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What happened in the hinterland?

A batch study of early bucket-shaped pots from the 4th and 5th centuries AD in Southwest Norway

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Introduction

One of Elna Siv Kristoffersen's major contributions to archaeology is a research agenda that seeks to grasp the individual hands at work. This focus has provided novel insights into the sociomaterial fabrics of crafts, especially metalworking, pottery and textile production, in the Migration Period (MP, AD 400-550). A seminal work is her comprehensive treatise on bucket-shaped pottery, co-authored with Bente Magnus (Kristoffersen and Magnus 2010). This provides a high-resolution chronological framework for Rogaland, Hordaland and Sogn and Fjordane[1], the core area of this distinct feature of the archaeological record of the western Scandinavian Peninsula. Emerging sometime in the 4th century AD, in the final decades of the Late Roman Iron Age (LRIA, AD 200–400), bucket-shaped pots made their way into a range of contexts (graves, dwelling houses, boathouses, caves, rock shelters). Apparently, the type disappeared rather abruptly, along with virtually all other ceramic production, around the transition to the Merovingian Period (AD 550–800). Or so the standard narrative went, until recently. Kristoffersen and Magnus' work paved the way for critical rethinking of this narrative, proving instrumental for studies of regional craft dynamics and connectivity[2]. So far, this renewed focus has resulted in an analysis that identified cross-craft intimacy between metalworking and pottery and introduced a sequencing of bucket-shaped pots into Phases I–III (Fredriksen et al. 2014), and a follow-up study that further refined the socio-technological chronology (Fredriksen and Kristoffersen 2020), as well as a comprehensive analysis of the massive but hitherto largely unpublished ceramic production site at Augland in Vest-Agder (Fredriksen et al. 2020).

[1] For the sake of comparability with earlier research, we consistently refer to the names of counties prior to 1 January 2020, when Hordaland and Sogn and Fjordane merged into Vestland and Vest-Agder and Aust-Agder became Agder. This also provides a better geographical resolution for comparison of the two sub-regions of particular interest here. Traditionally, Rogaland and Vest-Agder comprise the region Southwest Norway, while Aust-Agder is part of Southeast Norway. This topographical distinction resonates significantly better with the archaeological record for this particular segment of the Iron Age.

[2] Following Carl Knappett (2011: 61–145), we prefer the term 'connectivity' over 'connections'. While the latter tends to refer solely to lines drawn between dots on a map, 'connectivity' reflects a recognition of the intimacies between the human condition and the many nonhuman forces and agencies at play, and allows for material traces of technical acts to be incorporated into grounded sociomaterial networks on micro-, meso- and macro-levels.

An outcome of the cross-craft perspective is that we now have a well-developed understanding of the final century of bucket-shaped ceramic production. It also means, however, that we know less about the first century of production, up to AD 450/60. It is therefore of particular interest that the recent work on the Augland workshop, related to the Oddernes elite milieu, concludes that its gradual process of decline and eventual ceasing of production around AD 450/60 was concurrent with the rise of workshop milieux on Jæren in Rogaland. Specifically, the analyses identify two pulses of influence, most likely with origins in Rogaland. The first pulse is linked to the initial introduction of bucket-shaped pots in the mid to late 4th century AD, and the second to novel wares with relatively higher levels of soapstone (steatite) inclusions in the first half of the 5th century AD. Rogaland is a likely origin for this soapstone component (Rødsrud and Fredriksen 2023: 146). Consequently, the area between the two regional nodal points Augland and Jæren becomes of particular interest. What happened to regional connectivity in this hinterland during the first century of bucket-shaped ceramic production? Are we able to identify the origins of the two pulses?

This pilot study is part of a wider suite of analyses by the present authors with the ultimate aim of understanding how knowledge of the bucket-shaped ceramic technology emerged, developed, and travelled between craftspeople across space and through time. In order to bring us one step closer to this long-term goal, the study compares bucket-shaped vessels from Vest-Agder and Rogaland, all selected from graves with contextually reliable dates to the century leading up to around AD 450/60 using Kristoffersen and Magnus' (2010) framework. We trace the movements of individual pots, and the study is designed to identify vessels coming from the same batch of ceramic paste, or from a very similar paste with the same origin of clay and mineral inclusions, and using the same recipe (see below). Cognisant of the lack of sufficiently comprehensive archaeometric studies, partly due to the costs involved, we present an approach that combines qualitative macroscopy with quantitative analysis of data from a handheld X-ray fluorescence (h-XRF) device. This transferrable and low-cost sorting method establishes an intermediary analytical stage that classifies wares and identifies promising sample groups for subsequent petrographic and/or geochemical study.

