Daily life in the Roman Republican countryside
Daily life in the
Roman Republican countryside
A ceramic perspective on change and continuity in the production,
distribution and consumption of cooking wares from the Pontine region
(Central Italy), 4th–1st centuries BC

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Abstract

Daily life in the Roman Republican countryside (4th–1st centuries BC) was influenced by the lasting effects of unification and integration into the Roman state. The outcomes of this process varied between areas depending on the local environment and pre-Roman history, leading to variation in daily practices among rural communities. This study aims to shed new light on the rural communities of the Pontine region and how they were impacted by larger-scale socio-economic processes. Through a detailed study of the production, distribution and consumption of cooking wares retrieved during surveys of farmsteads in the region, elements of change and continuity are explored.

In order to be able to connect small-scale data obtained from ceramic fabrics and individual sherds to large-scale socio-economic and top-down political processes, a multi-scalar behavioural framework centred on the life cycle of cooking wares is employed. The assemblages recovered from consumption contexts are viewed as remnants of habitual behaviour performed in domestic settings. Indirectly, the ceramic fragments also provide information about the production and distribution of these pots through their fabrics.

The morphological longevity and standardisation of different vessel forms suggests that production technology and consumption practices were widely shared, leading to the conceptualisation of what a cooking pot should look like. Minor morphological, technological and distributional changes occurred in the first half of the 2nd century BC. These tentatively point to changes in the organisation of production and distribution mechanisms, with regional and interregional producers supplying the Pontine pottery markets. This coincided with much wider societal changes associated with the Second Punic War.

The assemblage study reveals intra-regional variation and similarities. The Pontine plain shows a high level of uniformity in the assemblages, suggesting a homogenous population of (Roman) colonists settling the previously uninhabited but now drained marshland in the late 4th century BC. On the other hand, the coastal area shows more variation in consumption practices, reflecting the co-habitation of different groups such as the Volscians and Latins, mixed with Roman colonists, as well as possibly more socio-economic diversity between households. Diachronically, Mid-Republican foodways were centred on (semi)liquid foods prepared in jars and served in bowls, supplemented with a pre-Roman local tradition of bread baking. By the Late Republican period, foodways and their associated assemblages became more varied. Nonetheless, by the end of the 1st century, what inhabitants of the region would serve for dinner would still have been somewhat recognisable to their Mid-Republican ancestors.

Keywords: Roman, countryside, ceramic, cooking wares, foodways

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Table of contents

Chapter 1 Introduction: cooking wares as a lens to daily life in the countrysides ........................................1
  1.1 Republican cooking wares: research gap and opportunities ........................................................................3
  1.2 Aims, goals and research questions .............................................................................................................4
  1.3 Cooking ware studies .................................................................................................................................4
  1.4 Framework: a ceramic perspective on daily life in the Pontine countryside ..........................................6
  1.5 Method and sampling of the Pontine region dataset ..................................................................................7

Chapter 2. Up-scaling contexts: pots, people and processes .................................................................10
  2.1 Scale 1: Pots .................................................................................................................................................11
  2.2 Scale 2: Farmsteads and households ........................................................................................................15
  2.3 Scale 3–4: Localised processes in the Pontine region: local histories, local trajectories .........................16
  2.4 Scale 5: Large-scale processes: the Roman Republic ............................................................................25

Chapter 3. Pots, people and processes: cooking wares as reflections of habitual behaviour ........30
  3.1 Human behaviour at the intersection of scales .........................................................................................30
  3.2 Opportunities, constrains and socially acceptable choices – behaviour as connector .......................33
  3.3 Intertwining things and people ................................................................................................................35
  3.4 Things, people and scalar processes: human behaviour as the connector .........................................37

Chapter 4. Cooking ware production in Republican Italy. Part 1: The behavioural chain of Roman Republican cooking ware production .................................................................38
  4.1 The behavioural chain of making cooking pots .........................................................................................38
  4.2 Introduction to the ceramic dataset: limitations and opportunities .......................................................45
  4.3 The behavioural chain of making cooking pots: steps and choices reflected in the fabrics of the Pontine region ...............................................................................................................46
  4.4 Conclusion: change and continuity in the behavioural chain of the cooking pots from the Pontine region ....56

Chapter 5. Cooking ware production in Republican Italy. Part 2: Standardisation and production organisation of cooking wares ..............................................................................................................58
  5.1 Degrees of standardisation ..........................................................................................................................58
  5.2 Measures of uniformity in the Pontine cooking wares ..............................................................................60
  5.3 From sherds to standards to production organisation .............................................................................66
  5.4 The ceramic landscape of southern Lazio: pottery production locations ..............................................67
### 5.5 Change and continuity in cooking ware production organisation during the Republican period: from fragmentation to centralisation

Chapter 6. Pontine pottery markets

<table>
<thead>
<tr>
<th>Section</th>
</tr>
</thead>
<tbody>
<tr>
<td>6.1 Roman market integration and extending distribution networks</td>
</tr>
<tr>
<td>6.2 Pontine infrastructure: connecting the Pontino to the expanding Roman world</td>
</tr>
<tr>
<td>6.3 The Pontine market: where to buy pottery?</td>
</tr>
<tr>
<td>6.4 Pontine connections: the cooking wares</td>
</tr>
<tr>
<td>6.5 Pontine connections: a closer look at amphorae and black-gloss pottery</td>
</tr>
<tr>
<td>6.6 Patterns of pottery trade in the Pontine region</td>
</tr>
</tbody>
</table>

Chapter 7. From cooking pots to meals: a material-based approach to Roman foodways

<table>
<thead>
<tr>
<th>Section</th>
</tr>
</thead>
<tbody>
<tr>
<td>7.1 Food ‘assemblages’: the Republican meal</td>
</tr>
<tr>
<td>7.2 Food production in the Pontine region</td>
</tr>
<tr>
<td>7.3 Kitchen objects: fabric + form follows function?</td>
</tr>
<tr>
<td>7.4 Pontine pottery assemblages: the material remains of the Republican meal</td>
</tr>
<tr>
<td>7.5 Transport and food storage in the Pontine region</td>
</tr>
<tr>
<td>7.6 Food processing</td>
</tr>
<tr>
<td>7.7 Serving food</td>
</tr>
<tr>
<td>7.8 Pontine culinary practices: sets of things</td>
</tr>
</tbody>
</table>

Chapter 8. Household consumption practices

<table>
<thead>
<tr>
<th>Section</th>
</tr>
</thead>
<tbody>
<tr>
<td>8.1 Pottery functional assemblages</td>
</tr>
<tr>
<td>8.2 Form and cooking ware type assemblages</td>
</tr>
<tr>
<td>8.3 Fabric assemblages</td>
</tr>
<tr>
<td>8.4 Pontine foodways in the Republican period</td>
</tr>
</tbody>
</table>

Chapter 9. A ceramic perspective on daily life in the Roman Republican countryside

<table>
<thead>
<tr>
<th>Section</th>
</tr>
</thead>
<tbody>
<tr>
<td>9.1 Bottom-up histories: from minerals to historical processes</td>
</tr>
<tr>
<td>9.2 The middle ground: production, distribution and consumption of cooking wares in the Republican period</td>
</tr>
<tr>
<td>9.3 The bigger picture: change and continuity in daily life in the Republican countryside</td>
</tr>
</tbody>
</table>

