Stone Age hunter-gatherer ceramics of North-Eastern Europe: new insights into the dispersal of an essential innovation

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ABSTRACT – *This paper explores the emergence and dispersal of the earliest pottery among the hunter-gatherer groups east and north of the Baltic Sea in the 6th and 5th millennium calBC. By combining existing knowledge with the results of detailed statistical analyses of 17 selected early ceramic complexes with altogether 535 vessel units from Finland, Estonia, Lithuania and Russia, chronological, typological and spatial trajectories in the history of early ceramics are reconstructed. On the basis of this information, a scenario for the spread of the pottery technology into the study area is put forward, illuminating the situation not only for the actual research area, but for a wider region from the Baltic to the Urals mountains and from the Barents Sea to the Black and Caspian Seas. As a result, it is suggested that three separate lines of tradition in early pottery development played a role in the genesis of early ceramic groups east and north of the Baltic Sea.*

IZVLEČEK – *V članku raziskujemo pojav in razširitev najzgodnejše lončenine med lovsko-nabiralniškimi skupnostmi vzhodno in severno od Baltskega morja v 6. in 5. tisočletju calBC. Z združevanjem obstoječega znanja z rezultati natančne statistične analize 17 izbranih zgodnje-keramičnih kompleksov s skupno 535 enotami lončenine iz Finske, Estonije, Litve in Rusije poskušamo rekonstruirati kronološke, tipološke in prostorske trajektorije pri razvoju zgodnjega lončarstva. Na osnovi teh podatkov predstavljamo scenarij razširitve lončarske tehnologije na študijskem območju in v širši regiji od Baltika do Urala ter od Barentsovega do Črnega morja in Kaspijskega jezera. Na podlagi teh rezultatov ugotavljamo, da so v razvoju zgodnjega lončarstva obstajale tri ločene tradicije, ki so odigrale določeno vlogo v genezi skupin z zgodnjo keramiko vzhodno in severno od Baltskega morja.*

KEY WORDS – *North-Eastern European forest zone; Mesolithic/Neolithic; hunter-gatherers; dispersal of early pottery; correspondence analysis*

Introduction

The reconstruction of the dispersal and development of early ceramics in North-Eastern Europe on a supra-regional level remains a desideratum in prehistoric research. Filling this gap in the archaeological knowledge is an important task, not least because the outlook towards the east is also very important for Central European questions. The present study is dedicated to the investigation of the earliest pottery in the Eastern and Northern Baltic region in the 6th and 5th millennium calBC.

The cultural groups in question are characterised by the production and use of ceramic vessels in a cultural environment based on a foraging economy and the seasonal mobility of their makers (*Edgren 2009. 502*). This distinguishes them from their Southern, Central and Western European counterparts, where the earliest pottery is mostly associated with the onset of the Neolithic era, which in these regions is defined by the transition towards a productive economy, residential sedentism and the emergence of more complex forms of society. The fact that the complex of pottery-bearing hunter-gatherers not only left traces in Eastern Europe, but also reached west as far as Northern Germany and Southern Scandinavia in the guise of the Ertebølle culture, has increa-

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singly been understood also by western researchers since the end of the Cold War and triggered immense interest in this complex (see *e.g.*, *Hartz, Lüth and Terberger 2011; Jordan, Zvelebil 2009a*).

The problem of the differing definitions of the term 'Neolithic' in Western and Central European archaeology on the one hand and in the Eastern European scientific tradition on the other hand has been discussed repeatedly in recent years (see *Werbart 1998; Oshibkina 2006; Jordan, Zvelebil 2009a. 33–36*). In the present study, the terminus will be used according to an 'Eastern' understanding, in which the beginning of the Neolithic is marked by the first appearance of pottery vessels, irrespective of the prevailing economy.

While at the local level, a substantial amount of work has been dedicated to groups with early pottery in the study area (*i.e.*, *Brazaitis 2002; Engovatova, Zhilin and Spiridonova 1998; Europaeus-Äyräpää 1930; German 2002a; 2002b; Ivanishcheva, Ivanishchev 2004; Kriiska 1995; Loze 1992; Marcinkevičiutė 2005; Nedomolkina 2004; Nuñez 1990; Skandfer 2005; Shumkin 2003; Torvinen 2000; Tsetlin 2008*), only a few articles have addressed the phenomenon at a more general level (*i.e.*, *Timofeev 1998; Gronenborn 2009; Mazurkevich, Dolbunova 2009*), and larger, material-based works revealing supra-regional coherences are completely lacking. Not least because of language barriers, the local studies remained largely unknown to Central and Western European archaeological researchers (*Klassen 2004.111–117*).

The work presented here summarises the results from these existing studies and places them on a new foundation by supplementing them with original material studies. Through a detailed analysis of exemplary pottery complexes, problems of regional, typological and chronological developments will be pursued.

The study area encompasses the regions east and north of the Baltic Sea, from the Barents Sea coast in the extreme north of Europe to the Neman-Pripyat basin in the south and from the Åland islands in the west to the upper course of the River Sukhona in the east (Fig. 1). For the period of the initial spread of ceramic technology, various archaeological cultures have been defined in this region, mainly based on ceramic styles. Among them are the Neman culture, with its early stage Dubičiai in the south (*Piličiauskas 2002*), the Narva culture of the

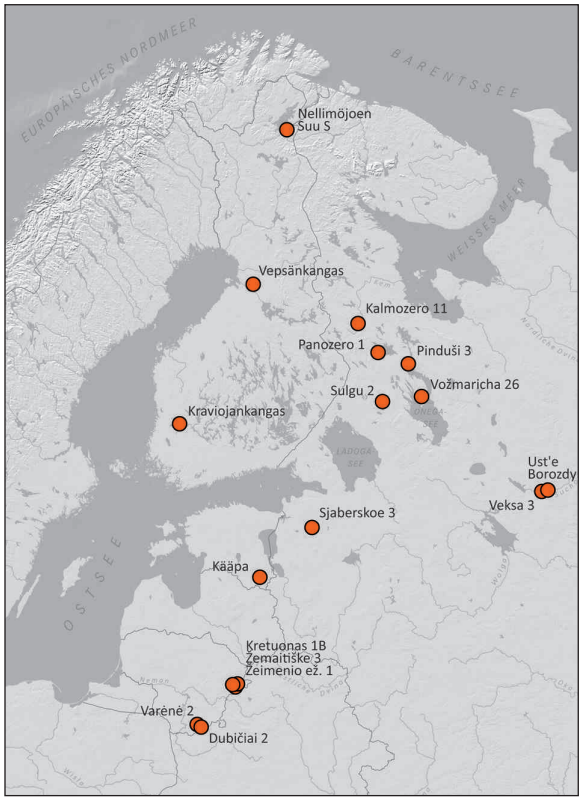

Fig. 1. The study area with sites from which original materials were analysed.

Eastern Baltic (*Kriiska 1995; Loze 1992*), the Sperrings culture in Russian Karelia (*German 2002a; 2002b*) and the closely related Ka I:1 style in South and Central Finland (*Nuñez 1990*), the Säräisniemi 1 type in Northern Fennoscandia (*Skandfer 2005; Torvinen 2000*), and a mosaic of various groups such as Upper Volga and 'Northern types' in Central Russia (*Engovatova, Zhilin and Spiridonova 1998; Nedomolkina 2004*). Although the cultural-historical character of these units remains open to discussion and the differentiation between them is seldom clear-cut and can also vary according to author (*Piezonka 2011*), they will nonetheless be employed in the this study, because at the moment they constitute the best and most widely understood basis for structuring the material.

Methods

The empirical background of the study

An assessment of the publications on evidence for early pottery in the study area shows that the quality of the information available is very heterogeneous. Comprehensive descriptions of sites and their associated finds which could be used for detailed analyses are almost completely lacking, and systematic, well-illustrated presentations of the ce-

Country	Administrative unit	Site	Relevant cultures	^{14}C dates	No. of vessels recorded	No. of sherds recorded	Percentage of all Early Neolithic pottery	Origin of recorded materials
Lithuania	Varėna county	Dubičiai 2	Neman, Narva	none	15	68	100%	excavations 1962
Lithuania	Varėna county	Varėnė 2	Neman	none	4	29	100%	excavations 1997, 1999
Lithuania	Švencionys county	Žemaitiške 3	Narva	yes	27	72	part	excavations
Lithuania	Švencionys county	Kretuonas 1	Narva	yes	23	73	part	excavations 1984, 2001
Lithuania	Švencionys county	Žeimenio ež. 1	Narva	none	12	30	?	excavations 1986
Estonia	Võru county	Kääpa	Narva, Ka II	yes	71	194	small portion	excavations 1960
Finland	Kokemäki parish	Kraviojankangas	Ka I:1, Ka I:2, Ka II	yes	72	143	small portion	excavations 1965–1983
Finland	Ylikiiminki parish	Vepsänkangas	Säräisniemi 1	yes	35	205	100%	excavations 1989–1998
Finland	Inari parish	Nellimöjoen suu S	Säräisniemi 1	yes	5	14	100%	surface finds 1974, excavations 1984, 1988
Russia	Leningrad oblast	Sjaberskoe 3	Narva	no relevant dates	20	21	part	excavations 1988
Russia	Vologda oblast	Veksa 3	Upper Volga, "2nd Comb Ceramic Complex", "Northern types", Lyalovo, Narva *etc.*	yes	118	205	small portion	excavations and surface finds 1996, 1999, 2000, 2001, 2002
Russia	Vologda oblast	Ust'e Borozdy	Narva	none	1	1	small portion	surface finds 1987/2002
Russia	Republic of Karelia	Sulgu 2	Sperrings	yes	64	150	100%	excavations 1960
Russia	Republic of Karelia	Vozhmarikha 26	Sperrings	yes	25	112	100%	excavations 2003
Russia	Republic of Karelia	Pindushi 3	Sperrings	none	37	227	part	excavations 1962, 1970
Russia	Republic of Karelia	Panozero 1	Sperrings	yes	5	13	part	surface finds 1994
Russia	Republic of Karelia	Kalmozero 11	Säräisniemi 1	yes	1	13	100%	test trench 1991
Total					**535 vessels**	**1570 sherds**		

Tab. 1. The ceramic complexes documented.

ramic material have been published only for very few sites (*i.e.*, *Yanits 1959; Kriiska 1995; Loze 1988*). For a material-based investigation of the dispersal of the earliest pottery in North-Eastern Europe it was therefore necessary to document and analyse the original ceramics of selected complexes.

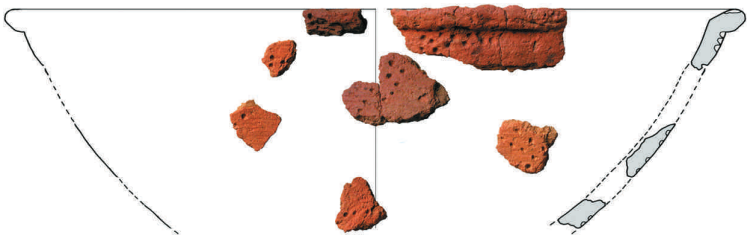

Fig. 2. Ceramic vessel of Dubičiai type from Varėnė 2, Lithuania. Scale 1:4.

In the selection of sites from which original ceramic finds were to be analysed, attention was paid to covering the study area and the respective cultural units as evenly as possible. Several study trips in 2006 and 2007 to find collections in Lithuania, Estonia, Finland and Russia were undertaken to assess and select the original material. Suitable sites were chosen together with the local archaeologists, paying special attention to criteria such as scientific importance and cultural type, quality and amount of the available material, reliability of the chronological attribution, and geographical location.