Approach and research status

What can such a batch study do, exactly? An important step towards a deeper understanding of the flow of people, materials, and craft knowledge during the emergent century for bucket-shaped pottery is to get a better grasp of the various recipes – paste compositions, techniques, and decorative elements – at work. Studying ceramics through a *chaîne opératoire* lens, we seek to capture key technological and social elements of specific learning networks (Rebay-Salisbury et al. 2014). The focus is on factors that influence knowledge transfer through apprenticeship and cause changes to technologies and materials over time. Significantly, the various elements of a recipe are material citations of a certain learning environment within apprenticeships, or of a group of people, a place, or a landscape. Such citations of locations and past events create subtle socio-material geographies, and the movements of materials and knowledges can be traced via sophisticated archaeometric studies (see Fredriksen and Lindahl 2023 for discussion and references).

Using such a recipes approach, a recent piece co-authored by Siv (Fredriksen and Kristoffersen 2020) showed how bucket-shaped potting developed into a 'technology of remembrance' in the century after AD 450. This study wove the dimension of craft as memory work into the established research status for this enigmatic century: certain ceramic craft networks rose to prominence and culminated in workshop milieux intimately tied to the formation of central places such as those identified in Jæren, Rogaland after

around AD 450/60. These milieux eventually made bucket-shaped vessels alongside Salin's Style I metalwork, lingering into the first decades of the 6th century AD after virtually all other ceramic production had vanished. The majority of ceramic production had died out by AD 500, most likely as part of a wider suite of changes in the household as social institution (Fredriksen et al. 2014). The current study extends the technological history of bucket-shaped pottery backwards to its emergence in the final decades of the 4th century AD.

Comprehensive research overviews are available elsewhere (e.g., Kristoffersen and Magnus 2010; Fredriksen et al. 2014; Fredriksen et al. 2020) and so we limit the following to a synopsis of the socio-technological chronology, an extraction of key points for guidance when tracing origins and connectivity, and a brief survey of the formation of relevant elite centres and intra-regional connectivity during the 4th and 5th centuries AD. Kristoffersen and Magnus' (2010) detailed analysis resulted in a firm relative chronology that divides the two centuries of bucket-shaped pottery production into 50-year segments: AD 350–400, 400–450, 450–500 and 500–550. This enabled a socio-technological chronology into Phases I–III (Fredriksen et al. 2014: 120). For this study the definitions of Phases I and II (Fredriksen and Kristoffersen 2020: 109) are of particular interest:

Phase I (late 4th and early 5th century AD): emergence and establishment of standardized aesthetics and pastes, including early use of the mineral additives asbestos and soapstone.
Phase II (middle to late 5th century AD): experimentation and acceleration, intimacy between high quality bucket-shaped pot making and metal technology.

Significantly, the two pulses of influence at Augland may be related to these two phases: the first pulse corresponds to early Phase I and the second to the transition to Phase II, continuing until the ceasing of production around or soon after AD 450/60 (Fredriksen et al. 2020).

The origins of bucket-shaped pottery are notoriously difficult to pin down. This is primarily due to its generic, easy-to-copy production method. Fortunately, previous research provides us with at least three waypoints for guidance when staking out the course of a study of emergence and early distribution. First, its introduction may be linked to a change in culinary practices (Kleppe and Simonsen 1983). Second, we may safely assume that Rogaland was a core production area throughout the era of bucket-shaped ceramic production. The third waypoint is an observation that turns out to be highly relevant for this study: while the early sub-series of bucket-shaped pots labelled AB1 was produced in Rogaland up to the second half of the 5th century AD, it seems the majority of the production of AB1 vessels took place elsewhere in Rogaland than Jæren (Kristoffersen and Magnus 2010: 43). This means that a search for origins needs to include other landscapes than Jæren, which is characterised by a very fertile lowland, flat and cultivated, with wide vistas and an exposed coastline with sand or pebble beaches. As we will see, of particular interest here are the landscapes of the outer fjords, with sloping hillsides and good conditions for cultivation and pasture, and along their inner edges to the mid fjords, characterised by moraines, narrow fjords and valleys, and steep waterways (cf. Østmo 2020: 74–75, table 2.2 and fig. 2.2).