Chapter 10. Conclusions

Bibliography

Appendix I. Sampling strategy and methodology

<table>
<thead>
<tr>
<th>Section</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sampling in survey archaeology and Roman ceramic studies</td>
</tr>
<tr>
<td>Step 1: criteria for deselection of sites</td>
</tr>
</tbody>
</table>
List of Figures

Figure 1.1. The Pontine region and the case study areas with the selected sites ...................................................2
Figure 1.2. Flow model of the life cycle of cooking ware .....................................................................................5
Figure 1.3. Sample selection funnel ...................................................................................................................7
Figure 2.1. Visualisation of the different scales and their relationship to behaviour .............................................11
Figure 2.2. Overview of the Olcese types sampled for thin-sectioning .................................................................14
Figure 2.3. Main sites and roads in the Pontine region .......................................................................................19
Figure 3.1. Theoretical model ..............................................................................................................................31
Figure 3.2. Scales within the behavioural system ................................................................................................32
Figure 3.3. Flow model of cooking ware ..............................................................................................................33
Figure 4.1. Behavioural chain of cooking ware production ..................................................................................39
Figure 4.2. Overview of the quartz-feldspar fabric family ...................................................................................48
Figure 4.3. Overview of the volcanic fabric family ...............................................................................................49
Figure 4.4. Variation in temper sources ...............................................................................................................50
Figure 4.5. Indications for clay paste preparation ...............................................................................................51
Figure 4.6. Forming methods ...............................................................................................................................53
Figure 4.7. Sample MC102376.1.2 .......................................................................................................................54
Figure 4.8. Variation in firing atmosphere ...........................................................................................................55
Figure 5.1. Overview of type variation within the fabric groups ..........................................................................61
Figure 5.2. Uniformity and variation in rim morphology .....................................................................................64
Figure 5.3. Map of the production sites in the Pontine region and surrounding areas ...........................................69
Figure 6.1. Pottery trading options ......................................................................................................................79
Figure 6.2. Infrastructure in the Pontine region ..................................................................................................81
Figure 6.3. Distribution of the fabrics within the Pontine region .........................................................................84
Figure 6.4. Amphorae consumption trend Pontine plain ....................................................................................88
Figure 6.5. Amphorae consumption trend coastal area .......................................................................................88
Figure 7.1. Regional and local baselines of pottery consumption based on functional categories ......................100
Figure 7.2. Regional and local baselines of pottery consumption based on forms ............................................100
Figure 7.3. Local baselines of pottery consumption related to the preparation of food based on forms ......................................................102
Figure 7.4. The baking of bread in a clibanus ..............................................................................................................................................103
Figure 7.5. Local baselines of pottery consumption related to serving based on forms .................................................................105
Figure 7.6. Diachronic baselines kitchen ware ........................................................................................................................................106
Figure 7.7. Diachronic baselines serving vessels ......................................................................................................................................106
Figure 7.8. Diameter data cooking ware types .........................................................................................................................................109
Figure 7.9. Diameter data black-gloss forms ..........................................................................................................................................110
Figure 8.1. Location of Mid- and Late Republican sites in the case study areas .....................................................................................115
Figure 8.2. Overview of the pottery functional assemblages .........................................................................................................................116
Figure 8.3. Overview of the form assemblages ........................................................................................................................................119
Figure 8.4. Diameter sizes for the Olcese ollae, coperchi and tegami ..................................................................................................124
Figure 9.1. Life cycle of cooking ware ......................................................................................................................................................130
Figure I.1. Sampling steps and sample selection funnel ............................................................................................................................159
Figure I.2. Location of PRP surveys .......................................................................................................................................................159
Figure I.2. Location of Republican sites in the Pontine plain and coastal area with different buffer zones .................................................166
Figure I.3. Overview of the database and the relationships between the different tables .........................................................................168
Figure III.1. A = M-fabric A. B = M-fabric A with slip. C = M-fabric C. D = M-fabric D .................................................................192
Figure III.2. A = M-fabric E. B = M-fabric F. C = M-fabric G. D = M-fabric H ......................................................................................193
Figure III.3. A = M-fabric I. B = M-fabric J ........................................................................................................................................194
Figure IV.2. A = V.1. B = V.2. C = V.3. D = V.4 ........................................................................................................................................212
Figure IV.3. A = VL. A. B = VL.B. C = VL.C. D = VL.D .............................................................................................................................213
Figure IV.4. A = VL. E. B = VL.F. C = VL.G. D = VL.H .............................................................................................................................214
Figure IV.5. A = QF.1. B = QF.2. C = QF.3. D = QF.4 .......................................................................................................................................215
Figure IV.5. A = QF.5. B = QF.6. C = QFL.A. D = QFL.B ......................................................................................................................................216
Figure IV.6. A = QFL.C ..............................................................................................................................................................217
List of tables

Table 1.1. Overview of the 464 macroscopically examined samples and the 100 samples for thin-sectioning .....8
Table 2.1. Overview of Republican vessels used for the preparation of food ..........................................................12
Table 2.2 Chronology ................................................................................................................................................18
Table 2.3. Overview of the colonies and their (re)foundation dates in the Pontine region ...............................22
Table 2.4. Overview of the major historical events during the Republican period ........................................26
Table 4.1. Overview of production indicators in the different thin-section fabrics ........................................47
Table 5.1. Overview of the regional production sites ............................................................................................70
Table 6.1. Overview of fabrics, frequency, types, dating, regional occurrence or provenance ....................83
Table 6.2. Overview of types and fabrics ...........................................................................................................86
Table 6.3. Overview of the occurrence of Republican amphorae types ..........................................................88
Table 8.1. Overview of the relationship between functional group, form, type and fabric ............................113
Table 8.2. Overview of the pottery functional assemblage data based on the 36 selected sites ..................117
Table 8.3. Overview of the quantitative data of the form assemblages .............................................................120
Table 8.4. Overview of the proportional data of the form assemblages ............................................................121
Table 8.5. Overview of the Olcese cooking ware type assemblages .................................................................123
Table 8.6. Overview of the fabric assemblages ...................................................................................................126
Table I.1. Overview of the main functional types in the PRP classification system .......................................163
Table I.2 Overview of the number of selected sherds per type for the macroscopic analysis ..................168
Table I.3. Overview of the selected types, macroscopic samples and thin-section selection ....................173
Table II.1 Overview volcanic fabric samples ................................................................................................174
Table II.2 Overview quartz-feldspar samples .................................................................................................175
Table V. Z-scores ..........................................................................................................................................269-270
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Daily life in the Italian countryside changed significantly over the course of the Republican period (4th–1st centuries BC). Social, economic, political and cultural aspects of daily life transformed under the influence of the expanding power of Rome, leading to new realities. Specific events, such as the foundation of colonies and warfare, had lasting effects on everyday life that only became visible over the generations. But not everything changed. Elements of continuity can be traced in for example settlement patterns, road networks and ceramic repertoires.

The societal transformation of Italic communities through integration into the Roman state has long been acknowledged. The transformative power of colonisation and the political, social and economic integration that followed affected a wide variety of aspects touching upon daily life. The academic focus has often been on changes visible in specific types of data, such as urban contexts, monumental structures, coinage and political history. However, the majority of people lived in the countryside, perhaps only occasionally visiting towns and probably having limited knowledge on the day-to-day politics in their area and in Rome.