In this way, 17 sites with early pottery complexes were selected, covering the study area from the Byelorussian border in the south to the Inari region of Lapland in the north and from the Bothnian Bay in the west to the Sukhona basin in the east (Fig. 1). Five are located in Lithuania, one in Estonia, three sites are situated in Finland, and the remaining eight are located in Russia. Altogether, a total of 1570 sherds from 535 vessels were documented. Table 1 summarises the main characteristics of the complexes, illustrating the heterogeneous character of the material. For example, the number of vessel units documented per site ranges from just one respective vessel at Ust'e Borozdy and at Kalmozero 1 to 118 vessels at Veksa 3, and the number of sherds varies even more from one sherd, again at Ust'e Borozdy, to 227 at Pindushi 3. The complexes also differ in terms of the fraction of the documented material representing the entire amount of early pottery retrieved from the respective sites. In those cases where only part of the relevant finds was able for documentation, attention was paid to the selection of a representative extract of the early pottery spectrum, rather than, for exam-

Fig. 3. 1–2 ceramic vessels of Narva type from Žemaitiške 3, Lithuania; 3 Kretuonas 1, Lithuania. Scale 1:4.

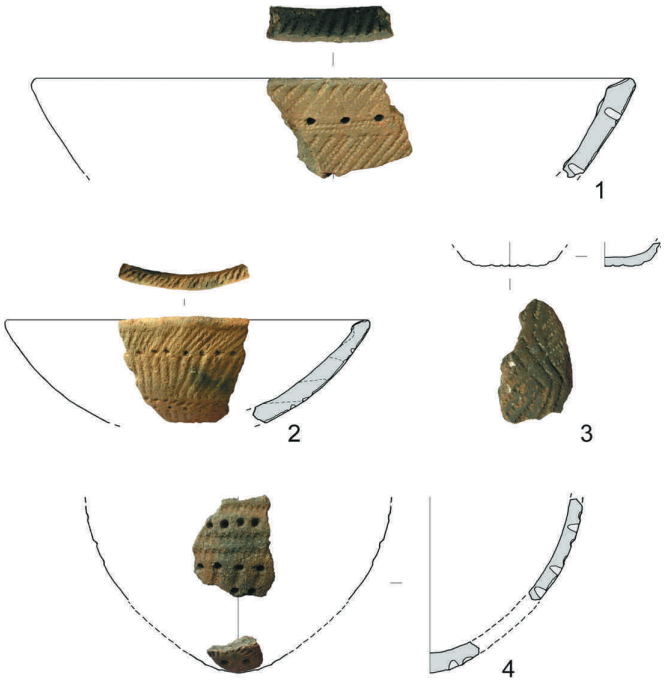

Fig. 4. 1–2 ceramic vessels of the 'Second comb ceramic complex'; 3 of Narva type and; 4 of 'Northern type' from Veksa 3, Russian Federation. Scale 1:4.

ple, the selection of only especially nice or well-preserved specimen, thereby disregarding less eye-catching, but perhaps typologically important pieces.

The ceramics from the selected sites include examples of all major early pottery styles of the study area (Figs. 2–6). While the analysed material from most sites can be more or less attributed to one respective typological group, the Veksa 3 site is a special case. This site on the upper course of the River Sukhona in North-Western Russia is characterised by a clearly stratified sequence up to 3m thick of archaeological layers from the Stone Age to the Middle Ages, including the entire Neolithic development from the 6th to the 3rd millennium calBC (*Nedomolkina 2004; 2007; in prep.*). This unique situation enabled the documentation of pottery from various Early Neolithic cultural units (Fig. 4). The relative sequence of these units is known from the distinct vertical stratigraphy at Veksa, and for this reason, plays an important role in the interpretation of the results of the correspondence analysis.

In the course of the work with the original finds, 16 organic samples from 7 sites were selected to be dated by the AMS radiocarbon method (Tab. 2). Most of the samples consisted of organic residue adhering directly to the pottery (charred crust, tar). The results contribute to a more precise reconstruction of the chronological division of the Early Neolithic in the study area, and also help to establish a sound basis for our understanding of the typological developments of the associated ceramics (*Piezonka 2008; 2011b*).

Ceramic documentation and correspondence analysis

The technological, formal and ornamental characteristics of the ceramics were recorded by macroscopic assessment of the original sherds. The basic unit investigated was the vessel. Sherds belonging to the same vessel were identified from a combination of characteristics such as decoration, rim shape, temper, surface and section colour, *etc*. Especially with the northern pottery types, it was possible to assign a large portion of the sherds, including wall fragments, to individual vessels, because here, the decoration generally covers the entire outer surface and the decorative elements are at the same time very distinct, so that the affiliation of fragments to vessel units was in most cases unambiguous (see Figs. 5 and 6).

For each vessel identified, a multitude of criteria concerning technology, shape and decoration was recorded and documented in a data base (Fig. 7). The selection of these criteria was determined by the culture-historical and chronological objectives of the study and the heterogeneous character of the material also had to be accommodated. Most important for the analysis were those characteristics which proved particularly significant for the recognition of lines of tradition in the Early Neolithic ceramic production of the study area: technological characteristics such as temper, moulding technique and surface treatment, formal criteria such as mouth diameter, wall thickness and rim shape, and particularities in the execution and design of decoration.

The systematic documentation of this information in the data base formed the basis for the study of combinations of features and immanent normative structures by correspondence analysis. The analysis was carried out using the CAPCA program version 2.0 (*Madsen online*). Multivariate analysis enables the mathematical identification of organising principles within the data set that could not be recognised by a mere impressionist consideration or statistical analyses of single characteristics. In archaeology, correspondence analysis is often employed in the investigation of cemeteries and settlements with

the primary goal being to disclose relative chronological sequences. In a supra-regional diachronic study like the one presented here, however, other possible structuring factors such as regional stylistic and technological traditions must also be expected to be reflected in the result of the analysis. It is therefore very important to consider carefully all the available archaeological information to reach valid interpretations of the calculated coherences within the data set.

To carry out the correspondence analysis appropriately, it was necessary to subsume the individual criteria recorded in the data base under significant categories which could be denoted as present or absent for each vessel unit and at the same time optimally capture the variability within the data set (Tabs. 3–5). The analyses themselves were run for various combinations of vessel units and variables to discover which factors influenced the internal structure of the complex and in which ways. All vessel units with two or more variables and all variables present on at least two vessels were included in the calculations. The results of the individual analyses are presented as two parable test diagrams, the axes of which are formed by the relevant eigenvectors (Figs. 9–15). The respective top diagrams show appropriate values of the vessel units while the diagrams below depict the values of the variables. The symbols in the vessel unit diagrams were selected according to the following system: the form of the symbols indicates the established cultural affiliation of the complexes; triangles mark the Dubičiai type, lozenges stand for Narva, circles depict the comb ceramic variants (Ka I:1, Sperrings, Säräisniemi 1), and squares denote the find complexes of the Upper Sukhona (Veksa 3 and Ust'e Borozdy). Within these cultural entities depicted by symbol form, each find complex (the material from the individual sites and from the stratigraphic units of Veksa 3) is coded by a specific colour. To make the results better perceivable optically, Dubičiai sites are marked in green tones, Narva sites in warm shades ranging from yellow to dark red, and comb ceramic sites in cool colours from blue to purple-brown (the colours for the stratigraphic units of Veksa 3 do not correspond to this scheme).

Results of the correspondence analysis

A basic structure within the data set can already be illustrated by a simple diagram depicting the number of different decorative elements per vessel for the four major cultural complexes and the Veksa 3 material (Fig. 8): Two units are clearly distinguished from each other, a 'southern' group with the Dubičiai and Narva traditions, and a 'northern' group consisting of the comb ceramic traditions of Sperrings, Ka I:1 and Säräisniemi 1 and of the Central Russian finds from the Upper Sukhona (Veksa 3 and Ust'e Borozdy).

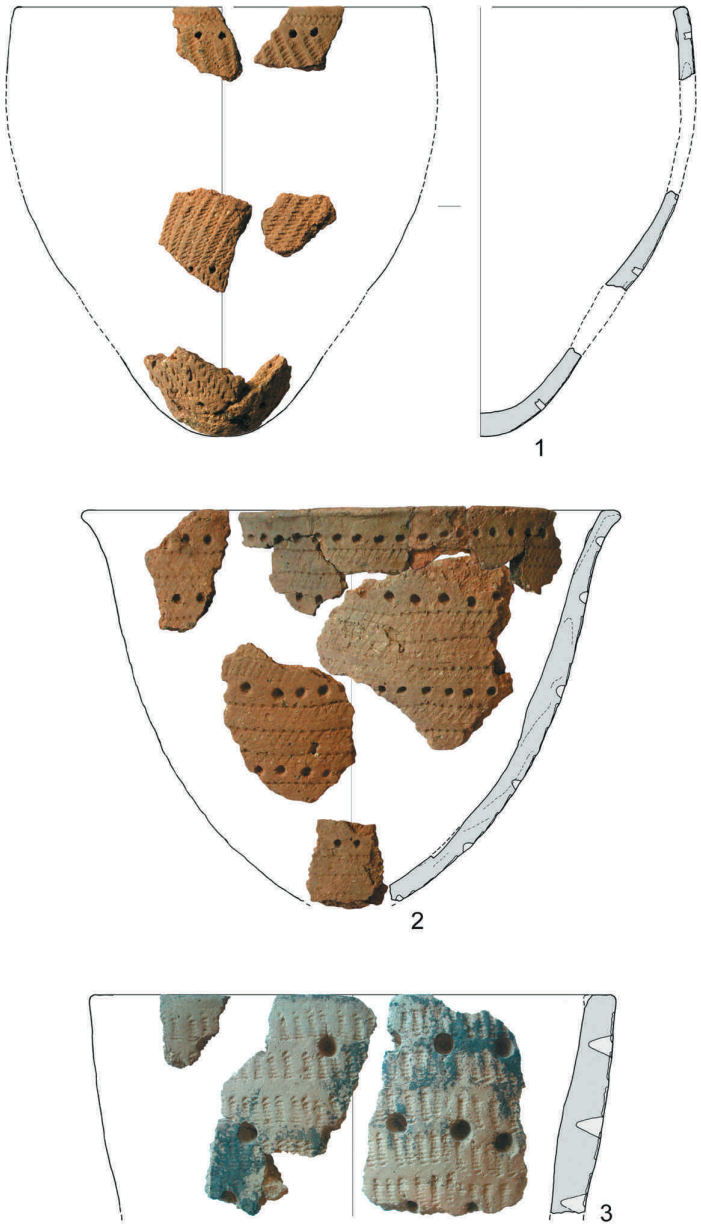

Fig. 5. 1–2 ceramic vessels of Sperrings type from Pindushi 3, Russian Federation and; 3 of Ka I:1 type from Kraviojankangas, Finland. Scale 1:4.