The Augland study (Fredriksen et al. 2020) adds significant detail to the regional dynamics in Vest-Agder and Rogaland. The seminal works by Haakon Shetelig (1905) and Johs. Bøe (1931) had established the co-existence of two distinct ceramic production modes with different geographical origins and historical trajectories. The earlier southern mode (Fredriksen et al. 2020: 442–445) appeared around AD 200 and came to an end by the 6th century AD. This consists of vessels made by coiling, and culminated in the production of sophisticated black burnished

wares. The excavations at Augland (Rolfsen 1980) established that this was a key production site for black ware and well-known LRIA and MP types like the serving vessels R360 and R361. Birgitta Hulthén (1986) showed that most of these vessels were made using a form of coiling known as the N technique. The second mode is the bucket-shaped or western mode, where pots were made using a markedly different plate/mould technique. The two modes belonged to overlapping but distinct exchange networks. The southern mode had its nodal points along the Skagerrak coastline while the western mode was anchored in communities along the North Sea coast, from Rogaland to Sogn. Significantly, from a learning network perspective (Wallaert-Pêtre 2001), this was the meeting between an older and relatively closed network characterized by a strict and faithful reproduction of style, and a more open network characterised by a 'flat' structure without discernible nodal points for learning, adaptability to unknown situations, and a tendency for trial-and-error.

The cessation of manufacture at Augland coincides with the transition to Phase II for the western mode, and more broadly with a lack of gold prestige finds in Vest-Agder (Reiersen 2017: 317–18). Fredriksen et al. (2020: 460) found these concurrences to indicate that the nodal points along the southern Skagerrak coast were struggling to cope with the new elite milieux along the North Sea coastline, probably in Jæren in particular, where potting merged with Style I metalworking.

Keeping in mind that a study of early bucket-shaped ceramic production needs to look beyond Jæren, our discussion is informed by two recent works on regionality in southwest Norway. The first has already been introduced; this is Mari Østmo's (2020) innovative environmental analysis of intraregional diversity in Rogaland in the Iron Age. As indicated above, the landscape districts of interest are, in addition to Jæren, the outer fjords and their inner edges to the mid fjords. The other key study is Håkon Reiersen's (2017: 220–298) comprehensive analysis of centre formation (see Figure 3 with caption). In Vest-Agder, the centres at Lista/Sande, Spangereid and Langeland are highlighted here. In Rogaland, the Riska, Rennesøy and Bjoafjord centres are of particular interest. The latter come in addition to the Jæren cluster, which included at least five centres.

Materials and methods

This pilot study consisted of three steps, following previously established procedures (Fredriksen et al. 2020; Fredriksen and Lindahl 2023). The first was the selection of 76 ceramic samples of vessels from Rogaland and Vest-Agder in the collections at the Museum of Archaeology (MA), University of Stavanger and the Museum of Cultural History (MCH), University of Oslo. Sixty samples from Rogaland were selected from Kristoffersen and Magnus' (2010) catalogue, while 16 samples from Vest-Agder were chosen on the basis of the same criteria. This means that all samples are from graves with firm dates to Phases I and II.

The second step was the analysis of data from a handheld X-ray fluorescence (h-XRF) device. Despite the challenges and pitfalls of its use in ceramic analysis, h-XRF was chosen because it provides an intermediary stage for the identification of samples for subsequent archaeometric study (Fredriksen et al. 2020: 445). All samples were analysed by the same instrument, a Thermo Scientific portable analyser Niton XL3t 970 GOLDD+, set to mining Cu/Zn. The analyser is equipped with four filters: Main, Low, High and Light range, and the measuring time for each filter was set at 30 seconds. For the samples at the MA, three analyses at different locations of the samples were taken, while four analyses were taken for the samples at the MCH, using the same procedure. Subsequently, the average value was used as the 'true' value of the sample (Bergman and Lindahl 2016). Clay, and by default ceramics, consists mainly of the elements Silicon (Si) and Aluminium (Al) in the oxide states SiO_2