Many aspects of daily life that have received scholarly attention were influenced by top-down processes following political decisions made by the Roman elite. Local rural communities had probably limited possibilities (or desires) to control decision-making processes that were both socio-politically and sometimes also physically far-removed from them. This however does not mean that people in the countryside did not have any decision-making power. People were able to make individual choices on other levels, such as which objects they used, which might have been of far greater direct importance for their day-to-day life then politics.

Although there has been a gradual shift in the field of Roman archaeology towards the Roman countryside, non-elite groups and the study of pottery, how this process of integration affected daily life of rural populations is still poorly understood. This study therefore aims to provide a new perspective onto daily life in the Roman countryside through the lens of utilitarian pottery, specifically cooking wares, from the Pontine region (Figure 1.1). This area, located circa 60 kilometres south of Rome, provides an excellent case study to better understand the effect of Roman expansion and integration because of its early colonisation history (4th century) and vicinity to Rome. Ceramics for the preparation of food were used by everyone in society and fulfilled an important role in daily life. They were part of the almost invisible background noise of the material world that surrounded them. These ceramics belonged to the group of mundane objects that set the frame for normative, habitual behaviour that was deeply entrenched in their identities. It is through what

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1 All dates in this work will be BC unless stated otherwise.
3 For the most recent overview studies in the Pontine region see De Haas 2011; Tol 2012; Tol, de Haas & Attema forthcoming.
Figure 1.1. The Pontine region and the case study areas with the selected sites.
Dan Miller calls “the humility of things” that these mundane objects had a profound but almost invisible influence on daily routines.

These pots were a necessity that was affordable to everyone, and as such can be used to gain a better understanding of different aspects of daily life from a non-elite and rural perspective. The production, distribution and consumption of these ceramics link with both top-down economic structures and bottom-up household level consumption decisions, making them very suitable to study the effects of economic and social developments taking place on a local and regional level. Moreover, what we eat and how we prepare our food is reflected in the objects we use and is often culturally specific. Utilitarian pottery was used on a daily basis to prepare meals. It is not surprising that frying pans and cooking jars could be found in every Roman household and can tell archaeologists a great deal about aspects of daily life.

1.1 Republican cooking wares: research gap and opportunities

Coarse utilitarian pottery, of which cooking ware is a subgroup, is often the largest material group found during archaeological fieldwork on Roman sites, both in urban and rural contexts. It was used by everybody in society, regardless of the status of the household. Studies using ceramic assemblages to understand daily life in the Roman world are frequently aimed at better understanding the outcomes of colonisation. Consequently, such studies are more commonly executed for consumption contexts in the Roman provinces than Italy. Furthermore, although these studies focus on the relationship between consumption of food, related material culture and cultural change, such analyses are foremost limited to morphological examinations of ceramic assemblages. The pioneering study of Bats on the ceramics from Olbia (Gaul, southeast France) was among the first to make explicit connections between cooking pot forms, serving vessels and changing food habits. Within peninsular Italy, the study by Roth of black-gloss serving vessels from Etruria and the analysis of cooking pots from the same region by Banducci stand out for highlighting how diachronic changes in serving and cooking vessels can provide the perspective of non-elite groups. Furthermore, Banducci moves beyond the study of morphology by also including extensive use-wear analysis to connect cooking pots, behaviour and foodways.

Yet, the detailed study of cooking wares beyond typological and functional study is still limited. This is problematic because of the increase in standardisation of ceramics during the Republican period and the longevity of many shapes. This means, for example, that in order to discern different production sites, their distribution networks and consumption patterns, a more in-depth study of not only typological characteristics but also of clay pastes (fabrics) is needed.

The small number of fabric studies on coarse utilitarian wares that have been carried out for the *suburbium* of Rome, are focussed on the reconstruction of production technologies and distribution networks. Macroscopic examinations, such as those carried out for parts of the Pontine region and the Tiber valley, indicate that there is a wide variety in coarse ware fabrics with shared characteristics in clay and temper choice. More in depth studies using thin-section analysis and chemical analysis largely confirm this preference for specific types of clays and volcanic temper. Technological changes can be traced across wide areas, suggesting a shared knowledge system in the production of coarse utilitarian wares that changed over time. Furthermore, the study of provenance of these fabrics, although complicated, also indicates that some of the coarse utilitarian wares were distributed beyond local and regional boundaries. Not much is known (yet) on how production and

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6 Yilling & Spathar 2015, 4; Pitts 2015, 95.

7 Ashley et al. 2004, 59–73; Pitts 2015 on the archaeology of consumption.

8 For provincial studies on ceramic assemblages and food see for example Cool 2006 and Pitts 2010 for Britain; Winther-Jacobsen 2010 for Cyprus; Marques da Silva 2015 and Principal 2006 for Iberia; Bats 1988 and Luley 2011, 2014 for southern France.


10 Roth 2007.

11 Banducci 2021.

12 Banducci 2021 is also one of the few that includes extensive environmental data as well as textual sources in her discussion. For another example of connecting cooking pots to textual sources, see Donnelly 2016 for the Imperial period in southern Italy.


16 Bousquet & Zampini 2012.

distribution networks developed, how these systems transformed over time and how they were affected by the integration into the expanding network of the Roman Republic.

Previous coarse ware studies with a focus on petrography have thus mostly focused on production and distribution of cooking wares, while morphological changes as indicators for change are mostly studied within (colonial) consumption contexts. The methodological and contextual division between the two types of studies has led to disconnected ideas on change and continuity in the production, distribution and consumption of these wares. Utilitarian pottery forms in Central Italy used from the 6th century onwards changed little in their morphology and assumed function. This continuity suggests that their visual looks were not much affected by the general transformations taking place as a consequence of the expansion of Roman power and related socio-economic integration. Because of the static appearance of these cooking pots, continuity in their use is often assumed. On the other hand, the small number of fabric studies suggests that the underlying production technology and organisation of production changed, even though this was not reflected in the form repertoire. While form and use might thus show social continuity despite changing social-political structures, production and distribution might have altered drastically under the influence of economic changes and the expanding networks of the Roman Republic.

1.2 Aims, goals and research questions

The aim of this study is to contribute to the current debate on the effects of political and economic integration on a socio-economic level from the perspective of rural, non-elite communities during the Republican period (4th–1st centuries) in Italy. It thereby provides a new and often neglected perspective in long o-going debates in classical archaeology and ancient history. A bottom-up approach is taken to achieve this by examining ceramic cooking wares from the Pontine region. Related and co-dependent spatial scales are employed to connect ceramic data to individual households, the local areas of the Pontine coast and plain, the Pontine region at large and finally the Roman Republican state. By doing so, the connection between small-scale bottom-up data and larger top-down socio-economic processes is maintained. This is important because the goal is to contribute to our knowledge on how economic systems of production, distribution and consumption developed during the Republican period and influenced social aspects of daily life on a local and regional scale.

This leads to the following research questions:

In which way can change and continuity in the production, distribution and consumption of cooking wares inform us about daily life and wider historical processes?

How does bottom-up ceramic data relate to top-down theories and large scale processes? How can micro-scale data be applied to the study of macro-scale processes?