Very interesting results were produced by the correspondence analysis of the technological characteristics of the entire complex. Particularly informative is the graph depicting the first against the third eigenvector of the calculation (Fig. 9). The result resembles an – albeit somewhat distorted – geographical map of the research area: The 'south-west' is characterised by the Dubičiai type vessels, which accords with their geographical location in relation to the other complexes. The variables characterising this part of the diagram are plant impressions on the vessel surface and plant temper (Fig. 9, below). Further 'north', the vessels of the various Narva sites are distributed, with the 'northernmost' cluster being dominated by vessels from the Estonian site at Kääpa. The underlying technological characteristics include mollusc temper, coarse temper and scratched surfaces. Further to the 'east', the vessels of the Sperrings/Ka I:1 and Säräisniemi 1 comb pottery variants, as well as the pots from Veksa 3 form a dense cluster, the 'northern' part of which is dominated by Säräisniemi 1 vessels and vessels from Kraviojankangas. Among the technological characteristics are various types of mineral temper. A link between the two scatter clouds is provided by the vessels from Sjaberskoe 3, which indeed takes a geographically intermediate position (see Fig. 1). The Early Neolithic phase of this site has generally been attributed to the Narva culture, although the correspondence analysis now indicates that, at least technologically, strong links to the comb ceramics tradition are also evident. An interesting and somewhat unexpected result is the dissociation of the find complexes of the Narva sites Žemaitiške 3B, Kretuonas 1B and Žeimenio ežero 1, which are all located just a few kilometres apart in Eastern Lithuania (see Fig. 1). The vessels from Žemaitiške 3B are exclusively situated in the upper part of the point cloud among the pots from Kääpa, while the Žeimenio ežero 1 vessels are distributed in the lower part of the diagram, close to and partly overlapping with the pottery of the Dubičiai type. The Kretuonas 1B vessels are located in the centre and thus link the lower and upper parts of the 'western' point scatter. Possible reasons for this distribution might have been chronological variations in combination with varying typological relations. Also very instructive is the position of two vessels from the surface collections at Veksa 3 (vessels 113 and 118) and the vessel from the nearby site at Ust'e Borozdy. Just as had been already suspected from their general ap-

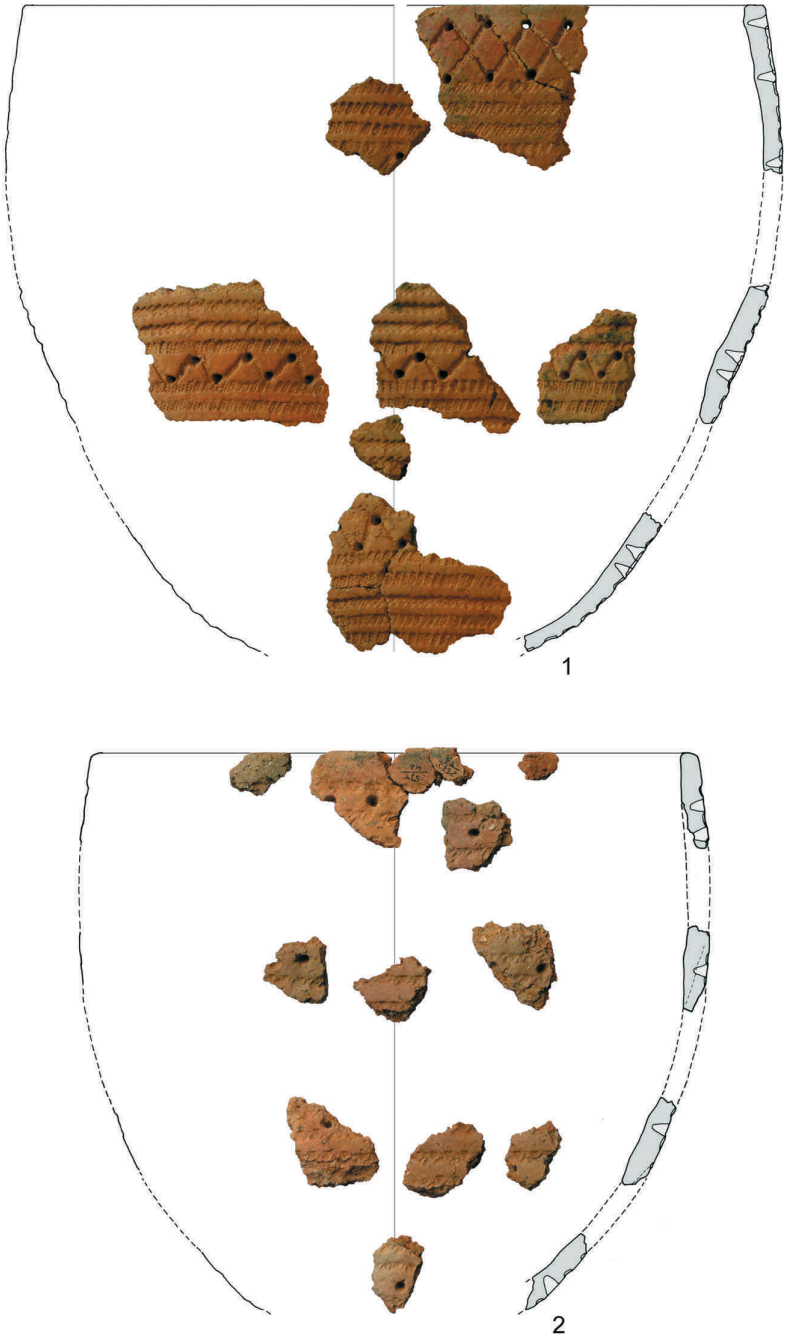

Fig. 6. 1 ceramic vessels of Säräisniemi 1 type from Vepsänkangas, Finland and; 2 Kalmozero 11, Russian Federation. Scale 1:4.

Site	Sample material	Cultural context	Lab. no.	^{14}C age bp	Age calBC (1σ, 68,2 %)	Age calBC (2σ, 95,4 %)	Notes
Žemaitiške 3B	Repairing tar on pottery	Narva	KIA–33923	5730±35	4650–4500	4690–4490	Context: horizon B
Žemaitiške 3B	Charred crust on pottery (inside)	Narva	KIA–35898	5210±45	4050–3965	4230–3940	Context: horizon B
Žemaitiške 3B	Charred crust on pottery (inside)	Narva	KIA–33922	4405±40	3100–2930	3120–2900	Context: horizon B; sample contaminated, not reliable
Kääpa	Charred crust on pottery (inside)	Narva	KIA–35897	6540±40	5530–5470	5620–5380	
Kääpa	Charred crust on pottery (inside)	Narva	KIA–33921	5985±35	4940–4800	4990–4780	
Veksa 3	Soil sample with fish remains	Upper Volga	KIA–33929	6340±30	5365–5300	5470–5220	Context: layer 9, pit
Veksa 3	Charred crust on pottery (inside)	'2nd Comb Ceramic Complex'	KIA–33927	6185±30	5210–5070	5230–5030	Context: surface find
Veksa 3	Charred crust on pottery (inside)	'Northern types'	KIA–33928	6105±30	5200–4960	5210–4930	Context: surface find
Veksa 3	Charred crust on pottery (inside)	Narva?	KIA–33926	5425±30	4330–4255	4340–4230	Context: surface find
Sulgu 2	Burnt bones of elk and reindeer	Mesolithic/ Sperrings?	KIA–35900	6670±35	5630–5555	5660–5520	
Sulgu 2	Tar or charred residue on pottery (outside)	Sperrings	KIA–36724	6085±30	5040–4950	5210–4900	
Sulgu 2	Repairing tar on pottery	Sperrings	KIA–33925	6015±30	4945–4845	5000–4830	
Vozhmaricha 26	Charred crust (outside)	Sperrings	KIA–35901	5505±50	4450–4270	4460–4250	
Panozero 1	Tar on pottery (outside)	Sperrings	KIA–33924	5795±35	4710–4605	4730–4540	
Kalmozero 11	Black residue on pottery (outside)	Säräisniemi 1	KIA–35899A	6340±70	5470–5220	5480–5200	Same vessel as KIA–35899B
Kalmozero 11	Black residue on pottery (inside)	Säräisniemi 1	KIA–35899B	6080±45	5190–4910	5210–4840	Same vessel as KIA–35899A

Tab. 2. Radiocarbon samples and dating results. Dates calibrated using OxCal v3 Bronk Ramsey (2005) and the IntCal04 curve data (Reimer et al. 2004).

pearance, these pots are not related to the remaining ceramics documented at the Upper Sukhona sites, but are closely associated with Narva pottery and in particular with the Kääpa/Žemaitiške 3B 'subgroup'.

A separate correspondence analysis of the two identified main groups regarding the technological characteristics yields additional, more detailed information. The calculation for the comb ceramic complex (Fig. 10) results in a scatter plot in which along the x axis (= 1st eigenvector) pots from Veksa 3 tend to be located on the right side around variables connected with small amounts and fine grain size of the temper, while Säräisniemi 1 vessels and pots from Kraviojankangas concentrate further left, where they are placed by characteristics such as coloured vessel surface and abundant temper. The centre is dominated by pottery from the Karelian Sperrings sites. The graph, however, does not form a parabola, because the y-axis (2nd eigenvector) already ceases to cause any discernible order of the material. Nevertheless, it is striking that the comparably small set of technological characteristics included in the calculation already distributes the Veksa 3 pottery and Säräisniemi 1 vessels to opposite ends of

the complex, a phenomenon which will be confirmed by the incorporation of decoration characteristics later on.

The analysis of the technological characteristics of the pottery from the southern complexes (Fig. 11) results in a very clear separation of the Narva sites and the sites attributed to the Dubičiai type along the x-axis (= 1st eigenvector). The characteristics causing the separation of the latter encompass crushed stone temper, very coarse temper, and plant impressions on the vessel surface. Only two pots from Dubičiai sites are located inside the Narva cloud: one vessel from Varėnė 2, for which an association with Narva has already been suggested on impressionist grounds (*Marcinkevičiūtė 2005*), and one vessel from Dubičiai 2, which is represented by just one small sherd. In addition to the described separation of Narva and Dubičiai along the x-axis, the Narva cloud shows a further sub-division into two parts along the y-axis (= 2nd eigenvector): The vessels from Kääpa and Žemaitiške 3B cluster in the upper left region around the technological criteria of coarse temper, mollusc shell temper, ochre/chamotte temper and surface residue, while the vessel units from Sjaberskoe 3, Kretuonas 1B and Žeimenio ežero 1 concentrate in the lower right area of the Narva cloud around characteristics such as plant temper, fine and middle-grained temper and scratched surface.

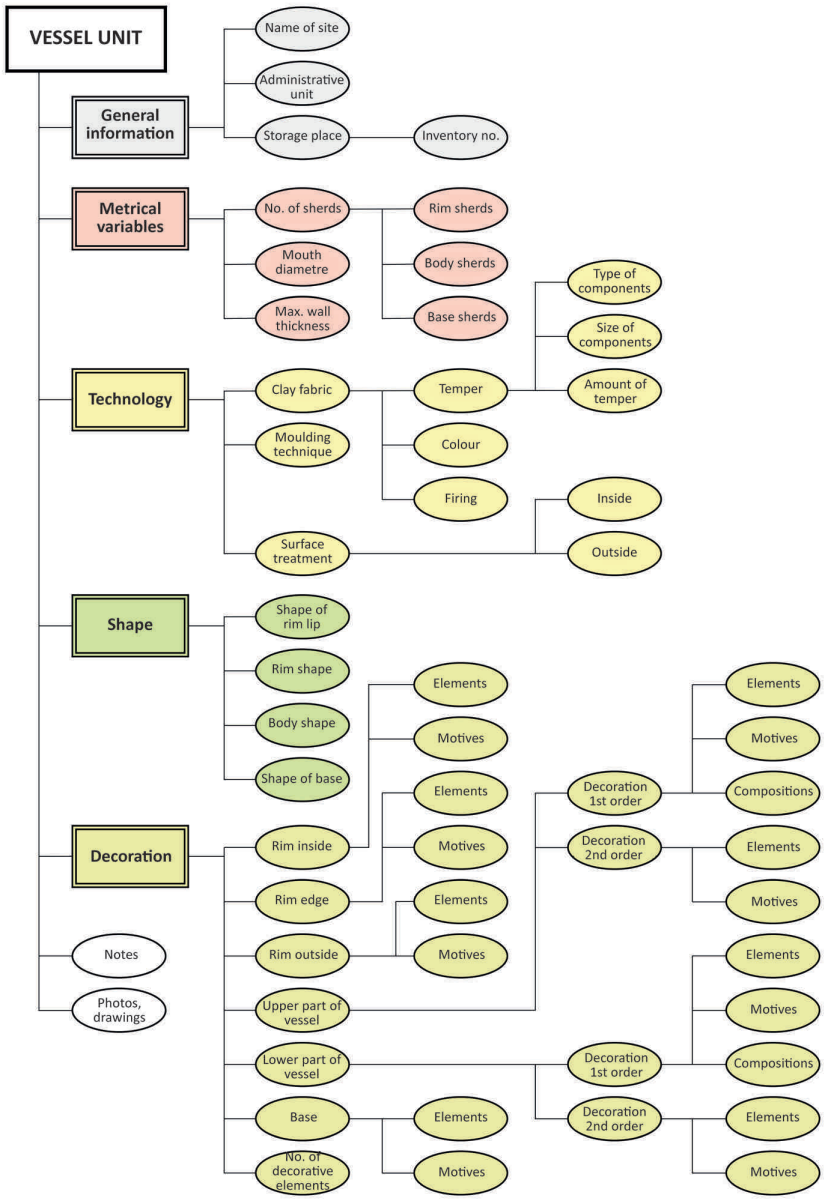

Fig. 7. The structure of the data base in which the analysed material was documented.