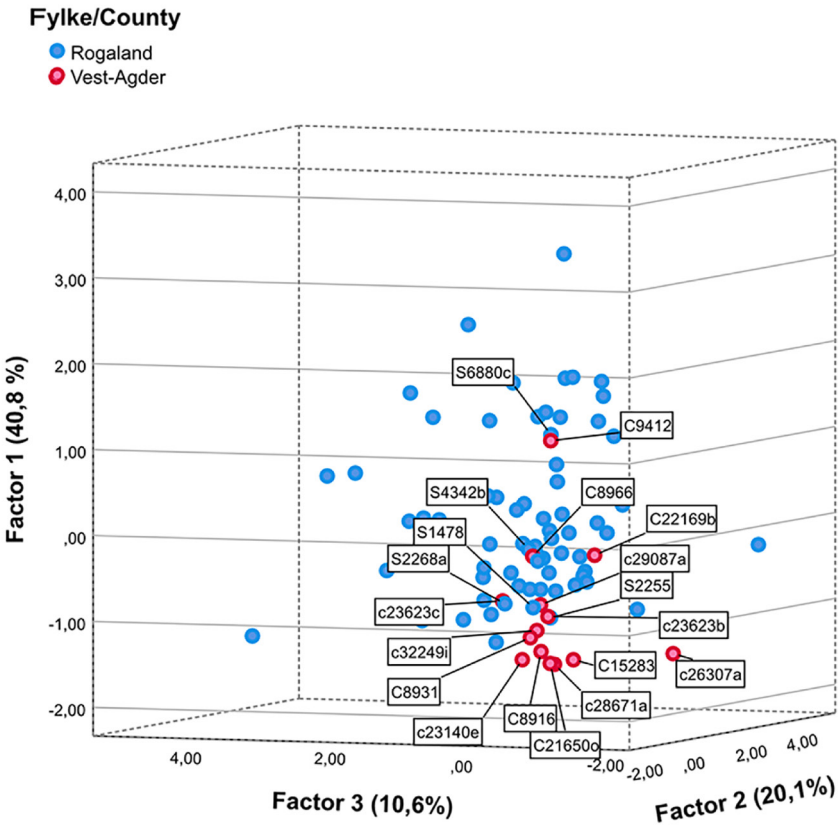

Figure 1. Analysis of h-XRF data. 3-D graph displaying the samples from Rogaland and Vest-Agder based on the results of the PCA of all elements in the h-XRF analysis (main elements and trace elements). Total variance explained in brackets at the different Factors. PCA by Anders Lindahl.

and Al_2O_3, as well as quite a large proportion of Iron (Fe_2O_2/Fe_2O_3), Calcium (CaO), Potassium (K_2O), Titanium (TiO_2), Manganese (MnO), Magnesium (MgO) and Phosphorous (P_2O_5). All these are normally found in percentage amounts (%). Other elements are only detected as parts per million (ppm). Since the h-XRF only detects the elements, not the oxides, the major elements have been recalculated and normalised to 100%.

All statistical calculations were performed using IBM SPSS Version 27. The variations of the three readings for the different elements in the h-XRF analysis was tested by the one-way ANOVA before using the geometrical average as an estimate of the element. Principal Component Analysis (PCA) was used as a dimension reduction technique to transform the large number of variables (oxides/elements) into a smaller number of uncorrelated variables. In addition, in order to securely establish that the PCA plots indeed identified samples made using an identical or a very similar paste recipe, a hierarchical cluster analysis using Ward's method was performed. The resulting dendrogram (Yim and Randeen 2015) was tested in a K-means cluster analysis to validate the most optimal number of clusters. Importantly, this test confirmed that the differences in chemical composition between the different groups and sub-groups identified may be reliably interpreted as representing different production sites.

