Infusion cuisine: a study of the value of foods in a pottery context across the transition to agriculture in the southern Baltic.

Volume I
Total number of volumes 2

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Submission of thesis for PhD
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April 2011
Abstract

Pottery residues offer a promising source of evidence about the types of food that were important in the Late Mesolithic and Early Neolithic, as domesticates began to be incorporated into culinary use. It is argued that although residues are not a reflection of the economy, there were diverse values to food that contributed to the sequence that domesticates appear in the archaeological record, as well as the seeming rate and extent to which they were adopted. Although calorific value has received attention (Rowley-Conwy 1984), and prestige models (Fischer 2002) acknowledge the social embeddedness of food culture, foods are also implicated in multiple evaluation processes that cross-cut the categories of ritual and mundane, prestige and subsistence. Ethnographic accounts suggest that food may be valued as perhaps medicine, for aesthetic purposes, for inducing altered consciousness, as well as negative values such as toxicity or pollution, to name a few. One way of understanding the concept of Cuisine is to suggest that it is a selective mixing and manipulation of these values into a cultural notion of food, rather than simply a literal mixing of food units into a meal, or menu. Such a concept of Cuisine is expressed in traditions of pottery use, through the choices of what it is acceptable to use certain vessels for. Investigating the values of food over time can suggest what motivations brought about a change in culinary practices to include domesticates.

This thesis reports on the results of multi-disciplinary analyses of pottery residues from sites in the southern Baltic. Lipid characterisation techniques and isotope analyses of absorbed residues and surface deposits were combined with novel plant microfossil investigations of starches from the surface ‘foodcrusts’, and stylistic information on the pots. An automated programme was developed to assign starches to a taxonomic class, based on comparison to modern reference examples according to 26 morphological variables. The combined findings suggest that foods were implicated in multiple processes of evaluation, not all of which directly motivated the change to a domesticated food economy.
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Figure 6.43. A graph showing the silica body counts mg^{-1} for the Wangels surface deposits. Blue bars indicate that all of the samples were low in phytoliths.

Figure 6.44. A table showing the automated classification of the Wangels foodcrust with a provisionally high count. The proportion of each plant present in the sample is indicated beneath the plant name.

Figure 6.45. A graph of the bulk carbon and nitrogen isotope values of the Wangels foodcrusts, showing also the values for modern reference foods.

Figure 6.46. A graph plotting the δ^{13}C values of C16:0 and C18:0 compounds from absorbed lipid in the Wangels sherds. Those samples with corresponding foodcrusts are annotated. All the samples are from Funnel Beaker style vessels and so are indicated with a red symbol. Ranges were generated using authentic marine and freshwater reference fats from Danish coastal and lake waters. Terrestrial data are a combination of published references (Dudd and Evershed 1998), with northern German wild boar and cow milk, and are plotted with 95% confidence intervals.
Figure 6.47. A graph plotting the bulk carbon and nitrogen isotope values for the Wangels foodcrusts. Each datum point is represented by a symbol that matches the class of food defined by single compound isotope analysis of the corresponding sherd fabric.

Figure 6.48. A pie chart illustrating the proportions of plants defined by automated starch classification for the only Wangels foodcrust with high starch counts mg\(^{-1}\).

Figure 6.49. A graph plotting the bulk carbon and nitrogen isotope values of the Wangels foodcrusts. Each datum point is represented by a symbol detailing the size of the vessel from which the sample derives. Diameter sizes: small= 5-15 cm, medium= 16-26 cm, large= 27-37 cm, extra large= >38 cm.

Figure 6.50. A graph plotting the bulk nitrogen and carbon isotope ratios for the Wangels foodcrusts. Each datum point is represented by a symbol indicating the type of funnel vessel the sample came from.

Figure 6.51. a) A possible fragment of eel scale, x30, b) a cycloid fish scale, almost complete, x10, c) a fragment of possible bone showing a longitudinal structure, x20.