How did daily life in the Roman Republican countryside change under the influence of socio-economic developments between the 4th and 1st century? How were the production, distribution and consumption of Republican cooking wares influenced by the economic and social developments of the Roman Republic?

1.3 Cooking ware studies

At the centre of this study are so-called cooking wares. A variety of terminologies and definitions exist to describe this group of ceramics. Cooking wares are part of the larger, ill-defined group of coarse ware pottery in use during the Republican period. The variation in terminology is a reflection of dispersed research traditions and lack of standardised and shared typologies for this ware group. The use of different terms to denote the same group of ceramics is strongly related to the research history of Roman pottery. Systematic study of Roman pottery started in the 19th century, but coarse wares were largely ignored in site publications for a long time. This changed with the first publication of the complete pottery assemblages from Ventimiglia by Lamboglia in 1950. Although the system of Lamboglia was adopted for other sites, most projects continued to devise their own definitions and classification.
systems for coarse wares based on assumed local typological variations. This has changed over the last few decades, with a focus towards classification into ware groups based on fabrics and function. However, variation in terminology still persists with terms like *ceramica da fuoco*, *ceramica da cucina*, *impasto grezzo*, and *kitchen ware* all used to refer to the same subgroup of coarse wares that is often used for the preparation of hot food.

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22 See for example the Etruscan School and the system of Olcese 1993/2003. The new classification system of Olcese (1993) is based on a restudy of the material from Ventimiglia published earlier by Lamboglia (1950). The Pontine Region Project database also shows these shifts in classification systems between individual projects – see for example the overlap in jars with almond shaped rims and specific types such as Bouma 1996 jar type Ivc (Satricum), Dyson 1976 Class 1, fig. 2, CF25 (Cosa) and Olcese 2003 olla type 2 (Rome).


24 Olcese 1993; Olcese 2003.

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25 The term *impasto grezzo* is connected to the Etruscan School classification system, see Carafa 1995. In some publications both *impasto grezzo* and *ceramica da fuoco/cucina* are used. Usually this will denote a chronological difference, with *impasto* being pre-Roman. See for example the publication of Lilli (2008) on the hinterland of Velletri. The older version of the Pontine region classification system had a similar chronological difference between *impasto* and *coarse ware*, see Attema et al. 2003; Tol 2012.

26 Kitchen ware is used as a separate category in the Pontine Region Project classification system since the Minor Centres surveys in 2012.

27 The use of different terms and localised typologies also made it difficult to not only compare cooking wares from different sites but also created the perception that cooking ware types were not shared across wider regions. This is however not the case, see for example the widespread use of almond shaped rims on cooking jars. This assumption on localised types cannot be seen separately from the assumption that cooking ware was mostly produced and distributed on a local scale.
Throughout this study, I will use the term cooking ware to refer to pots suitable to withstand thermal shock, usually caused by use above or in a fire. The term cooking ware is preferred over other terms because it includes the indication that it was used for cooking, implying the involvement of heat and fire in their use. These pots require specific properties because of the repeated cycle of heating and cooling that they were exposed to. Compositionally, they are often characterised by coarse inclusions and the use of non-calcareous clays, which both increased the heating efficiency and strength of the fabric.\(^{28}\)

The current standard typology for cooking wares found in Central Italy is Olcese’s *Ceramiche comuni a Roma e in area romana: produzione, circolazione e tecnologia*.\(^{29}\) Her classification system is based on the combination of form/function, fabric and technology. This typology has been used within the Pontine Region Project (PRP) since 2004 and formed the basis for the sample selection (see below and Appendix I). The subgroup of cooking ware, termed *ceramica da cucina* by Olcese, includes cooking jars (*ollae* and *pentole*), baking trays (*tegami*), portable (bread) ovens and their covers (*teglie* with *clibani*) and lids (*coperchi*) (Chapter 2.1 for a detailed discussion on these types). Each general form is thought to have had a different function in the preparation of food and each form is further subdivided into types based on morphological variations in mostly the rims. In turn, morphological variation is connected to chronology by looking at dating evidence from excavated contexts.

1.4 Framework: a ceramic perspective on daily life in the Pontine countryside

The cooking wares in this study invariably come from consumption contexts. They were recovered during field surveys by the Pontine Region Project from sites that have been interpreted as habitation sites (farmsteads of different sizes and complexity). However, consumption and subsequent discard was only the last step in the life cycle of a pot, after production and distribution. The latter two stages can be studied through production traces left on the ceramics. As we shall see, these three phases within the life cycle of a pot are strongly intertwined through human behaviour and should therefore be studied together (Figure 1.2 and Chapter 3).\(^\text{20}\)

The life cycle of a cooking pot started with its production. The study of individual ceramic fragments makes it possible to reconstruct the behavioural chain of production (Chapter 4). Because the production steps are embedded within socio-cultural standards, choices made during production that are reflected in the ceramics themselves can also provide information about larger scale processes. This leads to a tentative reconstruction of the production organisation of cooking wares (Chapter 5). Furthermore, the study of distribution and consumption can provide additional information about the social, political and economic context of production, even when the precise production location remains unknown.\(^\text{31}\)

Distribution is the black box in the life cycle of a pot. The actions and motives of objects being transported – with some notable exceptions – tends to not be visible in the archaeological record. What we see is a consumption pattern that is the outcome of distribution, followed by exchange between people and the final owner taking the pot home. Because of the archaeological invisibility of the act of distribution, its reconstruction relies heavily on the study of provenance (fabric analysis), fabric variation between the case study areas (frequency) and fabric variation in relation to forms (Chapter 6). Despite the difficulties, distribution needs to be taken into account because it is the stage that was most affected by wider societal trends such as infrastructural developments and economic reforms. The study of distribution thus provides a connector not only between production and consumption but also between state influenced processes and individual choices reflected in the consumption patterns.

Consumption patterns of pottery are used as indicator for foodways within this study. Foodways are about the production, preparation and consumption of food. It does not only include the foodstuffs themselves but also all material culture involved in and behaviour around the consumption of food. How food was prepared, served and what was eaten relates to different types of behaviour. This makes archaeological approaches very suitable to study foodways based on material remains such as ceramic assemblages, to be able to trace socio-economic and

\(^{28}\) Bertoldi 2011, 113–120; Olcese 2003, 20; Schuring 1986, 185–190.

\(^{29}\) Olcese 2003.


cultural change and continuity in habitual practices as reflections of identity. After all, you are what you eat. In this study, the ceramic assemblages will be used to examine foodways on the regional, local and household level (Chapters 7 and 8; Appendix V).

The Pontine region, located c. 60 kilometres south of Rome, is selected as case study (Figure 1.1). The region is bounded by the Alban Hills and Lepine Mountains to the east, the Ausoni Mountains and Monte Circeo to the south and the Tyrrhenian Sea to the west. It is one of the first areas that was colonised by Rome in the late 4th century. The colonisation process had a profound and very visible effect on some parts of the region through the establishment of colonies, infrastructure and reclamation of land while other parts show more signs of continuity with the pre-Roman period (Chapter 2). Two local areas with different historical trajectories are therefore studied in more detail. These are the Pontine plain, which was a marsh land before the Roman conquest, and the coastal area between the mouth of the Astura river and the Latin towns of Antium and Satricum, flourishing Latin sites before Rome got involved.

Long-term research within the PRP has led to the discovery of hundreds of sites across the region during field surveys. The material remains were classified and archived in an extensive database. This database is the starting point for the analysis.