The combined analysis of technology and ornamentation is very revealing with regard to the inner structure of the investigated pottery complex and, in particular, of the large entity of early comb pottery styles (Figs. 12–14). Here, too, the 1st eigenvector (Fig. 12: x-axis) produces a clear distribution of the Narva/Dubičiai complex to the left and the comb pottery to the right, with the vessels from Sjaberskoe 3 again forming a link between the two areas, as has been the case in the above-described analysis of the technological characteristics. While the 2nd eigenvector (y-axis) does not describe any sub-division of the Narva/Dubičiai cloud, it captures a clear internal structure of the comb ceramic complex. Along the respective axis of the graph (Fig. 12: y-axis) the pottery from the older layers of Veksa 3 displays particularly negative values; Sperrings and Ka I:1 vessels are grouped around zero and in the lower positive region, and only a number of pots from Säräisniemi 1 sites are located in higher positive areas.

The results of this analysis thus indicate that regarding technology and ornamentation, the comb cera-

Code	Description
MSand	Tempering material sand
MGrus	Tempering material gravel/crushed stone
MOcker	Tempering material ochre/chamotte
MMuschel	Tempering material mollusks
MPflanze	Tempering material plants
Mfein	Tempering particles fine
Mmedium	Tempering particles medium
Mgrob	Tempering particles coarse
Msgrob	Tempering particles very coarse
Mwenig	Small amount of temper
Mmittel	Medium amount of temper
Mviel	Large amount of temper
OohneSch	Surface without slip
Ogekratz	Surface scratched
Opflanz	Surface brushed or with plant impressions
Ogefärbt	Surface coloured red or black
OAuflag	Surface with residue (foodcrust etc.)
Bgut	Firing temperature high
Bmittel	Firing temperature medium
Bschl	Firing temperature low
Bsschl	Firing temperature very low

Tab. 3. Codification of the variables concerning technology for the correspondence analysis.

mic complex is significantly subdivided into various sub-groups. For this reason, the complex will be analysed in more detail to follow up questions of the dispersal of the earliest ceramics into the north, of the role Veksa and the Upper Sukhona region played in these processes, and of the relations and links between the northern groups of Sperrings/Ka I:1 and Säräisniemi 1 (Figs. 13, 14).

Code	Description
Verz2Eb	2nd order decoration
EAnz3	3 decorative elements per vessel
EAnz4	4 decorative elements per vessel
EFisch	Element fish vertebrae impression
EKnoch	Element bone epiphysis impression
EKammk	Element short comb stamp
EKamml	Element long comb stamp
EMatrize	Element figured stamp
EungSt	Element unstructured stamp
EWickel	Element wound cord/knot stamp
EKerbe	Element notch
EFurche	Element stitch-and-furrow
ERitz	Element incised line
EFläche	Element plane impression
LövorBr	Element hole before firing
Mo1vert	Motive vertical row
Mo1mehr	Motive multiline band
Mo1Band	Motive band of oblique or vertical rows
Mo1komp	Motive complicated band made of one element
MoTremo	Motiv stepping comb band
Mo2einf	Motiv simple row made of two elements
Mo2komp	Motive complicated band made of several elements
Mounord	Motive unstructures pattern
Moleer	Motive undecorated field

Tab. 5. Codification of the variables concerning decoration for the correspondence analysis.

Code	Description
Dm1	Mouth diametre ≤ 5cm
Dm5	Mouth diametre ≥ 30cm
Wdst1	Wall thickness ≤ 0,5cm
Wdst4	Wall thickness ≥ 1,2cm
Form1	Vessel shape 1 (bowl-like, with wide mouth)
Form2	Vessel shape 2 (egg-shaped, upper part cylindrical)
Form3	Vessel shape 3 (egg-shaped, narrowing mouth)
Form4	Vessel shape 4 (oval lamps)
FormK	Vessel shape with bent
RFI	Rim shape I
RFC	Rim shape C
RFCS	Rim shape CS
RFS	Rim shape S
RAFger	Rim edge straight
RAFschr	Rim edge oblique
RAFrund	Rim edge rounded
RAFspitz	Rim edge sharp
RAFdick	Rim edge thickened

Tab. 4. Codification of the variables concerning vessel shape for the correspondence analysis.

Figure 18 displays the result of the correspondence analysis of all vessels in this group. Both the 1st and the 2nd eigenvectors attest to an order in the material which leads to a parabolic point scatter. Its lower right region is almost exclusively comprised of vessels from layers 9 and 8 of Veksa 3, which are the oldest complexes in the entire dataset. The relevant variables in this area are ornamentation characteristics such as long comb stamps, motifs with vertically placed elements or stepping comb pattern, and holes incised before firing. The centre of the

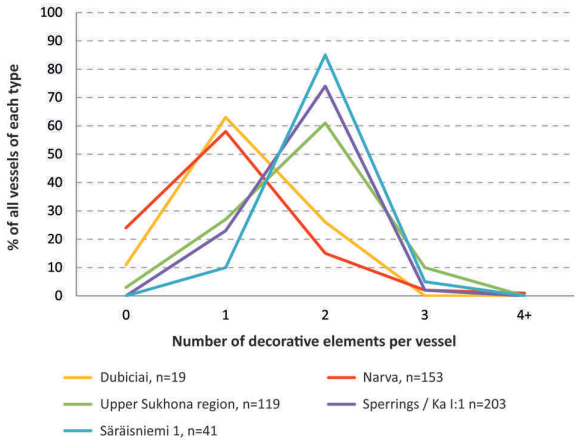

Fig. 8. Number of decorative elements per vessel according to cultural group (y-axis: percentage of all vessels of the respective cultural groups).

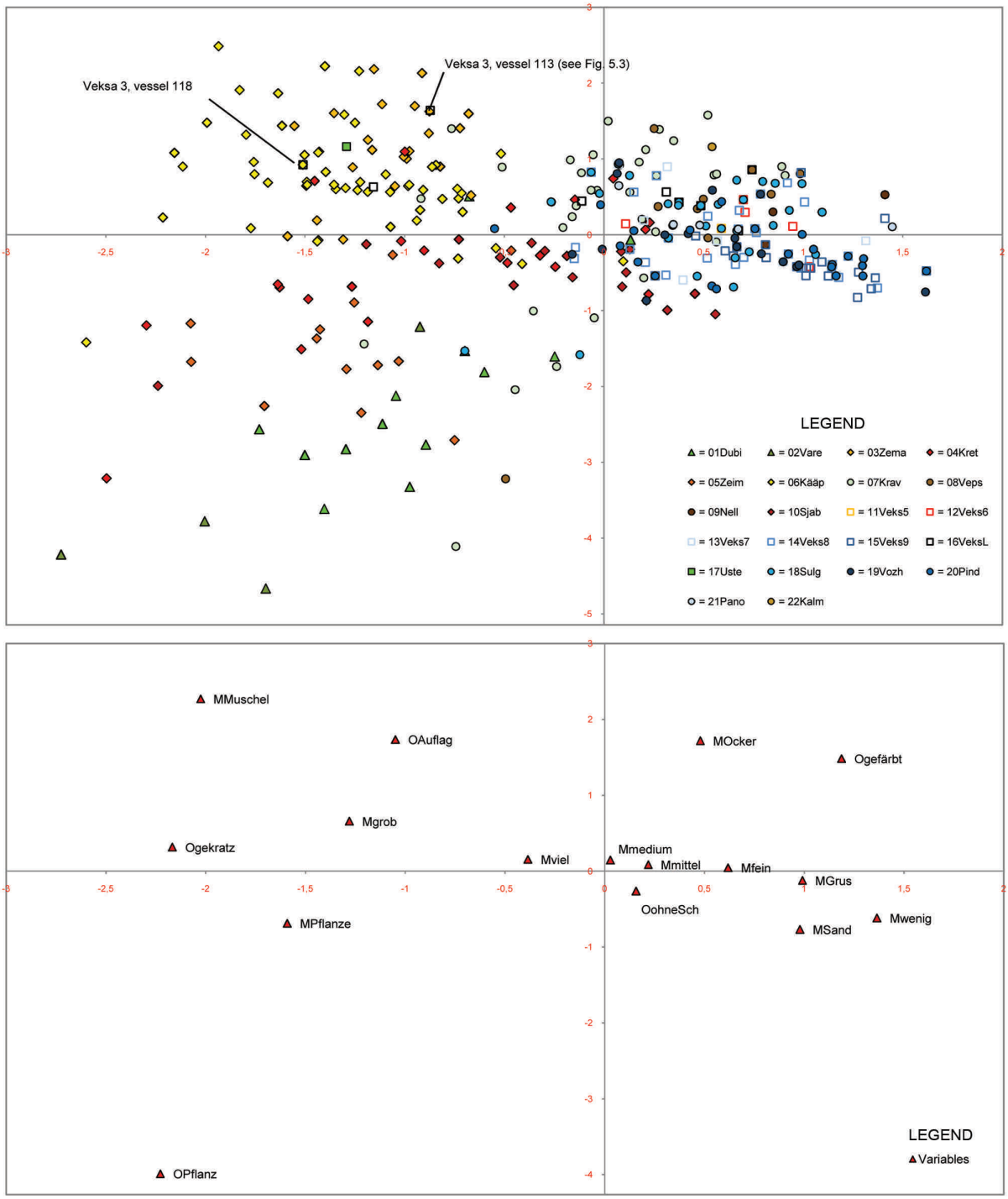

Fig. 9. Correspondence analysis of the technological characteristics for the entire complex, display of 1st against 3rd eigenvectors. Above: vessel units, below: variables (resolution of codes: see Tab. 3).

cloud concentrated around zero consists of a dense agglomeration of vessels from the younger layers of Veksa 3 as well as Sperrings pots. It is characterised by a large variety of decorative and technological criteria, some of which are apparently too common to structure the data set significantly. Down to the left, further Sperrings vessels are located together with the ceramics of the Ka I:1 site of Kraviojankangas, and the lower left arm of the point scatter is made up of Säräisniemi 1 pottery. At this end of the scatter, the technological characteristics include coloured surfaces and very coarse temper, and the relevant decorative features are wound cord impressions, figured stamps, and simple as well as complicated motifs composed of several elements. When the existing AMS radiocarbon dates of individual vessels are added to the illustration (Fig. 13, top diagram) it becomes clear that the scatter does