Figure 6.52. A graph showing the length and width measurements (\(\mu\)m) for 100 randomly chosen starch granules of the same ‘bean-shaped’ class, showing the swelling alteration caused by heat. The shaded region of the graph shows the size range for modern unheated granules of this class.

Figure 6.53. The \(\alpha\)-amylose degradation of starches from four of the Tybrind Vig foodcrusts.

Figure 6.54. A graph of the starch counts mg\(^{-1}\) for the Tybrind Vig foodcrusts. High counts are indicated by samples with an orange bar, whilst low counts are indicated by a green bar.

Figure 6.55. A graph of silica body counts mg\(^{-1}\) for the Tybrind Vig foodcrusts. Those samples with a green bar indicate samples that are considered to have been used to process silica rich plants.

Figure 6.56. A table of the automated starch classification results from Tybrind Vig. The proportion of each plant represented in the starch results is given beneath the respective species’.

Figure 6.57. The types of phytoliths found in the Tybrind Vig foodcrusts.

Figure 6.58. A graph plotting the bulk carbon and nitrogen isotope ratios of the Tybrind Vig foodcrusts, also showing the values for modern reference foods.

Figure 6.59. A graph plotting the \(\delta^{13}C\) isotope values for C16:0 and C18:0 fatty acids from the lipid absorbed into the Tybrind Vig vessels. Ranges were generated using authentic marine and freshwater reference fats from Danish waters. Terrestrial data are a combination of published references (Dudd and Evershed 1998), with northern German wild boar and cow milk, and are plotted with 95% confidence intervals.

Figure 6.60. A graph plotting the bulk carbon and nitrogen isotope ratios of the Tybrind Vig foodcrusts. Each datum point is represented by a symbol indicating the food class defined by single compound isotope analysis of the corresponding sherd.

Figure 6.61. A graph plotting the bulk carbon and nitrogen isotope values for the Tybrind Vig foodcrusts. Each datum point is represented by a symbol that indicates the number of aquatic biomarkers present from absorbed and surface deposits, base on GC-MS results.

Figure 6.62. A graph plotting the bulk carbon and nitrogen isotope values of the Tybrind Vig foodcrusts. Those samples that have significant starch counts are represented by pie charts.
illustrating the proportions of different plants present based on automated starch classification.

Figure 6.63. A graph plotting the carbon and nitrogen isotope values for the Tybrind Vig foodcrusts. Each datum point is represented by a symbol indicating the stratum from which the sample derives.

Figure 6.64. The two images on the left display carbonised Salmonid fish scales, and the image on the right is a piece of possible bone or fish scale.

Figure 6.65. A graph showing the length and width measurements (μm) for 50 randomly chosen starch granules of the same ‘bean-shaped’ class, showing the swelling caused by heat. The shaded region of the graph shows the size range for modern unheated granules of this class.

Figure 6.66. The α-amylase degradation of starches from two of the Stenø foodcrusts.

Figure 6.67. A graph of the starch counts mg⁻¹ for the Stenø foodcrusts. High counts are indicated by samples with an orange bar, whilst low counts are indicated by a green bar. Bars with question marks indicate samples provisionally accepted for starch classification.

Figure 6.68. A graph of the silica body count mg⁻¹ for the Stenø foodcrusts. Those samples with a green bar indicate samples that are considered to have been used to process silica rich plants.

Figure 6.69. A table of the automated starch classification results from Stenø. The proportion of each plant represented in the starch results is given beneath the respective species.

Figure 6.70. The types of phytoliths found in the Stenø foodcrusts.

Figure 6.71. Scanning Electron Microscope images of a suspected Alliaria petiolata phytolith embedded in the carbonised matrix.

Figure 6.72. A graph plotting the bulk carbon and nitrogen isotope values of the Stenø foodcrusts, also showing the values for modern reference foods.