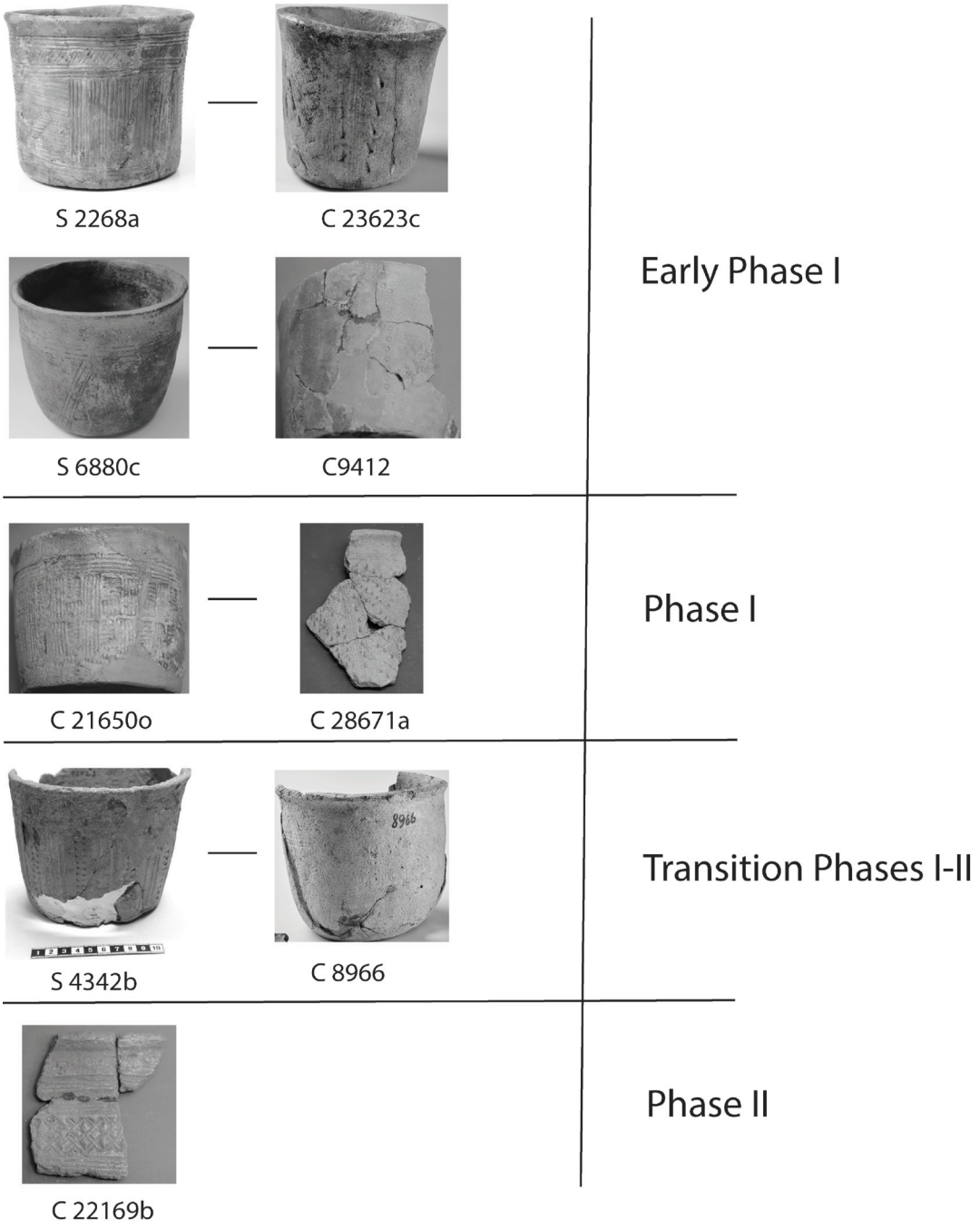

Figure 2. Chronology of identified samples: A relative sequence of identified batch matches. Note that the Phase II sample does not have a match. Photos by Terje Tveit/AM (S 2268a, S 6880c), Davies Borrowman/Kim Alexandra/AM (S 4342b), Ulla Schildt/MCH (C 8906, C 23623c) and PD Fredriksen (C 9412, C 21650o, C 22169b, C 28671a).

Museum ID	Location	Relative date	Ware mm	References	Batch match
Rogaland					
S1478	Tu, Klepp	Transition Phase I-II	5	Kristoffersen & Magnus 2010: F31, 117; Engevik 2008: 42, 213	**C29087a**
S2255	Østabø, Vindafjord	Early Phase I	3	Kristoffersen & Magnus 2010: F35, 118; Engevik 2008: 214	**C23623b**
S2268a	Mæland, Sandnes	Early Phase I	5	Kristoffersen & Magnus 2010: F23, 118; Engevik 2008: 48-49, 214	**C23623c**
S4342b	Høyland, Time	Transition Phase I-II	4	Kristoffersen & Magnus 2010: F24: Engevik 2008: 216	**C8966**
S6880c	Hodnafjell, Stavanger	Early Phase I	5	Kristoffersen & Magnus 2010: F44; Engevik 2008: 42, 217	**C9412**
Vest-Agder					
C8916	Stoveland, Mandal	Phase I	3	Engevik 2008: 42, 210	
C8931	Stoveland, Mandal	Phase I	4	Engevik 2008: 44-45, 210	**C32249i**
C8966	Bringsdal, Mandal	Transition Phase I-II	5	Engevik 2008: 42, 210	**S4342b**
C9412	Presthus, Lindesnes	Early Phase I	7	Engevik 2008: 62, 210	**S6880c**
C15283	Åmodt, Kvinesdal	Phase I	5	Engevik 2008: 45-46, 211	
C21650o	Foss Ytre, Lyngdal	Phase I	5	Engevik 2008: 48-49, 212	**C28671a**
C22169b	Stokke, Farsund	Phase II	5	Engevik 2008: 44-45, 212	
C23140e	Stallemo, Vennesla	Phase I	4	Engevik 2008: 42, 212	
C23623b	Moi Øvre, Kvinesdal	Early Phase I	5	Engevik 2008: 45-46, 212	**S2255**
C23623c	Moi Øvre, Kvinesdal	Early Phase I	6	Engevik 2008: 44-45, 212	**S2268a**
C26307a	Vatne Ytre, Hægebostad	Phase II	5	Engevik 2008: 47, 212	
C28671a	Åmodt, Kvinesdal	Phase I	6	Engevik 2008: 45-46, 212	
C29087a	Halse, Mandal	Transition Phase I-II	4	Engevik 2008: 48-49, 212	**S1478**
C32249i	Rosfjord, Lyngdal	Phase I	5	Engevik 2008: 44-45, 212	

Table 1. List of samples identified in the h-XRF analysis: Location, relative chronology, ware thickness and batch match. Early Phase I samples (first pulse) in light grey; transition Phase I-II samples (second pulse) in dark grey. Table by PD Fredriksen.

