region. Instead, the Kierikkisaari site is no longer special because of the abundance of amber, as comparable finds have been made at adjacent sites as well (Franzén 2009; Núñez & Franzén 2011).

The speciality of the Kierikkisaari Island is visible also in the varying interpretations given of its function. Apart from the attractive fishing and hunting opportunities provided by the rapids (see Koivisto & Nurminen 2015), it has been seen as an advantageous position for defence (Koivunen 2002) and trade, even once considered as the terminus of the eastern Baltic amber trade (Siiriäinen 1984; 1986). Location surrounded by flowing water may have resonated with certain metaphysical concepts, as suggested by other Stone Age phenomena and more recent northern cosmologies (Lahelma 2012; Herva & Ylimaunu 2014; Nordqvist et al. 2016), and this may have signified the place as well. Thus, the island may have acted as some sort of an aggregation place, a location for keeping up social connections and making economic transactions (also Vaneeckhout 2009b: 46). Unfortunately, no new material may be obtained to support these interpretations, as the site is currently completely flooded by the dammed reservoir (Fig. I).

In the original publication (Siiriäinen 1967), the Kierikkisaari site was given a relative age based on the shore displacement and typological dating, but the first absolute age determinations for the site were obtained only through the eight datings presented in this paper (Tables 1 & I; Fig. 7). Based on these dates, the site seems to have had two main use periods between 3640–3030 calBC. It is not possible to say, if the site's function was drastically changed over the 500-year use period, but the tailing-off of activities may be connected with changes in the estuary dynamics, which started after c 3400 calBC. Simultaneously, new fishing structures became established at the Purkajasuo site approximately 2.5 kilometres downstream (Schulz 2000; Koivisto 2012; 2017) and cultural change is further evidenced by the introduction of Pöljä Ware at that time.[2] In the process, the focus of habitation eventually shifted permanently to the new estuary area, by the seashore, and also Kierikki Ware disappeared from the micro-region.

NOTES

[1] The observations presented in this Appendix are based on the analyses of the following materials: Kierikin Sorakuoppa, KM 23431:1–893, 23728:1–768; Kierikinkangas, KM 31829:2418–3116; Kuuselankangas, KM 30666:1023–2676, 30667:20–759, 32220:1–7243. The properties of these materials are shown in Table II (see also Appendix 1).

[2] The strongest evidence of the use of fishing structures at the Purkajasuo site date to c 3400–2800 calBC (Schulz & Koivisto 1997; Koivisto 2012; Koivisto & Nurminen 2015), although one date might indicate even some 400 years older age (see Table I). However, the context of this date is uncertain, as the sample originates in a section of a drainage ditch and it is not known if it derives from a structure *in situ*, or represents a secondary deposition of worked wood.