Figure 6.73. a) A plot of the bulk isotope values for Stenø overlaid with samples with high starch counts mg⁻¹, b) The same plot of bulk isotope values but overlaid with samples high in silica bodies mg⁻¹.

Figure 6.74. A graph plotting the δ¹³C isotope values from C16:0 and C18:0 fatty acids from the lipid absorbed into the Stenø vessels.

Figure 6.75. A graph plotting the bulk carbon and nitrogen isotope values for the Stenø foodcrusts. Each datum point is represented by a symbol that indicates the corresponding single compound isotope food class that is defined for the sherd.

Figure 6.76. A graph plotting the bulk carbon and nitrogen isotope values for the Stenø foodcrusts. Each datum point is represented by a symbol that indicates the number of aquatic biomarkers present from absorbed and surface deposits, based on lipid characterisations.

Figure 6.77. A graph plotting the bulk carbon and nitrogen isotope values of the Stenø foodcrusts. Those samples that have significant starch counts are represented by pie charts illustrating the proportions of different plants classified by automated starch identification.

Figure 6.78. A graph plotting the carbon and nitrogen isotope values for the Stenø foodcrusts. Each datum point is indicated by a symbol representing the size of the vessel.
from which the sample derives. Diameter sizes: small = 5-15 cm, medium = 16-26 cm, large = 27-37 cm, extra large = >38 cm.

Figure 6.79. A graph plotting the bulk carbon and nitrogen isotope values for the Stenø foodcrusts. Each datum point is represented by a symbol indicating the type of vessel from which the sample derives.

Figure 6.80. a) a fragment of a possible Salmonid fish scale, b) an artefact with a longitudinal structure, possibly bone.

Figure 6.81. A brightfield and polarised image of starches from foodcrust sample NMA_40882 showing an absence of cracking and heat alteration, and a sharp extinction cross indicating maintained molecular order of the granule. Mag x600.

Figure 6.82. The α-amylase degradation of starches from three of the Bog Pot foodcrusts.

Figure 6.83. A graph of the starch counts mg⁻¹ for the Bog Pot foodcrusts. Samples with orange bars (and question marks) indicate samples provisionally accepted for automated classification despite not being statistically different from exterior _S deposits.

Figure 6.84. A graph of silica body counts mg⁻¹ for the Bog Pot foodcrusts. Those samples with a green bar indicate samples considered to have been used to process silica rich plants.

Figure 6.85. A table of the automated starch classification results from the Bog Pots. The proportion of each plant represented in the starch results is given beneath the respective species.

Figure 6.86. The types of phytoliths found in the Bog Pot foodcrusts.

Figure 6.87. A graph plotting the bulk carbon and nitrogen isotope values of the Bog Pot foodcrusts, also showing comparison values for modern reference foods.

Figure 6.88. A graph plotting the bulk carbon and nitrogen isotope values of the Bog Pot foodcrusts. Those samples with significant starch counts are represented by pie charts illustrating the proportions of different plants identified by automated starch classification.

Figure 6.89. A plot of the bulk carbon and nitrogen isotope values for the Bog Pot foodcrusts. Each datum point is represented by a symbol indicating the type of vessel the sample comes from.

Figure 6.90. A plot of the bulk carbon and nitrogen isotope values for the Bog Pot foodcrusts. Each datum point is represented by a symbol indicating the form of vessel the sample came from.

Figure 7.1. A plot of the collated bulk carbon and nitrogen isotope values for all the sites, indicating samples from inland and coastal locations.

Figure 7.2. Single compound isotope values for a) coastal, and b) inland sites. Including values for Roskilde Fjord, Bjørnsholm, Norsminde, Store Åmose and Ringkloster. Red datum points indicate TRB samples, green datum points indicate EBK samples. The line indicates a theoretical mixing curve calculated by weight, so a 75% marine mammal to 25% dairy mixture will be weighted outside the modern range for marine foods, for example.