1.5 Method and sampling of the Pontine region dataset

The PRP database contains the legacy datasets of numerous individual field surveys carried out within the Pontine region under the umbrella of the Pontine Region Project since the mid-1980s. Decades of archaeological research within this project has resulted in a database containing information about circa 700 sites. For 585 sites, accompanying artefactual information has been collected and stored. Methodological developments led to changes in survey methods and classification systems over time. Therefore, to compare the datasets from the Pontine plain and the coastal area, a sustained effort was made in understanding the research history of each area and making the individual datasets compatible (Appendix I for more extensive discussion).

The extensive PRP dataset made it important to design a sampling strategy for this study with clear sampling criteria and a connection to the research questions and applied methods (Appendix I for extensive discussion on sampling strategy and methodology). These criteria are especially important in order not to lose the connection between larger scale data (e.g.,

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33 The now common phrase you are what you eat was first coined by the French gastronome Brillat-Savarin in 1825.
34 For a methodological overview of PRP see De Haas & Tol 2023.
the Pontine region) and small-scale data derived from fabric analysis. Only a very small fraction of the total amount of collected artefactual data could be studied in thin-section.

The sampling strategy consisted of four steps (Figure 1.3). Among all recorded PRP sites (step 1), non-compatible datasets or datasets collected with an unsystematic methodology, sites pre- or post-dating the Republican period and sites with only small numbers of cooking ware were deselected. The 36 Republican sites that remained (step 2) were the basis for further selection.

The assemblages of the Republican sites were broadly examined first. This included all the material found on each site, thus including non-diagnostic and non-ceramic materials. Following the general assemblage analysis, the next steps were guided by the occurrence of specific types of cooking wares. Sites were selected based on variation in chronology, location in relation to infrastructure and settlements, variation in the ceramic assemblages and variation in cooking ware types. A more detailed analysis focussed on the frequency and variation in cooking ware types based on Olcese’s typology. This resulted in the final selection of eight sites in the Pontine plain and eight sites in the coastal area (step 3). During the next step, the selected sites were studied in more detail using assemblage analysis (Chapter 7 and 8; Appendix V) and a macroscopic examination of the diagnostic cooking ware types (Table 1.1 and Appendix III). The macroscopic examination was the basis for the final last step, the selection of 100 ceramic samples for thin-sectioning (Table 1.1; Appendix II and Appendix IV).

<table>
<thead>
<tr>
<th>Olcese type</th>
<th>N macroscopy</th>
<th>N thin-section</th>
<th>Olcese type</th>
<th>N macroscopy</th>
<th>N thin section</th>
</tr>
</thead>
<tbody>
<tr>
<td>Olla 1</td>
<td>5</td>
<td>2</td>
<td>Tegame 1</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>Olla 2</td>
<td>269</td>
<td>38</td>
<td>Tegame 2</td>
<td>8</td>
<td>8</td>
</tr>
<tr>
<td>Olla 3A</td>
<td>101</td>
<td>24</td>
<td>Tegame 3</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Olla 3B</td>
<td>2</td>
<td>2</td>
<td>Clibanus 1</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Coperchio 1</td>
<td>47</td>
<td>6</td>
<td>Clibanus 2</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Coperchio 2</td>
<td>11</td>
<td>2</td>
<td>Clibanus 3</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>Coperchio 3</td>
<td>1</td>
<td>1</td>
<td>Clibanus general</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Casserole</td>
<td>1</td>
<td>1</td>
<td>Baking tray</td>
<td>3</td>
<td>3</td>
</tr>
</tbody>
</table>

Table 1.1. Overview of the 464 macroscopically examined samples and the 100 selected samples for thin-sectioning for each type of cooking ware based on Olcese’s typology.
While the general structure of this study follows the life cycle of cooking ware, from production via distribution to consumption, each step is also related to different scales of context and data. The use of different scales matters as it guides the process of abstraction and up-scaling, to make it possible to relate bottom-up data to wider socio-economic and historical processes. Contextualisation within this study is done on different levels, for which the necessary background information is discussed in this chapter.

Five different temporal-spatial scales are defined based on variance in physical size and assumed speed of change (Figure 2.1). In general, the larger the physical size, the slower changes occurred. The scales all have a central meeting point. This is the point where the action literally takes place – human and object behaviour forms the connecting process between the scales (Chapter 3 for discussion on behaviour).

The five different temporal-spatial scales are, from small to big:

Scale 1: Cooking pots, encompassing the studied individual cooking pot fragments. They are not only the smallest units in this study, but the expected life span of cooking pots was also short due to often quite intensive use. The sherds are part of the larger group of cooking ware and are differentiated based on general form (function, e.g. jar), type (typology by Olcese, e.g. Olcese olla 3A) and fabric. They are connected to other functional groups of pottery as part of assemblages (Section 2.2).

Scale 2: The sites, represented by the surface remains of farmsteads sampled for this study. This is the locus where most daily life took place and thus also most of the actions involving the members of the household and their objects. The ceramic assemblages are the material remains of the past practices and foodways of these rural households (Section 2.3).

Scale 3: The local level of the Pontine plain and the coastal area. These areas are loosely geologically and geographically defined and contain groups of sites. The local area of the Pontine plain is located along the via Appia, roughly between Forum Appii and Ad Medias. It is bordered on the east by the foothills of the Lepine Mountains and to the west by the marine terraces and coastal lakes. The coastal area is located between the Astura river, Antium and Satricum and bounded to the northwest by the via Antiatina. Local differences between the two areas are connected to local histories leading to different, local settlement trajectories (Section 2.4; Figure 2.3).

Scale 4: The regional level of the Pontine region, including the two study areas. The area is bounded to the north by the Alban Hills, to the west and south by the Tyrrenian coast and to the east by the Lepine and Ausoni Mountains. The region covers the southern part of the historical province of Latium Vetus. It has a shared pre-Roman history and process of colonisation, with local variations related to the presence of different cultural groups such as the Volsci, Latins and Romans (Section 2.4, Figure 2.3).

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35 Estimated to be one year, Peña 2007, 57.
36 Olcese 2003.
Scale 5: The (expanding) territory of the Roman Republican state. This is the broadest level, where state-wide decisions and processes were played out. It is related to wider Roman socio-economic history, affecting the people living in the regions of the Roman Republic in general (Section 2.5). This scale has a fluid boundary since the limits of the Roman Republican territory increased significantly between the 4th and 1st centuries due to the gradual conquest of Italy and later the wider Mediterranean.

The above five scales are interrelated; large-scale processes influence the impact of small-scale events, but they do not determine them completely because change at any scale is multi-causal through nested relations between the different scales. A reciprocal relation between the scales is assumed, making it possible to tentatively discuss how changes at one level might have affected other levels. This provides the opportunity to connect small-scale data, for example one household assemblage, to large-scale social, economic and historical processes.

The identification and use of these different scales of analysis also assists the interpretation of the effects of top-down decisions on rural daily life for which abstraction from the highest scale (the territory of the Roman Republican state) to a smaller scale (the household) is required. The data used is however even on a smaller scale – from assemblages to individual sherds to microscopic observations on clays and inclusions. The further down the scales, the more imperceptible the data becomes, especially on the level of fabrics. Because of this imperceptibility and the use of ‘scientific’ methods, mental and scalar boundaries need to be bridged between the small-scale scientific data used in this study and the larger societal processes that it aims to address. This is additionally complicated by the fact that each sample is unique, but simultaneously needs to be generalised to create a coherent story. The scales can therefore also be seen as a heuristic device, guiding the connection between bottom-up data and top-down processes.