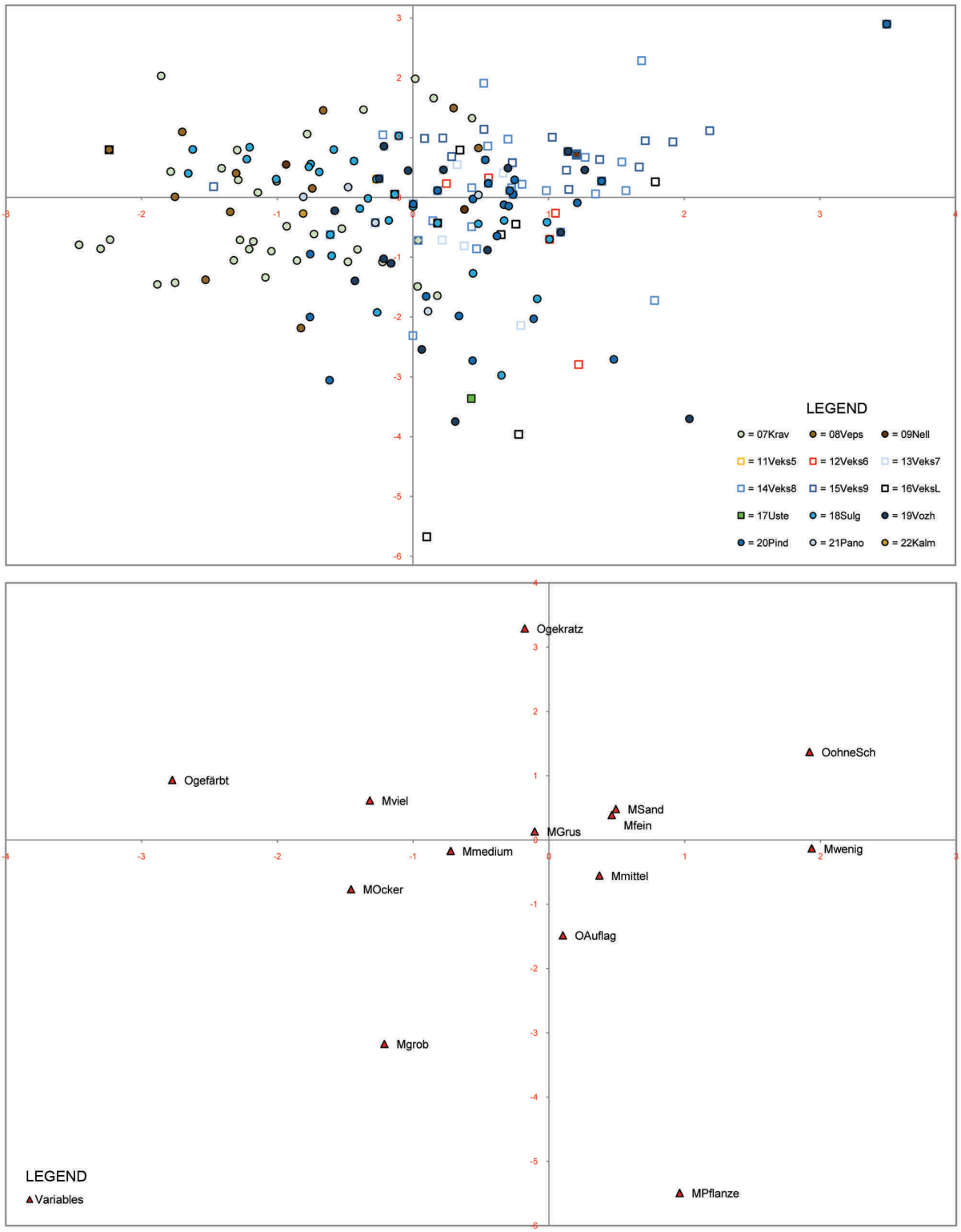

Fig. 10. Correspondence analysis of the technological characteristics for the northern groups, display of 1st against 2nd eigenvectors. Above: vessel units, below: variables (resolution of codes: see Tab. 3).

not represent an actual parabola in the sense of manifesting a systematic, *i.e.*, chronological sequence, but rather a central cloud with two outlying regions. Although the accuracy of some of the dates is not entirely reliable (*i.e.*, the date from Vozhmarikha 26, which is probably too young: *Piezonka 2008.91–92*), the general impression is that of an unsystematic distribution of older and younger dates in the left arm.

A different picture emerges when the central agglomeration of Sperrings and Ka I:1 vessels which con-

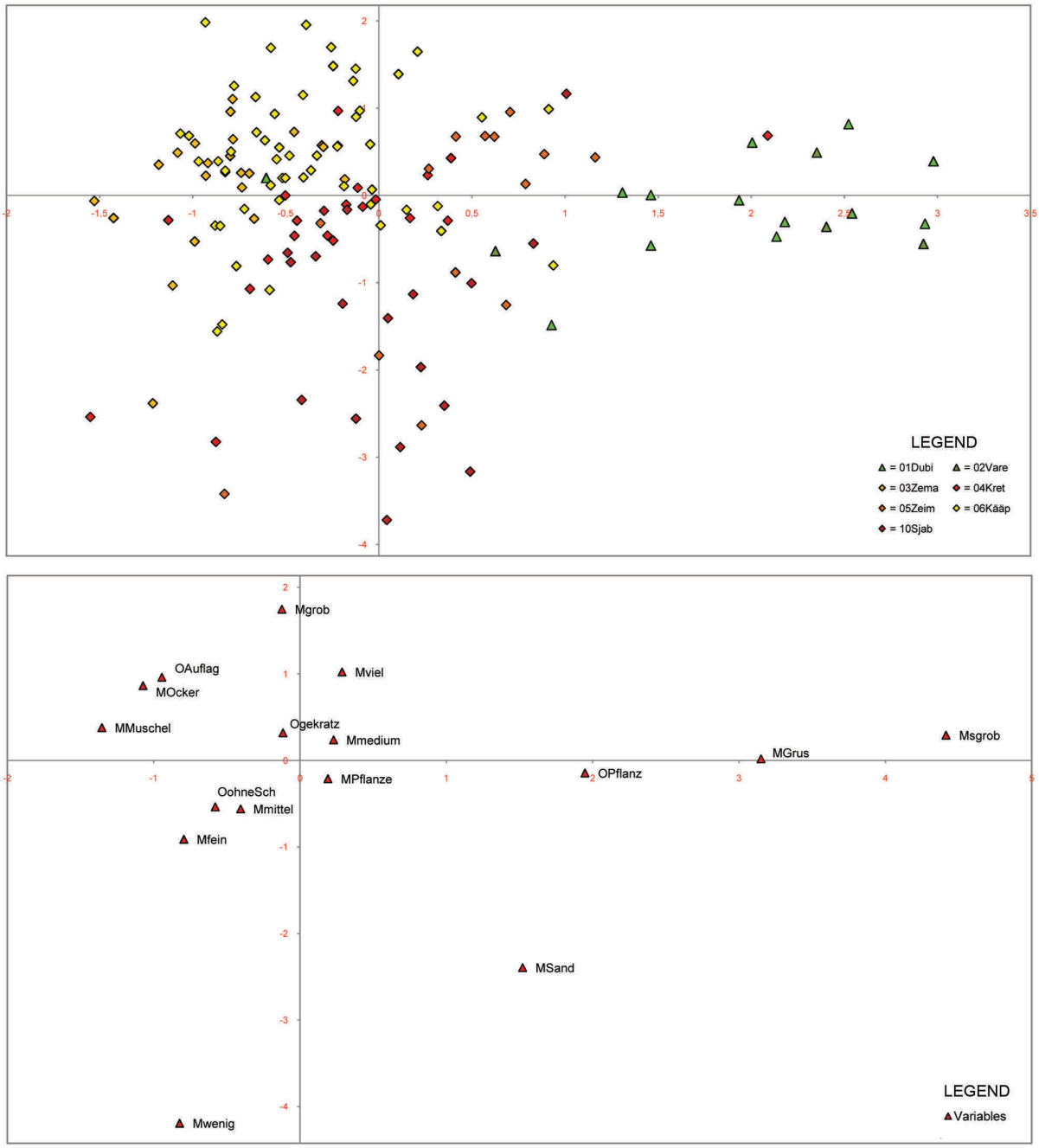

Fig. 11. Correspondence analysis of the technological characteristics for the southern groups, display of 1st against 2nd eigenvectors. Above: vessel units, below: variables (resolution of codes: see Tab. 3).

centrated in the zero region in Figure 13 are taken out of the calculation, thus resulting in a comparison of only the Sukhona sites of Veksa 3 and Ust'e Borozdy, and Säräisniemi 1. The correspondence analysis of such a data set does result in a true parabolic point scatter, indicating continuous development (Fig. 14). Its right arm again starts with vessels from the two lowermost layers of Veksa 3, which typologically encompass an early, sparsely decorated ware, and pottery ornamented with long comb stamps which is related to the middle phase of the Upper Volga culture. Close to the crossing point of the two axes of the diagram, there follows a concentration of vessels from the upper layers of Veksa 3 intermixed with some Säräisniemi 1 pots, and the left arm is made up of only a few more vessels from Veksa 3 and the majority of the Säräisniemi pottery. In the lower part of the diagram, a few outliers are located, representing the Narva-like vessels from Veksa 3 and Ust'e Borozdy, which are of minor relevance for the present discussion. The sequence calculated in the correspondence analysis thus runs from the ceramics from the oldest layers of Veksa 3 via the pottery from the younger strata of the same