Figure 7.3. A series of pie charts collating the results of automated starch classification for inland and coastal sites, incorporating a breakdown of these regional plant traditions into EBK and TRB periods.
Figure 7.4. Bulk carbon and nitrogen isotope values for all the sites studied showing distributions of EBK and TRB samples. Modern reference foods are included.

Figure 7.5. The single compound isotope values for all the sites collated. Extra samples from Roskilde Fjord, Bjørnsholm, Ringkloster, Store Åmose and Norsminde are included. Red datum points indicate TRB samples, green datum points indicate EBK samples. The line indicates a theoretical mixing curve calculated by weight, so a 75% marine mammal to 25% dairy mixture will be weighted outside the modern range for marine foods, for example.

Figure 7.6. The results of automated starch classification on a site by site basis, with arrows indicating the time period over which each pie chart of plant use tradition spans.

Figure 7.7. A summary map showing the wider evidence for early cereal introductions in each region of the study area. Red indicates direct evidence of grains, green indicates pollen evidence of cereals, blue indicates grain impressions in pottery.

Figure 7.8. A summary map of the wider evidence of early domesticated animals. The map at the bottom is a close up of the Åmosen where a particularly high concentration of sites have been discovered with early domesticates.

Figure 7.9. A graph showing the total number of sherd with evidence of each class of food from single compound analyses, lipid characterisation and plant microfossils. Extra samples from Roskilde Fjord, Store Åmose, Ringkloster, Bjørnsholm and Norsminde are not included because there are no plant microfossil data from these sites.

Figure 7.10. A table showing the relative calorific values of different food classes for a medium-sized vessel.

Figure 7.11. Section through the midden at Ertebølle, showing the layers of shell-ash that begin in the a-ceramic period.

Figure 7.12. A chaîne-opératoire of pottery manufacture for Ertebølle-style vessels, which is similar in many ways to the Funnel Beaker chaîne-opératoire.

Figure 7.13. Greater challenges to construction are posed by vessels with curved contours (a), than more straight-sided conical pots (b). Both examples are from Tybrind Vig.

Figure 7.14. Examples of ‘teethed’ orifices on Ertebølle pottery vessels from (a-c) Bodal K, Åmosen, d-e) examples from Åkonge, Åmosen, f) an example from Neustadt, Schleswig-Holstein.

Figure 7.15. Pre-fired clay is grey but transforms to an oxidised red with firing. The process of construction embodies a management of material transformation.

Figure 7.16. An example of a very thin-walled pot from Bodal K, Åmosen. The N-construction is very oblique suggesting the paddle-and-anvil technique was used.

Figure 7.17. The relative proportions of classes of foods in pottery, compared to proportions of those classes in bone assemblages at Neustadt.

Figure 7.18. The relative proportions of classes of foods in pottery, compared to proportions of those classes in bone assemblages at Wangels.

Figure 7.19. A pie chart showing the relative proportions of the fish bones from Neustadt (Glykou 2010).

Figure 7.20. A five-year-old at Nivågård on Zealand was buried with its head resting on a stone pillow (Jensen and Hansen, 1999, 15).
Figure 7.21. a) The collective burial at Strøby Egede comprised eight individuals, five of which are child burials, b) the burial of an adult and child at Tybrind Vig.

Figure 7.22. A chart showing the ages of dietary stress shown on tooth enamel at the Skateholm cemeteries. At Skateholm II the weaning period is singular c.5 years old, but several periods of dietary stress possibly linked to multiple weaning stages are in evidence at Skateholm I.

Figure 7.23. A table showing the antibiotic constituents of different types of milk.

Figure 7.24. A wooden spoon from the Danish National Museum collection. The spoon is from Maglelyng in the Åmosen.

Figure 7.25. A table showing the lactose content of different milk derivatives.

Figure 7.26. Vessel N_22, a funnel bowl that would have had an open orifice suitable for separating cream, or whey from milk solids. Picture by K. Glykou. Scale 3:4.