2.1 Scale 1: Pots
The physically smallest scale contains individual fragments of cooking pots. These fragments did not occur in isolation. They are members of different groups, such as a fabric group, a typological group, a functional group and a ceramic assemblage. These groups provide the most intimate contexts for the samples.

To understand the relationship between individual fragments and the level of the household, some information is required on the Roman batterie de...
Daily life in the Roman Republican countryside

The *batterie de cuisine* includes all portable equipment used for the preparation of food. During the Republican period, most of the objects used for this purpose were made of clay. There are two main sources of information for this type of material: the ceramics themselves and literary accounts discussing the use of different vessels, especially recipes and agricultural manuals. 39 It is important to take the written sources into account here, since many of the Latin terms are taken over in the typological names because of the assumed relationship between form and function. 40

The study of Roman material culture has involved classification to facilitate interpretation. Commonly, ceramics are categorised based on ware and form and ordered in typologies. 40 In Roman archaeology, the antiquarian tradition of the 19th and early 20th centuries, which sought text-based analogies between Latin object names and material culture mostly excavated in Pompeii and Herculaneum, is still influential. 41 This typological and analogous tradition is problematic for several reasons. Firstly, Roman textual sources do not offer a representation of normative behaviour and tend to be biased towards elite and (Imperial) urban contexts. 42 The number of written sources, usually dated to the Imperial period, is also rather limited and consequently might give an unbalanced perspective on the Latin names and uses of ceramic vessels. 43 This is especially a concern for this study because it deals with non-elite groups in rural contexts predating the Imperial period. Secondly, there is the risk of ancient vessels becoming trapped in our modern-day kitchen vocabulary. 44 Based on analogies with modern day examples, a similar function is (implicitly) assumed for Roman objects that looked similar. Thirdly, and most problematic in relation to typological terminology, there is the implicit assumption that each object type only had one specific function. 45 On the contrary, archaeological research on consumption contexts and use-wear analysis clearly shows that the same type of pot could have had multiple functions. 46 While typologies might thus suggest a very specific function often based on an assumed intended, single function of the object, we need to take into account the possible multi-functional use of objects as comes forward both from textual sources and archaeological studies (Table 2.1).

The material collected on the studied sites was classified into functional groups within the PRP system (see Appendix I for extended discussion on classification). Each functional group is related to different types of behaviour connected to the preparation and serving of food. 47 The classification system is hierarchical, with functional groups split

<table>
<thead>
<tr>
<th>Republican Latin vessel names</th>
<th>Use</th>
<th>Typological fits (?) Olcese (2003)</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Olla, aula</em></td>
<td>Boiling, stews</td>
<td>Olla</td>
</tr>
<tr>
<td><em>Patina</em></td>
<td>Dish, baking</td>
<td>Tegame</td>
</tr>
<tr>
<td><em>Sub testu</em></td>
<td>Baking cover</td>
<td>Clibanus</td>
</tr>
<tr>
<td><em>Mortarium / mortario</em></td>
<td>Mixing bowl</td>
<td>Bacino, mortaria</td>
</tr>
<tr>
<td><em>Alveo</em></td>
<td>(mixing?) bowl</td>
<td>Bacino, mortaria?</td>
</tr>
<tr>
<td><em>Irneum</em></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Catinum</em></td>
<td>Dish underneath testu, baking</td>
<td>Tegame? Teglia?</td>
</tr>
<tr>
<td>-</td>
<td>Lid</td>
<td>Coperchio</td>
</tr>
<tr>
<td><em>Caccabus</em></td>
<td>Boiling, stews, sauces</td>
<td>Pentole</td>
</tr>
</tbody>
</table>

Table 2.1. Overview of Republican vessels used for the preparation of food, based on Cato, Agr., and Varro, Ling., their use based on textual and archaeological sources and the typological overlap of these vessels used for this study. The relationship between Latin names and Olcese’s typology is based on her own remarks unless followed by a question mark.

39 Cato, *De agri cultura*; Columella, *De re rustica*; Varro, *De re rustica*; Apicius, *De re coquinaria*.
40 For more general discussion on categorisation and typologies see Section 7.3.
41 Allison 1999b, 65.
42 Allison 1999b, 57; Beerden 2018, 17–18.
43 Allison 1999b, 57. The writings by Cato the Elder are however dated to the Late Republican period and thus contemporary to the studied materials.
44 See discussion Allison 1999b, 66–68 on *forma di pasticceria*, *casseruole* and *abbeveratoio*; Donnelly 2016, 109.
45 See discussion Allison 1999b, 62–63 on *fritillus* (dice thrower).
46 Allison 1999b, 62–64; Donnelly 2016, 28–29, 116–118. For archaeological case study, see for example Banducci (2021) analysis of use-wear traces on pottery from Musarna, Popolonia and Cetamura del Chianti and more general Skibo (1992) and Peña (2007) on primary and secondary functions. However, for example for the use the olla it already becomes clear from Cato’s *De agri cultura* that use was varied and not limited to cooking.
47 These functional groups form the base of the classification system used by PRP and are important for the assemblage analysis (Chapter 7 and 8 and Appendix V).
into smaller groups of general forms, where forms are further divided into specific types. Form is related to function, but every object could also have been used for other purposes (Section 7.3 for extended discussion on fabric, form and function). This study focuses solely on intended function, which is established based on the combination of functionality (form and fabric), written sources and contextual information from excavated sites. This choice is made because of the lack of stratigraphical context for the studied survey assemblages.48

The following functional groups have been distinguished:

Food was packaged and transported in the archetypical Roman amphora.49 Despite their size, amphorae were cheap transport containers.50 Once they had reached their final destination, the packaged products were likely poured into dolia or casks for storage, or smaller containers for sale in smaller quantities or consumption.51

Storage vessels were also needed, to store the agricultural products for the winter or to let products such as wine age. The Roman storage vessel, known as dolium, was made in a wide variety of sizes. Large dolia were often sunk into the ground (dolia defossa), while smaller specimens could also be kept in the kitchen. Dolia are commonly found on farms and villas, but also in storehouses and taverns where large quantities of wine and dry staples were kept or processed. Dolia were costly and their use-life normally spanned several decades.52 Besides dolia and the reuse of amphorae for storage, smaller jars including the olla could also be used for storage. However, only dolia were specifically produced for storage, whereas for other types of vessels storage would have been a secondary function.53

The group of vessels used for food preparation can be divided into those intended for cold food preparation (ceramica da preparazione in Olcese’s terminology) and those intended for hot food preparation (ceramica da cucina or cooking ware – Figure 2.2). Much food consumed in an ordinary Roman household was not heated. Furthermore, many varieties of hot food required a preparation step before they were heated, often involving vessels of the ceramica da preparazione group. Although frequently used, there are only two general forms of large vessels for food preparation: the mortarium with a coarse texture on the inside and the basin with a smooth texture. Mortaria were used for grinding food, such as cereals, while basins were used for mixing food, such as dough or salads.

