Early Pottery Use among Hunter-Gatherers around the Baltic

ACKNOWLEDGEMENTS

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Pottery technology was traditionally perceived as an integral component of the Neolithic 'package', inextricably connected with a sedentary way of life and economic practices that involved systematic land cultivation and animal husbandry. Today, it is well-known that they were first developed by hunter-gatherer cultural groups that lived in various environments and settlement patterns, thousands of years before the transition to farming. Besides others, the circum-Baltic region has a well-documented record of ceramic manufacture by pre-agrarian hunter-gatherers. But what made this people to decide on having pottery for the first time in the late 6th and 5th millennium cal BC?

- Were early ceramics being used for processing specific foodstuffs, and if so, was it the same all over the Baltic?
- Were there any variations in use within same pottery-ware cultures?
- What about different pottery-ware traditions and traditions that shared same morphological characteristics? Did they also "serve" same functional purposes?
- Did pottery use differ between coastal and inland sites within same or among different pottery-ware traditions?

These questions, also identified in a review research paper on previous organic residue studies on hunter-gatherer pottery material from the Baltic (Paper II, see below), formed the basis of this thesis that, overall, aims at contributing to the ongoing discussions about the issue of the emergence and spread of pottery technology into the prehistoric world. The study material derives from southern Sweden (Scania), Denmark (Lolland), Finland and Estonia and consists of early pottery sequences from coastal and inland hunter-gatherer settlement sites (Papers III and IV, see below). Lipid residue analyses were employed on selected potsherds. To enabling assessments of resources processed and pottery use determinations, it was essentially important that increased lipid recovery possibilities were ensured. Lipid extractions were performed by adopting an established protocol, the high efficiency of which was proved on very old and extremely small samples from one of the oldest ceramic traditions in the world (Incipient Jōmon, ca. 13,900-13,300 BP) (Paper I, see below). Analyses were performed by using state-of-the-art physicochemical analytical techniques, namely, gas chromatography - mass spectrometry (GC-MS) and gas chromatography – combustion - isotope ratio mass spectrometry (GC-c-IRMS).

A multi-method approach was also employed using the ceramic material from southern Sweden (Scania) as a case study, which involved GC-MS (Gas Chromatography-mass spectrometry), FTIR (Fourier Transform Infrared Spectroscopy), XRF (X-ray Fluorescence) and XRD (X-ray Diffraction) analysis (Paper V). The aim was to identify the range of information we can get by combining spectral indices of the organic and inorganic fractions of the ceramic matrices and monitor changes in the chemical and clay composition through analysis of the original and lipid-extracted samples. Statistical analysis will enable findings to get highlighted (work in progress).
The list of papers below provides an overview of work performed.

List of papers

**Paper I**


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**Abstract:** Lipid residue analysis has become a common technique for the identification of the organic residues remaining from resources processed in archaeological ceramic vessels. However, recovery of lipids from the vessels can be problematic in cases of high age and/or very small sample amounts. Here we show that acid-catalyzed direct extraction and methylation offers an efficient way to obtain enough fatty acids for quantification and stable carbon isotope analysis. We compared this technique with the more conventional technique of ultrasonically aided solvent extraction followed by silylation, which gave no measurable yields. Both techniques were applied on the absorbed residues of six extremely small sample amounts of less than 0.1 g of ceramic powder each from the Sankakuyama I site, Kyushu, South Japan (~13,900–13,300 cal BP). They belong to one of the oldest so far reported pottery traditions in the world, the Japanese Incipient Jōmon. δ¹³C analysis of the identified target C₁₆:0 and C₁₈:0 fatty acids indicated that the examined vessels were used for food-processing purposes, pointing to a significant contribution of terrestrial animal sources in the residues.

**Paper II**


**Abstract:** The advancement of techniques to characterize organic matter associated with pottery vessels offers a new approach for directly addressing archaeological enquiries concerning functional aspects. This paper summarizes work to date in the field of organic residue analysis, as well as contributions of other associated techniques. The focus is on pottery used by late foragers around the Baltic, looking also at possible changes in use at the threshold to the Neolithic and at foraging choices within it. Readers are referred to studies on pottery from Northern German and Danish sites, including material from submerged and shell midden sites, as well as investigations of hunter-gatherer pottery from Swedish and Finnish sites. Future potential is also highlighted.
Paper III


Abstract: The adoption of the ceramic pottery technology by hunter-gatherers in the Baltic region has mainly been placed within the concept of resource intensification, as a cultural choice that assisted an increased economic focus on aquatic resources. In Finland, a non-specialized pottery use has recently been suggested on the basis of lipid residue analysis data for Early Neolithic ceramics from a number of sites on the south-west coast that involves processing of both aquatic and terrestrial animal products. Our study is an attempt to further explore the relationship between the early pottery use, diet and environment in this particular region. For this purpose, we expanded the range of early pottery traditions and localities to be analyzed and applied gas chromatographic and mass spectrometric (GC-MS) analysis on the absorbed lipid residues. The study material comprises ceramics of the Säräisniemi 1 (Sär 1), Sperrings 1 (Ka I:1) and Sperrings 2 (Ka I:2) pottery tradition, as well as of the Jäkärlä Ware group, from coastal and inland sites spanning a period from c. 5100 to 4000 cal. BC. Our results strengthen the above observation for Early Neolithic Finland and further suggest that both aquatic and terrestrial animal resources were processed in most of the analyzed vessel groups, irrespective of coastal/inland site division and pottery ware culture. This additionally indicates a variability of motives behind the introduction of pottery within the Baltic area.

Paper IV

Papakosta, V., E., Oras, and S., Isaksson, Early pottery use across the Baltic – A comparative lipid residue study on Ertebølle and Narva ceramics from coastal hunter-gatherer settlements in Sweden, Denmark and Estonia (in prep.).

Abstract: Pottery handicraft tradition reached the Baltic area in the mid-6th and 5th millenium cal BC. There, it was adopted by a complex of different hunter-fisher-gatherer cultural groups, who shaped their vessels in a pointed-based form. A second type of elongated shallow bowls was also used, but only by the people of the Narva culture in the eastern Baltic and the Ertebølle on the southwest of it. Based on the morphological resemblances between the Ertebølle and Narva ceramics, this study aims to explore whether these were connected with similar functional requirements. For this purpose, Ertebølle potsherds from a number of sites in southern Sweden (Scania) and Denmark (Lolland) were submitted to molecular (GC-MS) and compound-specific stable carbon isotope (GC-c-IRMS) analysis on the absorbed lipid residues. Results are discussed and compared with analogous published data of Narva pottery samples from Estonia. The focus is on coastal settlement sites. The findings suggest variations in use, which were statistically more significantly pronounced within each of the two ceramics traditions than between them. Also, while exclusively aquatic resources were processed along the coast and hinterland of Estonia, contribution of terrestrial animal resources (mainly wild ruminants) was observed in Ertebølle vessels from coastal Scania and Lolland. A more variable use,
mainly for processing marine animals of different species, was observed in the latter compared to the seemingly less variable and probably more brackish-water oriented use of the Scanian ceramics.

**Paper V**

Papakosta, V., O., Lopez-Costas, and S., Isaksson, A multi-analytical approach (GC-MS, FTIR-KBr, XRF, XRD) on ceramic potsherds from the Scanian Ertebølle pottery tradition (in prep.)