The three-factor PCA plot of samples from Vest-Agder and Rogaland (Figure 1) provided the departure point for the third analytical stage: a qualitative analysis of selected samples that included macroscopic examination (typology, ware thickness) and inspection of available contextual information in museum archives. Given the focus on the hinterlands around and between Augland and Jæren, three categories of samples were identified based on the PCA plot: a) having identical or very similar geochemical signatures (batch match), b) forming a distinct group between the two nodal points Augland and Jæren, and c) being markedly different. The identification of three categories helped isolate 19 samples of particular interest to this study. Consequently, the museum ID numbers of these 19 samples were added to the plot: all 14 samples from Vest-Agder and five samples from Rogaland identified as direct batch matches with Vest-Agder samples. Significantly, the firm contextual dates of the Rogaland samples provided the framework for organising the selected samples chronologically, relating to the established Phases I and II (Figure 2, Table 1).

Results of the batch study

As indicated above, this pilot study is part of a wider suite of analyses of early bucket-shaped pottery. This material consists of 195 samples in total and covers south Norway up to Sunnmøre. The preliminary results suggest that there are two main clusters in western Norway: a northern centre in Sogn and Fjordane and Sunnmøre, and a southern dominated by samples from Rogaland. Perhaps not very surprisingly, the two major tempering agents, asbestos and soapstone (steatite), correspond almost exclusively to regional groups, with asbestos related to the northern group and soapstone to the southern (see Engevik 2008 for discussion). One particular aspect of these results has informed the current study. The material from Vest-Agder

is somewhat ambiguous: while a majority of the samples are located at the fringes of the main Rogaland cluster, a significant portion seems to form a separate group.

This broader picture should be kept in mind when turning to the results of the final step of this study (Table 1), which establishes a relative chronology and evaluates its implications for development of connectivity during the century in question. Our analysis finds that the five identified Rogaland samples belong to two temporal horizons: the first in early Phase I and the second around the transition between Phases I and II. When relating the identified samples from Vest-Agder to this temporal framework for Rogaland, the result is a finely-tuned relative sequence with two temporally distinct groups (Figure 2). Significantly, not only do the two groups correspond well with the two pulses of influence previously identified for the Augland ceramic workshop, the mapping of direct batch matches between the two sub-regions (Figure 3) also indicates a shift of location within Rogaland from the landscapes of the outer/mid fjords to the agriculturally-richer landscapes of Jæren. Specifically, the early Phase I group links the LRIA and MP centres (Reiersen 2017: 221, fig. 7.1) Lista/Sande and Spangereid in Vest-Agder with similar centres at Bjoafjord, Rennesøy and Riska in Rogaland. The later transitional Phase I-II group, on the other hand, links the Langeland centre in Vest-Agder, located further to the east than Lista/Sande and Spangereid, with coastal Jæren in Rogaland.

In addition to the five direct matches between the two sub-regions, our analysis identifies two direct batch matches within Vest-Agder:

C 32249i Rosfjord, Lyngdal – C 8931 Stoveland, Lindesnes
C 21650o Foss Ytre, Lyngdal – C 28671a Åmodt, Kvinesdal

These four vessels are all dated to Phase I, to the first part of the 5th century AD. Moreover, they form the core of a distinct Vest-Agder cluster of seven identified Phase I vessels (Table 1). Importantly, the vessels in this cluster have more in common with vessels from the outer/mid fjords in Rogaland (first pulse) than with the Jæren vessels (second pulse). With one exception, the gravitational loci of this cluster are the two centres at Lista/Sande and Spangereid. Interestingly, the one exception is from Vennesla (C23140e), located further to the east. This vessel and another from Lindesnes (C15293) are dated to AD 450-500, thereby belonging to Phase II. Significantly, this later date for the use of the same or similar batch recipes shows that certain recipes could be resilient and remained in use throughout most of the 5th century AD.

Two vessels from Vest-Agder, C 22169b from Farsund and C 26307a from Hægebostad, were quite different from the rest of the sample set. Both vessels are dated to AD 450–500. This means that they fall outside the scope of this study. Nevertheless, although a larger sample set is needed for a comprehensive discussion, it is interesting to note that their origins are most likely quite different: while the vessel from Farsund is related to a cluster in Rogaland, the Hægebostad vessel stand out as quite distinctive from the rest of the samples. Visual analyses show that this has extremely high contents of steatite, which helps to firmly place this vessel in Phase II.