The set of ceramics used for hot food preparation was much more varied. Broadly speaking, there were four main groups in the Republican period: jars (ollae), pans (tegami), lids (coperchi) and portable ovens consisting of a pan or baking tray (tegame or teglia) and a large lid (clibanus) (Figure 2.2).

The general form of the different vessel forms is of importance. The form limits what could potentially be cooked in a vessel or renders it more suitable for specific types of dishes. For example, forms with a body wider than the mouth make fluids evaporate less quickly and are therefore more suitable for the preparation of stews and porridge than shallow pans with a wide opening. On the other hand, shallow open forms are easier to use than high-collared jars with a narrow mouth when food needs to be turned regularly.

The olla was the standard Republican cooking jar. Olcese olla types 2 and 3 are closed cooking jars. Olcese olla type 2 is a globular, high-collared jar with a pronounced kink at the transition from the body to the outward-turned almond-shaped rim. It was produced between the 6th and 3rd centuries in many sizes. Over time, the form remained stable with only minor alterations in the rim shape.54 The Olcese olla 3 evolved out of the Olcese olla 2 and was produced in the 2nd and 3rd centuries. The Olcese olla 3 is an ovoid, high-collared jar with the maximum diameter high up on the body and with a thick, almond-shaped rim. It comes in a wide variety of sizes and two typological varieties: the Olcese olla 3A with an oval body and thick almond rim, and Olcese olla 3B with a more globular body and a rim with an internal ridge

48 Winther-Jacobsen 2010, 57 for discussion on reconstruction of use within survey assemblages.
49 Besides ceramic amphora, also other types of organic object such as baskets, caskets, skins and barrels were used. However, these are not present in the PRP dataset and therefore not discussed here.
50 Peña 2007, 49 states that amphorae were cheaper than skins but possibly close in price to casks.
51 Peña 2007, 49–50.
52 Peña 2007, 46–47.
53 The PRP ceramic assemblage classification only counts dolia as storage, but it should be kept in mind that probably at least part of the amphorae and jars were also used to store a variety of goods.
54 Olcese 2003, 37–38, 118; tav. VII.
Daily life in the Roman Republican countryside

Figure 2.2. Overview of the Olcese types sampled for thin-sectioning. Scale 1:4. From left to right. 
Olcese olla 1, olla 2, olla 3A and 3B. 
Olcese coperchio 1, coperchio 2 and coperchio 3. 
Olcese tegame 1, tegame 2 and tegame 3. 
Olcese clibanus 1, clibanus 2 and clibanus 3.

for the placement of a lid. Based on their form and mentions in recipes, these ollae are associated with the preparation of liquid or semi-liquid food such as porridge and stews.

Olcese tegame types 1–3 are open, pan-shaped forms dated to the Republican period. Their shared characteristic is the low wall and flat or slightly concave base. The rim diameter is similar to that of the base. Type 1 (325–200) is characterised by an inturned rim with a small ridge on the inside for the placement of a lid. The walls are straight, but the angle of the wall varies considerably. Type 2 (200–100) has a similar ridge for a lid, but instead has a rounded, outturned rim. The walls are generally slightly higher than those on type 1. Type 3 (100 BC–100 AD) has an inward curving wall and no ridge for a lid. These tegami are identified as ‘frying pans’ but larger specimens are also associated with the clibanus as baking trays.

Republican lids were used to cover jars and pans and consequently came in many sizes. Olcese coperchio types 1 and 2 are both dated 300–0. The shape of these lids is conical with a knob on the top. The difference between types 1 and 2 is in the morphology of the rim. Type 1 has a plain, rounded rim, sometimes slightly everted to the exterior. Type 2 has a flanged rim turning upwards from the body. Type 3 has a rim that is a combination of the general characteristics of types 1 and type 2.

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55 Olcese 2003, 37–38, 119; tav. VIII
56 Olcese 2003, tav. 125–127; XIV–XVI.
57 Olcese 2003, 130; tav. XIX.
Chapter 2. Up-scaling contexts: pots, people and processes

Olcese dates the introduction of the clibanus to the 3rd century. However, between the second half of the 7th and the 3rd centuries, there are already similar forms in use. According to Zifferero, these testi da pane were used for baking flatbreads. The clibanus occurs in a wide range of sizes, varying between 24 and 40 centimetres in rim diameter. Olcese’s clibani typology is based on changes in the form of the baking bell. Type 1 (325–200) has a rounded handle on top, while type 2 (300–0) and type 3 (200–0) have a knob. Further variation exists in the shape of the dome, the angle and decoration of the flanges and the shape of the rim. Occasionally, there are small holes perforated through either the upper or the lower part of the body. The portable oven was ‘preheated’ by placing the dome-shaped baking bell (clibanus) over some charcoal. This is archaeologically attested by scorching on the rim. Food that needed to be baked could be placed in a (preheated?) bowl functioning as a baking tray (teglia, bacino or tegame), on tiles or directly on the hearth floor and covered by the baking bell. To keep the heat inside the vessel, charcoal could be placed on the flanges and, if a bowl was used, this was likely to be placed on a bed of charcoal too.

The group of ceramics used for serving food was varied, both in form and in ware groups; together they are often simply referred to as table wares. Table ware forms include cups, bowls, plates, jugs and jars, while the ware groups are generally (but not always!) depurated and include ceramica da mensa, finer impasto chiaro sabbioso and a variety of fine wares dominated by black-gloss during the Republican period.

2.2 Scale 2: Farmsteads and households

Archaeology deals with the physical remains of households – the house itself and the material culture used by its inhabitants. Although a majority of the population would have lived on farms, very few Roman Republican farmsteads have been excavated. The excavated examples, mostly located in Etruria, Tuscany and the Bay of Naples, show a complex relationship between surface finds and sub-soil remains and wide variations in terms of size, construction method and wealth of material culture.

The term farmstead in site classification schemes thus includes sites that were likely to have varied widely in size and appearance. This is, for example, illustrated by the eight sites excavated by the Roman Peasant Project. These sites were identified as farmsteads or villages of varying sizes during field surveys. During excavation, it became apparent that the majority of these sites were probably not permanently inhabited but used for specific agricultural tasks on a seasonal basis. The analysis showed that it was not the architectural remains but the combination of ceramic assemblages and environmental data that provided the clearest indications for functional differentiation.