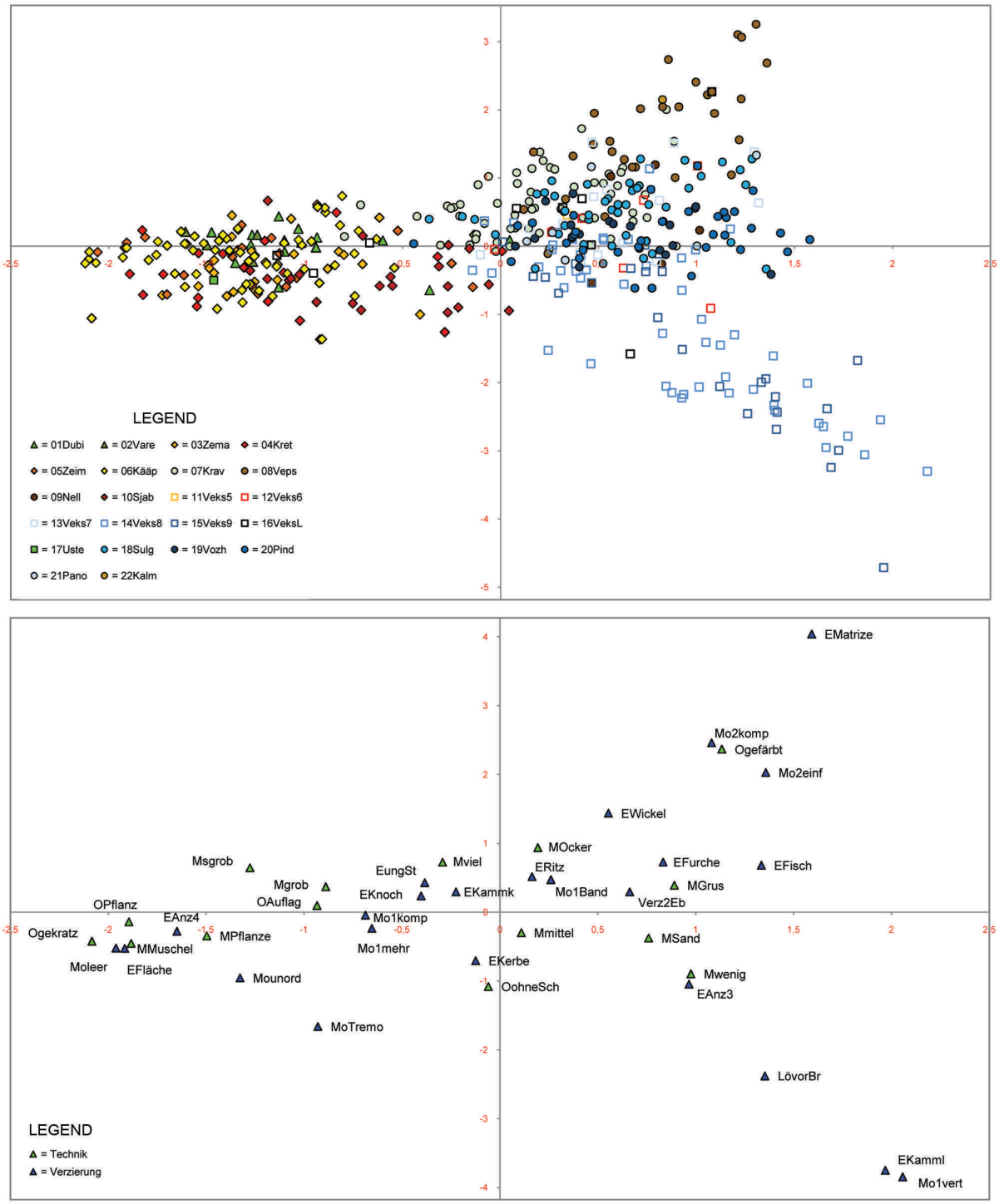

Fig. 12. Correspondence analysis of the decorative and technological characteristics for the entire complex, display of 1st against 2nd eigenvectors. Above: vessel units, below: variables (resolution of codes: see Tabs. 3, 5).

site towards the Säräisniemi 1 ware of north-eastern Fennoscandia. As the possibility of a certain intermixing between the finds from the Veksa layers has to be expected, typologically relevant vessels have been additionally colour-coded in the diagram: the '2nd comb ceramic complex' (yellow) and the 'Northern type' (orange). In this way, the sequence described above is confirmed: both ceramic types are concentrated in the central part of the parabola, with the stratigraphically older '2nd comb ceramic complex' extending farther to the right and the 'Northern type, which is stratigraphically younger, extending farther to the left. Thus the diagram (Fig. 14) indicates a continuous typological development from

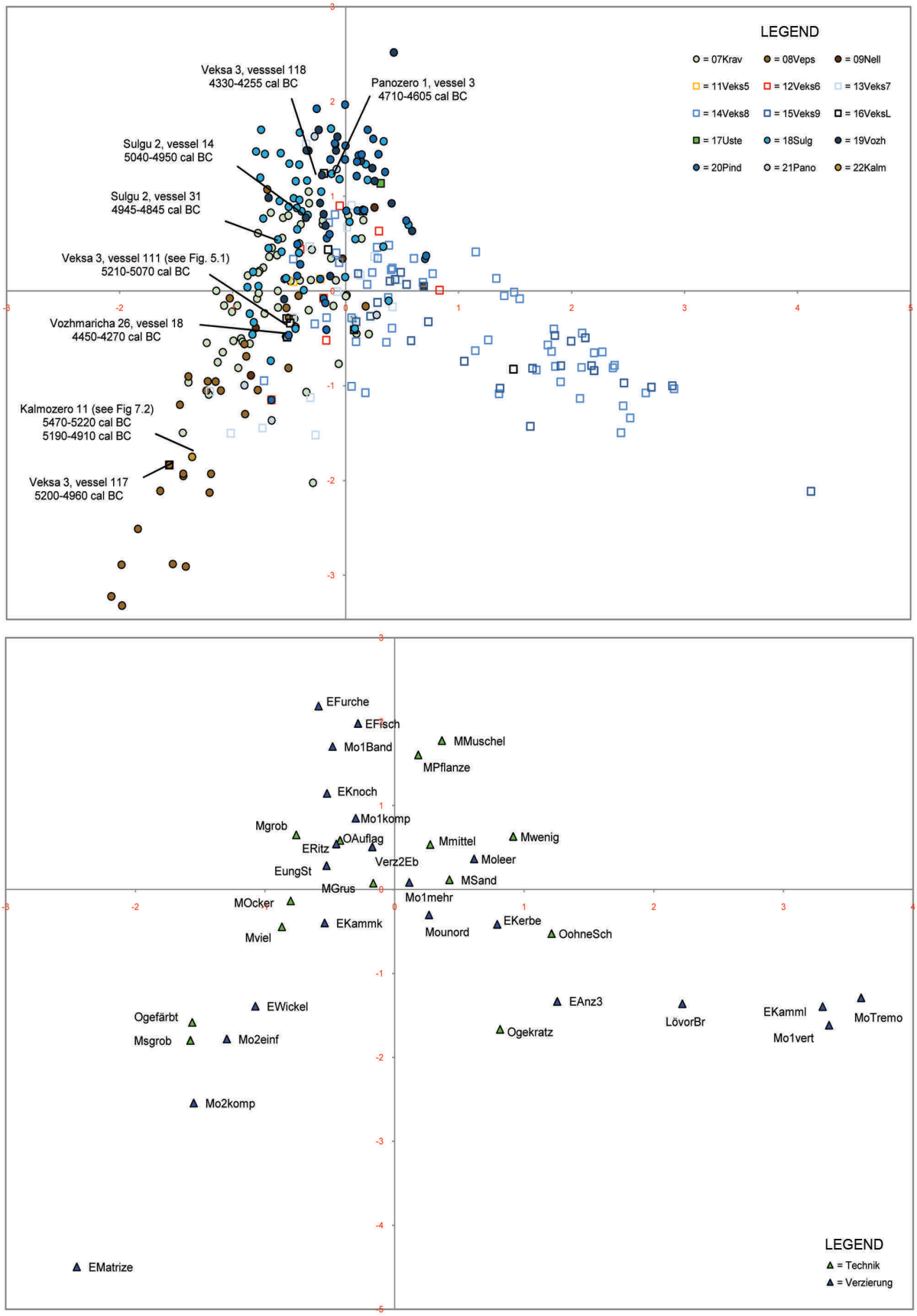

Fig. 13. Correspondence analysis of the decorative and technological characteristics for the northern groups, display of 1st against 2nd eigenvectors, and AMS 14C dates of selected vessels. Above: vessel units, below: variables (resolution of codes: see Tabs. 3, 5).

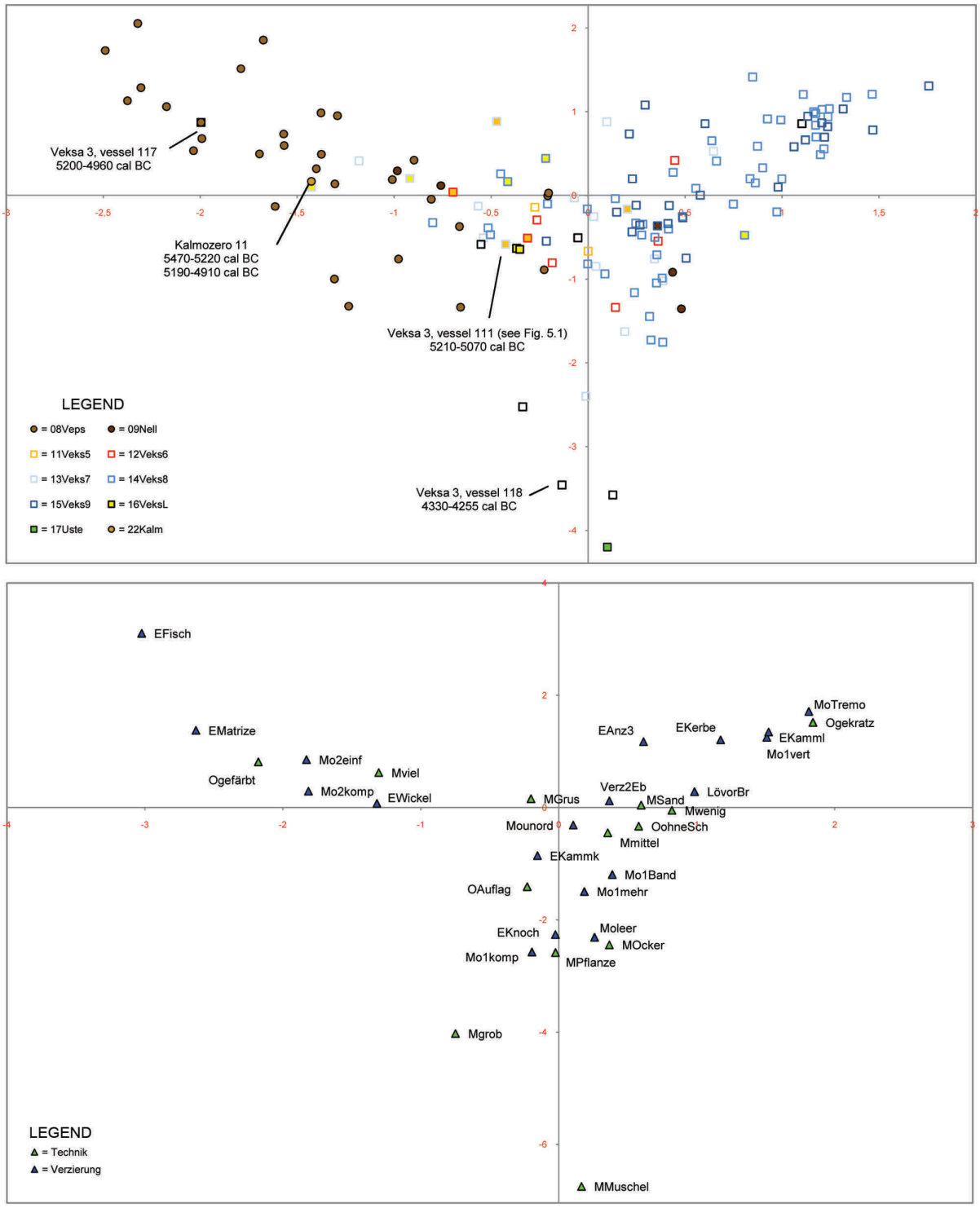

Fig. 14. Correspondence analysis of the decorative and technological characteristics for Veksa 3 and Säräisniemi 1 sites, display of 1st against 2nd eigenvectors, and AMS 14C dates of selected vessels. Above: vessel units, below: variables (resolution of codes: see Tabs. 3, 5). Highlighted in the upper diagram: yellow – vessels of the 'Second comb ceramic complex' of Veksa 3, orange – vessels of the 'Northern types' of Veksa 3.

the Upper Volga type pottery of Veksa 3 via the '2nd comb ceramic complex' and the 'Northern type' towards Säräisniemi 1 pottery in the north-western part of the study area. Concerning Veksa 3, this succession is accords with the stratigraphic sequence and, consequently, can be interpreted as a chronological development. The AMS radiocarbon dates of single vessels given in Figure 14 are chronologically very close to each other and cannot be used to verify the hypothesis. However, they do not contradict

Fig. 15. Correspondence analysis of the decorative, technological and shape characteristics for the entire complex, display of 1st against 2nd eigenvectors. Above: vessel units, below: variables (resolution of codes: see Tabs. 3, 4, 5).

it and might have to be understood as an indication of a rapid typological development or, alternatively, a rapid dispersal of the types.