Two pulses and a shift of gravity

This is a pilot study of connectivity based on batch recognition and not a conventional provenance study, and we are careful about drawing too wide-reaching conclusions. However, we note that our results so far fit quite well with previous findings, while also adding some significant detail to the picture for the first emergent century for bucket-shaped pottery. Importantly, all five identified Rogaland vessels belong to the AB1 shape sub-series. As the parallel AB2 sub-series has the earliest known dates (Kristoffersen and Magnus 2010), this means that our study does not

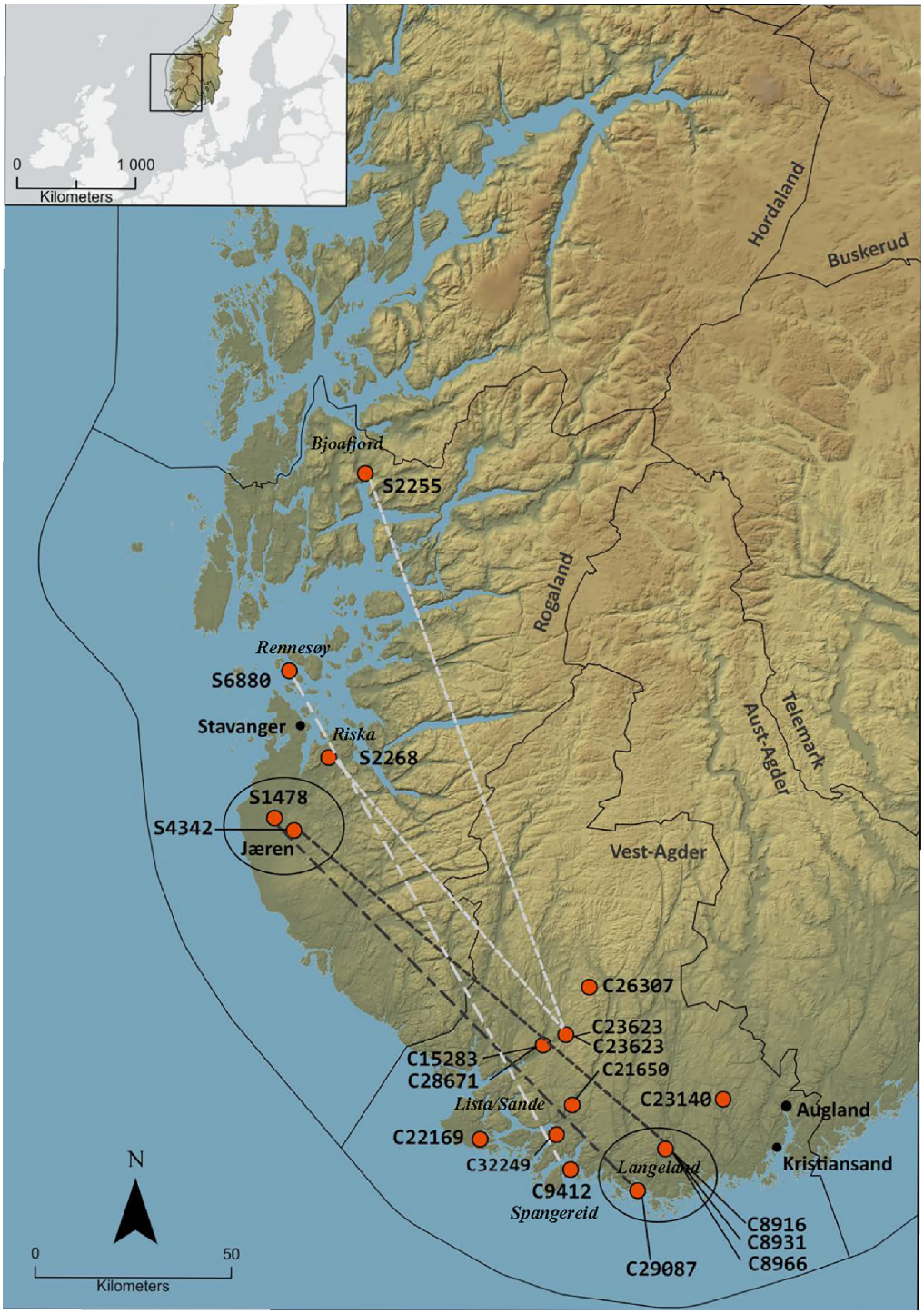

Figure 3. Map of study region with places mentioned and location of all listed samples.
Map by Anastasia Bertheussen.

identify the earliest vessels. Future work should include a comparison of the two core areas for AB2, namely Sogn and Rogaland. However, our study is helpful for future studies by indicating that a search for the origins of bucket-shaped pottery should be concentrated to the outer/mid fjord landscape districts, at least for Rogaland. Also, it should be added that our macroscopic analysis found all of the 19 identified vessels to be tempered with soapstone. While there are few, if any, known contemporary quarries of soapstone in Vest-Agder, there are several in Rogaland (Hansen and Storemyr 2017; Rødsrud and Fredriksen 2023).