Figure 7.27. A table showing the ‘weed-species’ introduced with the earliest advent of cereals in southern Scandinavia, with documented instances where these plants exhibit spice-properties. O= a minor presence, X= a considerable presence, XX= a major presence. Adapted from Regnell and Sjogren (2006c, 150-151), with additions from Watts (2007), Facciola (1998), and Bown (1995).
Acknowledgements

In memory of Eva Koch

My final task—apart from wiping the disbelieving look that three years can pass so quickly—is to muster some sort of linearity to my scattered memories and pay my respect and gratitude to all those that have helped and encourage me on the way. Here goes:

I must begin by thanking my supervisors Oliver Craig and Carl Heron, not only for the opportunity to do a PhD in the first place, but for all their efforts on my behalf, for teaching me ‘new things’ (my favourite subject), and for making the experience so action-packed with laughter. I’ve really enjoyed working with you both, and learning from you too. Thanks to Val Steele for working so hard to produce data for the project, like an oasis of calm! You’ve always been at the other end of an email with help and advice, and I’m really grateful.

Thanks also to all the project collaborators; I’ve really valued the time we’ve spent together sampling, digging, and chatting. Anders Fischer, for giving so much of your time and helping me get to grips with pottery, and for giving the project access to the Åkonge and Stenø material so freely. Thanks to Sönke Hartz, Katerina Glykou and Harald Lübke for kind permission to use the Neustadt and Wangels material. It’s been great to work with you all, and thank you for making us so welcome in Schleswig. Søren Andersen, thank you for allowing us to use the material from Tybrind Vig, and for letting me excavate at the Havnø shell midden. Thanks to Niels Wickman and everyone at Holbæk Museum for allowing me to study the Stenø pottery, making me feel so welcome, and taking me on exploratory fieldtrips to the monuments on northern Zealand. Thank you to Sørø Museum for allowing me to study the Bodal K pottery. Also, to all at Kalundborg Museum for allowing me access to study the Åkonge pottery. Also thanks to Poul Otto Nielsen for allowing the project to drill into the Danish National Museum’s beautiful ‘bog pots’. A special thank you must go to Eva Koch who sadly died whilst the project was underway. Thanks for everything Eva; for all your encouragement and contagious enthusiasm, your time and efforts even when you were ill.

Thanks to the scientific advisors that have contributed their time and knowledge: Geoff Bailey, Nicky Milner, Julie Wilson, Karen Hardy, Allan Hall, Marco Madella.
Your expertise has been invaluable. Special thanks to Nicky for patiently keeping me sane, above and beyond the duty of her official role as supreme high commander of the thesis advisory panel. Also to Marco Madella whom I’ve pestered with images of microfossils whilst he has been in every far-flung corner of the known world, thank you. Julie, I’m really glad to have had the opportunity of working with you, thanks for your efforts on my behalf. Thanks to Rick Allen for support, for keeping me on the straight and narrow of health-and-safety protocols, and for great advice including, ‘don’t drink those acorn tannins’. Thanks also to Cynthia Spiteri for running some of our experimental pots on the GC, and for teaching me to do the extraction. Also thanks to The Royal Botanical Gardens at Kew for providing some of the modern starch reference material, greatly appreciated.

I owe such a great debt of gratitude to my friends and family for supporting me over the last three years (+/-6 years build up). You’re all great, and hilarious, and valued. So, Mum, Dad, Em, Mark, Ariane, Granny Shop, Grandad Shop, Granny Seaside, Grandad Seaside, James, Leslie, Aleks, Steve, Nicky, Jon, Timur, Emma W, Andi, Irene, everyone in S Block and King’s Manor- thanks!

**Author’s declaration**

Lipid residue analyses were carried out by Dr. Val Steele at the University of Bradford. Pottery analysis of Wangels and Neustadt was provided by Katerina Glykou. Pottery analyses of the National Museum bog pots were carried out by Dr. Eva Koch of that institution. The automated starch classification programme was collaboratively produced with Dr. Julie Wilson, University of York.