When all three categories of variables, *i.e.*, technology, shape and decoration, are combined in the analysis, the internal structures characterising the data set are represented less clearly than in the described analyses of only the technology and a combination of technology and decoration. This means that, apparently, the shape criteria somewhat obscure the picture. In the diagram depicting the 1st and 2nd eigenvectors (Fig. 15), only some of the early pottery from Veksa 3 forms a clear-cut group dragged away

from the main cloud by the already-mentioned decoration characteristics of long comb stamps and of bands of vertical impressions, and the additional shape variable of a curve in the vessel belly profile. The remaining vessel units form a dense cloud of points which, as usual, is divided into two main areas, the Narva/Dubičiai region and the comb ceramic region, which includes vessels from the younger Veksa 3 layers.

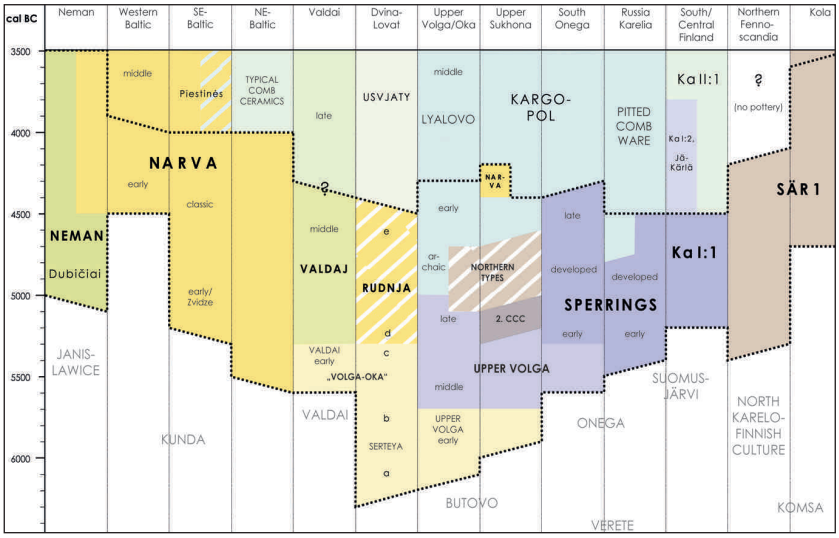

Fig. 16. Chronology of the cultural groups with early ceramics east and north of the Baltic Sea. Coloured: groups with pottery; white: groups without pottery; surrounded by dotted line: Early Neolithic block considered in this study.

The correspondence analysis of the pottery from 17 archaeological sites in the study area has revealed a number of significant, statistically documented results. It was possible to show that the complex investigated is divided into two main entities: a south-western group consisting of Dubičiai type and Narva culture pottery, and a north-eastern group which can be labelled early comb ceramics in a broad sense and which encompasses Sperrings, Ka I:1 and Säräisniemi 1 wares as well as material from the early pottery-bearing layers of Veksa 3 in the Upper Sukhona basin. Thus a hypothesis – already advanced in 1956 by the Finnish archaeologist and pioneer researcher of the Stone Age, Aarne Äyräpää – of the existence of two separate strands in the early pottery development of the North-Eastern European forest zone has now been statistically confirmed (*Äyräpää 1956.35*).

Within the south-eastern group, pottery of the Dubičiai type is distinguished from the Narva ceramics mainly on the basis of technological criteria. For Narva, the statistical analyses have revealed remarkable details of the typological sub-divisions of the ceramics within this culture. Significant differences have been detected between the three complexes of Narva sites in the Lake Kretuonas region in Eastern Lithuania which are located within a few kilometres of each other: The pottery from Žemaitiške 3B, which the excavator Algirdas Girininkas regards as the oldest complex in this region (*Daugnora, Girininkas 1998.223*), has its closest parallels in the ceramics found at the Estonian site at Kääpa and even seems to form a separate technological sub-group with them, while the pottery from Žeimenio ežero 1 only a few kilometres away has clear technological links with the Dubičiai type further south. The pottery of the third Eastern Lithuanian site investigated, Kretuonas 1B, takes an intermediate position between these two poles. Equally interesting are the results of the pottery analysis for Sjaberskoe 3, a North-Western Russian site whose early phase has been associated with the Narva culture. The present study shows that this association has to be reconsidered because, regarding technology and vessel shape, the Sjaberskoe ceramics also have close affinities with the other main group, the comb ceramics entity. At the same time, this site illustrates the existence of smooth transitions between the altogether well-distinguished pottery traditions.

Important results have also been obtained on the internal structure of the north-western main group of early comb ceramic variants. It was possible to demonstrate that the various Early Neolithic groups which can be distinguished at Veksa 3 on the basis of stratigraphy form an integral part of this entity. Very important in this respect is a particular result of the correspondence analysis, namely the possibility of a continuous development from the earliest, Upper Volga-like pottery at Veksa 3 via the younger '2nd comb ceramic complex' and the 'Northern types' towards the Säräisniemi 1 pottery of Northern Fennoscandia. The verification of such a sequence would represent an important step towards solving a central research problem concerning early pottery development in the forest zone regarding the genesis and interrelationship of 'Northern types' and Säräisniemi 1. Moreover, the results of the analysis

Fig. 17. North-Eastern Europe* c. *6000 calBC. Coloured: hunter-gatherer groups with pottery; grey: farming groups with pottery (from* Piezonka in prep.Fig 198*; distribution of hunter-gatherer groups: modified and supplemented after* Kotova 2003 *and* Vybornov 2008*; distribution of farming groups: according to* Müller 2009.Fig. 62*).

suggest that Karelian Sperrings pottery and the closely related Ka I:1 style in Finland stood more or less outside this line of development.

The dispersal of early ceramics into the Eastern and Northern Baltic

When we combine the findings of the above-described statistical pottery analysis with cultural-historical results already published, the following scenario of the emergence and further development of first ceramics groups in the study area and their cultural background can be drawn (Figs. 16–22).

The first pottery reached the study area possibly as early as the last third of the 7th millennium calBC, when the first radiocarbon dates from ceramic vessels and their contexts start to set in between the Volga and Oka rivers and further west in the Dvina-Lovat' region (Fig. 17), although to what extent reservoir effects might have influenced these dates is still under discussion (*Hartz* et al. *in print; Mazurkevich, Dolbunova 2009.80*). The vessels from these early contexts share a number of common features, such as sparse, simple decoration and the frequent occurrence of flat bases alongside the rounded or pointed examples. The earliest ceramics of the Valdai and Sukhona regions probably also belong to this typological entity. On the basis of such pottery from the Volga-Oka and Valdai regions, Yuri B. Tsetlin (*2008*) has defined a new 'Volga-Oka culture', while other authors prefer to associate this ware with the early phases of established archaeological cultures such as Upper Volga and Valdai (*e.g.*, *Timofeev 1996; Tsvetkova 2011*). Future research will have to show whether a singling out of this early horizon is an expedient alteration of the archaeological classification system.

Fig. 18. North-Eastern Europe* c. *5500 calBC. Coloured: hunter-gatherer groups with pottery; grey: farming groups with pottery (from* Piezonka in prep.Fig 19*; distribution of hunter-gatherer groups: modified and supplemented after* Karmanov 2008; Kotova 2003; Telegin 1996 *and* Vybornov 2008*; distribution of farming groups: according to* Müller 2009.Fig. 67*).

In the south-western part of the study region, the development continues with the emergence of the Narva culture, the beginning of which is defined by the first appearance of pottery within the Mesolithic Kunda culture substrate (*Kriiska 2009.161– 162*). The earliest dates for this ware stem from North-Eastern Baltic sites such as Zvidze and Osa in Latvia and Kääpa in Estonia and fall around 5500 calBC, while in the South-Eastern Baltic and especially in Eastern Lithuania the earliest pottery vessels emerge some centuries later in the last quarter of the 6th millennium calBC (*Piezonka 2008.98–100*) (Figs. 18, 19). At the same time, Narva typological features also start to influence ceramic production in the Dvina-Lovat' region (Rudnya culture) and – less apparent – in the Valdai area. In the Western Baltic, the first pottery which also belongs to the Narva culture, emerges much later, from the middle of the 5th millennium onwards. The further development of the Narva culture and its pottery differs in the various parts of the distribution area: in the north and east, Narva is replaced by Typical Comb Ware complexes around 4000 calBC, while in the south-west; it continues to exist well into the Late Neolithic (*Brazaitis 2002*) (Fig. 21).

Farther south, by the middle course of the River Neman in the border region between Lithuania, Belarus and Poland, the earliest pottery is represented by the Dubičiai type, which according to the established conception is regarded as the early phase of Neman culture (*Charnyauski, Isaenka 1997*). Based largely on typological observations rather than on the few existing radiocarbon dates which are not very reliable with regards to their contexts, the emergence of Dubičiai pottery probably took place around 5000 calBC or a little before (*Piezonka 2011a.329–332*) (Fig. 19). Approximately half a millennium la-

Fig. 19. North-Eastern Europe* c. *5000 calBC. Coloured: hunter-gatherer groups with pottery; grey: farming groups with pottery (from* Piezonka in prep.Fig 200*; distribution of hunter-gatherer groups: modified and supplemented after* Karmanov 2008; Kotova 2003; Matiskainen 2011; Telegin 1996 *and* Vybornov 2008*; distribution of farming groups: according to* Müller 2009.Fig. 68*).

ter, Narva traits start to influence the region from the north. Nonetheless, the Dubičiai type continues to exist up until *c.* 3800 calBC, when the transition to the Lysara Gara phase of Neman culture takes place (*Piličiauskas 2002.133*).

In the eastern and northern parts of the study area, the development of early hunter-gatherer pottery and its cultural context takes another course. Between the Volga and Oka and in the Upper Sukhona basin, the described 'Volga-Oka' phase with its sparsely decorated ware is followed by developed Upper Volga culture ceramics (Fig. 18). These appear just before the middle of the 6th millennium calBC and encompass, among others, vessels decorated with imprints of long comb stamps, which a little later has spread hundreds of kilometres north into the southern Onega basin (*Engovatova 1998; Ivanishchev, Ivanishcheva 2000*). The following developments are especially well deducible from the stratigraphies of the sites in the Upper Sukhona basin. Probably triggered by eastern influences from the Kama- and Dvina-Pechora region, the so-called '2nd Comb Ceramic Complex' (Fig. 4.1, 2) emerges here in the last third of the 6th millennium calBC (*Karmanov, Nedomolkina 2007; Piezonka 2008.82–83*). It might in turn have played a role in the genesis of the next-younger, so-called 'Northern types' (Fig. 4.4), which can be found between Lake Onega, the upper Sukhona and the Upper Volga-Oka region towards the end of the 6th and at the beginning of the 5th millennium calBC (*Piezonka 2008.84*) (Fig. 19). The pottery of the 'Northern types', as indicated by the name, has very close stylistic affinities with the Säräisniemi 1 ware in the far north of the study region (*Zhilin* et al. *2002.44*). The following horizon already belongs to the widely distributed entity of pit-comb wares, which in the Sukhona region is represented by the

Fig. 20. North-Eastern Europe* c. *4500 calBC. Coloured: hunter-gatherer groups with pottery; grey: farming groups with pottery (from* Piezonka in prep.Fig 201*; distribution of hunter-gatherer groups: modified and supplemented after* Gurina and Krainov 1996; Karmanov 2008; Klassen 2004; Kotova 2003; Matiskainen 2011 *and* Oshibkina 1996*; distribution of farming groups: according to* Müller 2009.Fig. 71*).