Returning to the question of connectivity between the two sub-regions in the first century of bucket-shaped ceramic production, the mapping of the established relative chronology (Figure 3) clearly shows two temporal horizons, and these correspond well with the two pulses of influence identified at Augland. The direct batch matches between Rogaland and Vest-Agder indicate early inner routes (light stippled lines) that connected the centres at Lista/Sande and Spangereid with centres in the outer/mid fjords in Rogaland: Bjoafjord, Rennesøy and Riska near the present-day town of Sandnes. Interestingly, the Sandnes area has rich clay deposits and has been identified as a likely origin area for bucket-shaped pottery (Bøe 1931; Kleppe and Simonsen 1983). The later outer routes (dark stippled lines) are suggested by the direct batch matches between the Langeland centre in Vest-Agder and an axis of magnate farms in Jæren. The samples date this to the transition between Phases I and II in the mid-5th century AD. This implies that 1) the outer routes correspond to the second pulse and thereby signals the cessation of large-scale ceramic production at Augland, and 2) that Jæren's areas of influence increased, most likely as a result of a shift of power gravity from the nodal points along the Skagerrak coast to the new magnates along the North Sea coast.

When comparing the second pulse to the first, the shift within Rogaland between the two might reflect a different rationale for the flow of raw materials used in ceramic crafts. For the establishment of the Jæren workshops from the transition to Phase II onwards, proximity to the magnate farmsteads seems to have been important. Compared to the outer/mid fjords, the Jæren locations imply a relative increase in the time and energy spent on transportation of necessary raw materials to the workshops. Interestingly, a similar observation was made by Hulthén (1986) for the bucket-shaped pots at Augland. Subsequent analyses of Augland dated these vessels to the Phases I–II transition (Fredriksen et al. 2020). Consequently, the present evidence suggests that an increase in the use of raw materials transported over longer distances happened around the same time in Jæren and Augland. As this significant change corresponds to the increased intimacy with Style I fine-smithing from the mid-5th century AD, it seems likely that magnate farms in Jæren established workshops that relied on the import of raw materials via established networks to a higher degree than at earlier production sites.

Concluding remarks

This batch study indicates a significant development of connectivity in Southwest Norway for the century in question. Three key aspects may be highlighted for future research. Firstly, a comparison of the earliest bucket-shaped pottery (the AB2 and AB1 subseries) in Sogn and Rogaland should, at least for the latter area, centre attention on the outer/mid fjord landscapes. The second aspect is related to the likely increase in travel distance for incoming raw materials to the Jæren workshops. As they seem to have been established in proximity to political leadership, a working hypothesis is that these workshop milieux, as more clearly defined nodal points for learning and apprenticeship, adopted more of the characteristics of closed learning networks, such as a stricter reproduction of style. Finally, we have detected a temporal shift between known centres and estates internally in Vest-Agder. The eastward

shift seems to coincide with the second pulse at Augland, probably following in the wake of its dwindling production and importance. This opens up for a renewed discussion of the strategic importance and connectivity of the Lista/Sande, Spangereid and Langeland centres (Stylegar 2001; Lund 2008; Reiersen 2017: 82, fig. 4.2) in the 4th and 5th centuries AD.

Abstract

Rogaland in southwest Norway was a core production area for bucket-shaped pottery throughout the ca. 200-year period spanned by these finds. Largely thanks to Elna Siv Kristoffersen's work we have a well-developed understanding of the final century of this characteristic Migration Period find: certain ceramic craft networks rose to prominence, culminating in workshop milieux intimately tied to the formation of central places like those in Jæren, Rogaland from around AD 450/60, eventually making bucket-shaped pots alongside Style I metalwork. This inventive cross-craft focus notwithstanding, we know less about the first century of production. A recent study suggests that the rise of the Jæren workshop milieux was concurrent with a gradual decline of the Augland ceramic workshop, related to the Oddernes elite milieu in Vest-Agder. Consequently, the areas around and between these two regional nodal points have come to be of particular interest. What happened to connectivity in this hinterland during the emergent first century of bucket-shaped ceramic production? This batch study identifies paste recipes and traces the movements of pots. Cognisant of the lack of comprehensive archaeometric studies, partly due to costs, we present a transferrable and relatively inexpensive approach that combines qualitative macroscopy with quantitative analysis of data from a handheld X-ray fluorescence (h-XRF) device.

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