Kargopol' culture, starting in the second quarter of the 5th millennium calBC, while in the Upper Volga-Oka region it is characterised by the Lyalovo culture, the archaic phase of which set in already a little earlier (*Zaretskaya, Kostyleva 2010*) and might have slightly overlapped with the final Upper Volga culture and the 'Northern types' (Fig. 20). According to established local definitions, the end of the Early Neolithic in this region is marked by the transition to the middle Lyalovo culture in the second half of the 5th millennium calBC. At the upper Sukhona sites around this time, the curious appearance of some vessels closely resembling Narva-type pottery can be noted (*Piezonka 2008.82.84*) (Fig. 4.3; see also the highlighted vessel units in Fig. 9). The reasons for, and character of, this typological link is still unclear and needs further investigation. Farther south, in the Upper Volga region, a comparable infiltration of 'Eastern Baltic type' pottery has also noted, although here it seems to be associated with the Late Neolithic (*Zhilin* et al. *2002.75–76*).

Further north, in the Onega region and the Russian part of Karelia, the oldest pottery is associated with the Sperrings culture, which probably started to develop from the middle of the 6th millennium calBC onwards on the basis of the local, aceramic Mesolithic. Only in the very south of the distribution area is it preceded by a ceramic phase connected to the middle Upper Volga culture (Figs. 19, 20) (*Ivanishcheva, Ivanishchev 2004*). Most researchers hold that in this culture the origins of the development of Sperrings ceramics must be sought (*Carpelan 1999.254–256; German 2006*). Some centuries later, in the final quarter of the 6th millennium calBC, pottery manufacture spreads into the southern and central parts of Finland. The earliest ware is called Ka I:1 (= Older Early Comb Ceramic) (*Europaeus-*

Fig. 21. North-Eastern Europe* c. *4000 calBC. Coloured: hunter-gatherer groups with pottery; grey: farming groups with pottery (from* Piezonka in prep.Fig 202*; distribution of hunter-gatherer groups: modified and supplemented after* Gurina 1996; Gurina and Krainov 1996; Karmanov 2008; Kotova 2003; Oshibkina 1996 *and* Pesonen on line*; distribution of farming groups: according to* Müller 2009.Fig. 72*).

Äyräpää 1930) and is typologically closely connected with Sperrings; in the archaeological literature both names are in fact frequently used more or less synonymously as cultural labels for the early Neolithic of the entire region (*Piezonka 2011a.313–314*). In Russian Karelia and the neighbouring regions to the south, Sperrings culture has been subdivided into several phases: after the initial early phase, the first centuries of the 5th millennium encompass the developed stage, and a late phase around the middle of the millennium has been distinguished for the southern Onega region (*German 2002b*), while at the same time further north and east, the early Karelian Pit-Comb Ware starts to develop (Fig. 20) (*Lobanova 1996.103*). Around this time, the developments in Southern and Central Finland start taking another course: on the basis of Ka I:1, the new Ka I:2 and Jäkärlä styles emerge along the southern coast, which are characterised by the absence of pits in the pottery decoration (Fig. 21). Subsequently, from around 4000 calBC, the Ka II:1 (Older Typical Comb Ceramic) style starts to develop, in the ornamentation of which pits form an important element (*Pesonen, Leskinen 2009*).

In the northern parts of Karelia and Finland and the adjacent regions of Norway, the earliest pottery belongs to the Säräisniemi 1 style. As mentioned above in connection with the results of the correspondence analysis, this ware has close typological links with the 'Northern types' distributed approximately one thousand kilometres further south to which it is probably related (Fig. 19). The oldest absolute dates for the Säräisniemi 1 style, however, stem from the northernmost periphery of its distribution area and start around the middle of the 6th millennium. These few early dates, however, might have been distorted by reservoir effects, and the next younger set of da-

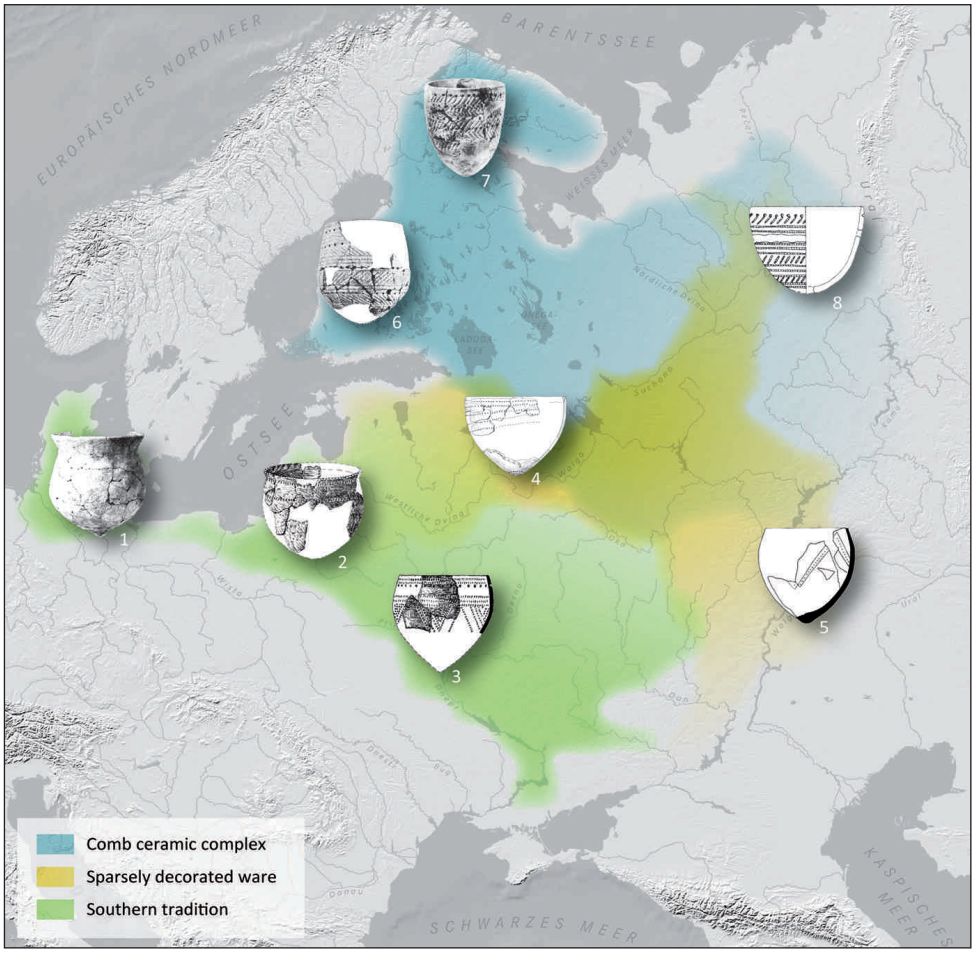

Fig. 22. Three ceramic tradition trajectories influencing the development of early pottery in the Eastern and Northern Baltic region. Displayed time frame:* c. *6000–4500 calBC. 1 vessel of the Ertebølle culture, Wangels, Germany. 2 vessel of the Narva culture, Sārnate, Latvia. 3 vessel of the Dnieper-Donets cultural complex, Luchizhevichi, Belarus. 4 vessel of the Valdai culture, Shchepochnik, Russian Federation. 5 vessel of the Elshan culture, Chekalino, Russian Federation. 6 vessel of the Ka I:1 type, Vargstenslätten, Finland. 7 vessel of the Säräisniemi 1 type, Chavanga, Russian Federation. 8 vessel of the Pechora-Dvina culture, Polovniki 2, Russian Federation (vessel illustrations after* Gurina 1961.Fig. 68 [4]; Gurina 1997.Fig. 28 [7]; Hallgren 2008. Fig. 4.4. [6]; Hartz 2011.Fig. 1 [1]; Karmanov 2008.Fig. 69 [8]; Telegin 1996.Fig. 13 [3]; Vankina 1970.Tab. 73 [2]; Vybornov 2008.Fig. 52 [5]*).

tes from the last two centuries of the 6th millennium calBC seems more reliable (*Piezonka 2008.103*). Säräisniemi 1 pottery, which so far has not been subdivided further, existed according to our present knowledge up until the first centuries of the 4th millennium (Fig. 20) (*Pesonen, Leskinen 2009.302*). In its Finnish and Norwegian distribution area, a hiatus without pottery follows which lasts more than a 1000 years (Fig. 21). A different situation applies to the Kola Peninsula: here the earliest Säräisniemi 1-like pottery makes its appearance comparatively late, around the middle of the 5th millennium calBC, to persist relatively unchanged up until the beginning of the Early Metal Ages (*Piezonka 2008.103–104*) (Fig. 21).

Summarising the evidence of both existing studies and the new multivariate pottery analyses, the cultural history of the 6th and 5th millennia calBC in the Eastern and Northern Baltic region is marked by three main tradition lines triggering and influencing local ceramic development (Fig. 22). The oldest tradition line encompasses sparsely decorated wares, the origins of which reach back to the first half of the 7th millennium calBC in middle Volga region. Via a number of intermediate steps in Central Russia, this tradition probably formed the background for the emergence of Narva culture pottery in the Eastern Baltic around 5500 calBC. A second, southerly tradition reached the study area from the Dniepr-Donets cultural complex of the steppes and

forest steppes in the Northern Pontic region. In the second half of the 6th millennium calBC, it formed the basis for the development of the Dubičiai type as the early phase of the Neman culture, and probably also affected the typological evolution of Narva ceramics. The third tradition encompasses stitch and comb stamp decorated wares with origins in the Volga-Kama region, from where it spread westwards at the beginning of the 6th millennium calBC. On its basis, the Upper Volga culture developed in Central Russia, which in turn formed the basis for the emergence of Sperrings and Ka I:1 farther north. New eastern influences probably triggered the formation of the 'Northern types' in the Central Russian basin and of Säräisniemi 1 pottery in Northern Fennoscandia. Concerning these developments, the period around 5300 calBC was especially dynamic, when changes in the material culture affected almost the entire study area, either it in form of the adoption of ceramic technology in the South-Eastern Baltic and in Finland, or in the form of the emergence of new stylistic features in regions where pottery had already been established (see Fig. 16).

Conclusions

The dispersal of the earliest pottery into the region east and north of the Baltic Sea has until now been understood at best on a very general level. The lack of significant material studies has so far hindered a sound and more in-depth reconstruction of this process and of the typological and chronological developments behind it. For this reason, the research presented in this article is based on a detailed standardised investigation of 17 selected pottery complexes of the 6th and 5th millennium calBC from Lithuania, Estonia, Finland and Russia to follow up problems of typology, chronological trends, and regional trajectories. To reach these goals, correspondence analysis proved to be a useful statistical method to investigate linking and dissociative elements within the investigated ceramics complexes. The method is well-suited to account for already presumed as well as new connections and relations in the dispersal process.

The central results of the study can be summarised as follows: two large traditions lines are distinguished in the investigated material – a southern tradition with Dubičiai and Narva in the Eastern Baltic and neighbouring areas to the south, and a northern comb ceramic tradition including Sperrings, Ka I:1 and Säräisniemi in Karelia, Finland and neighbouring areas. An older tradition preceding these two lines is represented by sparsely decorated wares spreading form the Volga steppes towards the northwest. In addition, for the question of the origin and genesis of the Säräisniemi 1 type, a connection with groups far to the east in the northern Cis-Urals can be suggested, while its relation to Sperrings and Ka I:1 seems less prominent. The results presented in this paper underline the potential of detailed ceramic analysis for understanding the typological developments and interrelations even in such a vast region as the one considered here, as they enable new and differentiated insights into cultural changes among hunter-gatherer groups of the Baltic region in space and time.

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