The farmstead is usually the most common type of site mapped in any rural survey project. Within the Pontine region, it is identified based on a combination of materials found on the surface and the extent of the material scatter. Within the latest phase of the PRP, farmsteads were subdivided into three subclasses: small, medium and large farms. The difference between them is primarily based on the size of the surface scatter, but also on the occurrence of the standard set of functional categories with additionally for the medium and larger farms the possible presence of precious architecture. Other sites are interpreted as non-settlements based on divergence from the standard set, i.e., an assemblage dominated by finds belonging to a specific functional

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58 Olcese 2003, 40.
60 Cubberley et al. 1988, 109–110. Late Republican examples are known from Matrice, San Vicenzo survey, Costa, Veii, Rome, Pompeii, Fregellae and Monte Irsi. This list also indicates that the use of portable ovens is not restricted to the countryside (contra Frayn 1978). For size range, see Olcese 2003, 128–29; tav. XVII–XVIII.
63 Jones 1962; Jones 1963 – Monte Forco (Ager Capenas); Delano Smith et al. 1986 – site 9 (Luni); Ostenberg 1962 – Villa Sambuco (Blera); Celuzza 1985 – Giardino Vecchio (Cosa).
64 The Roman Peasant Project excavated eight sites identified as farmsteads based on surface finds. Based on excavations, it appeared that these sites had varying functions, from agro-processing to shed to craft workshop or farm.
65 For a summary of the excavations of the farms at Boscoreale Stazione, Boscoreale Villa Regina and Boscoreale Giuliana see Rathbone 2008, 316–319 and references therein.
67 Tol et al. forthcoming. See also Appendix I. Small farm: 0.05–0.1 ha + standard suite of functional categories and rare categories optional; medium farm 0.1–0.2 ha + standard suite of functional categories and rare categories and precious architecture optional; large farm > 0.2 ha + standard suite of functional categories and rare categories and precious architecture optional. Densities are medium to high for all farm categories and location is not a factor. Precious architecture includes mosaic stones, marble and window glass.
category. These also include buildings that were related to farmsteads, such as outbuildings, storage spaces and field shelters.

Socio-economic variation between rural households is likely to be expressed not only in the size of the farm but also in the material culture it consumed. This includes not only agricultural equipment that required significant financial investment but also more mundane ceramic objects – the type of material usually retrieved during field surveys. What stands out when comparing excavated Republican farms with the survey assemblages from the Pontine region is that the former, with the exception of the Boscoreale farms, yielded relatively few ceramics. Although this is likely to be partly related to survey methodology and the clearance of buildings before abandonment, the find densities in the Pontine region appear to be relatively high in comparison to other areas in Central Italy and, as such, can provide useful information about the Roman Republican peasantry in the area.

The Pontine farmsteads from which the assemblages derived represent the main locus of everyday life practices for the group of people inhabiting them. The term “household” is frequently used to describe such groups within archaeology, but this term is often poorly defined. Consequently, a universal definition of household (and house) does not exist. Furthermore, a household is not static demographically, politically, socially or economically.

On a basic level, a household can be defined as a group of people that live together and share their economic resources. Its members work together to provide the basic needs for existence and, if possible, more. In the modern western world, a household is synonymous to a (nuclear) family, usually consisting of parents with children and sometimes grandparents. However, the Roman concept of *familia* does not neatly overlap with this modern understanding of the household. The Roman *familia* can refer to an array of different groups of people depending on context. It can be used to denote people related by kinship (*cognati* and *adfectitas*), but can also include those that fall under the power of the paterfamilias, such as slaves, apprentices and long-term guests. In contrast, the Roman term *domus* might be closer to the modern concept of family and household. *Domus* did not only refer to the house itself but also to the core kinship group that inhabited it.

Traditionally, the typical Roman household was believed to comprise a three-generational kinship-based household and its slaves. However, as convincingly argued by Dixon, three generation households would be uncommon considering mortality rates in the Roman period. Furthermore, it is likely that the size of a Roman household would vary based on its socio-economic status. Literary sources often describe very large and extended households, but these sources usually described wealthy elite households. It is more likely that the most common Roman household consisted of parents, children and occasionally grandparents. Depending on the status and wealth of the household, the number of slaves varied. The main source of income would influence or even determined the inclusion of apprentices and non-kin members. Rural households might thus be relatively small, especially in comparison to the urban elite households described in the literary sources.

The rural households in the Pontine region thus probably consisted of nuclear families living in farms of varying sizes depending on the socio-economic status of the family. Family members worked together on the land to generate an income. The ceramic assemblages are the remnants of these households and reflect their daily life practices.

### 2.3 Scale 3–4: Localised processes in the Pontine region: local histories, local trajectories

The Pontine region is located circa 60 kilometres south of Rome. It is bounded by the Alban Hills and Lepine Mountains to the east, the Ausoni Mountains...
and Monte Circeo to the south and the Tyrrenian Sea to the west. The geological variation within the region still has a profound effect on local histories and trajectories because of its influence on settlement distribution, agricultural potential and infrastructure. The natural environment changed profoundly over the course of the Republican period due to human intervention. The landscape of the coastal area and the plain respectively will be described first (Section 2.3.1), to provide the backdrop for the historical trajectories of both case study areas (Sections 2.3.2–2.3.4).

2.3.1 The Pontine landscape
The Pontine region is characterised from east to west by limestone mountains (Ausoni Mountains and Lepine Mountains), a lower lying graben with peat and clayey deposits in the southern part (the inner plain), rolling tuff hills in the northern part towards the Alban Hills and sandy marine terraces with lagoons along the coast (horst). The whole area is crossed by different rivers and smaller streams, such as the Astura and the Cavata.

The coastal area and the plain have very different landscapes, which also affected settlement histories due to different environmental conditions (see below). The coastal landscape mostly lies above sea level and is characterised by rolling hills, dissected by wide, lower lying river valleys. The mostly sandy-clayey surface soils are suitable for agriculture, especially cereal cultivation. Underneath them lies a subsoil of tuff that was formed by the eruptions of the Volcano Laziale (Alban Hills). These tuff deposits are exposed at different locations within the coastal area, such as in the Loricina river valley, around Satricum and directly north of Le Grottacce along the coast. These tuff soils and the colluvial and alluvial deposits in the river valleys offer less favourable circumstances for intensive agriculture in comparison.\(^78\)

The area of the plain largely overlaps with the lowest part of the graben. This area is squeezed in between the higher marine terrace complexes and Lake Fogliano to the west and the Lepine Mountains and Ausoni Mountains to the east. Sedimentation within the graben consists of alternating layers of peat and fine clays that relate to different periods of stagnant drainage (peat formation) and active sedimentation through rivers (clay deposits). Water coming from the mountains cannot drain naturally towards the coast on the west. The marsh sediments in the inner plain became covered by fluvio-colluvial sediments along the streams between the Late Bronze Age and the Roman period while peat growth extended in the other parts.\(^79\)

The Pontine marsh land was successfully drained by the Romans during the 4\(^{th}\) to 3\(^{rd}\) centuries through a system of canals and ditches running from north to south and east to west.\(^80\) The Cavata river was connected with the Decennovium canal, running along the via Appia and ending in Terracina, and the Rio Martino river was canalised.\(^81\) Because of these drainage works and the resulting drier conditions, the area suffered from peat oxidation and subsidence.\(^82\) By the end of the Republican period, conditions became wetter again in the plain due to renewed drainage issues.\(^83\) The flat landscape of the plain was thus being crossed by canals and ditches at regular distances during the Republican period as well as some rivers. This low-lying landscape with heavy peaty-clayey and fluvio-colluvial soils is very fertile when drained properly.

2.3.2 Archaic period: Volsci, Latins and others in the Pontine region
The variation in landscape between the higher sandy coastal area and the low-lying plain also affected the local historical trajectories of both areas (Figure 2.3 for main sites). Due to environmental conditions, a more permanent settlement pattern did not develop in the plain until the Mid-Republican period (see Table 2.2 for chronology). Before that, permanent habitation was mostly confined to the higher lying outskirts of this area along the Lepine foothills and the banks of the prehistoric lake.\(^84\) The sanctuary of Tratturo Caniò, located along a transhumance route, has yielded finds dating back to the Late Bronze Age. Based on Archaic votives, it is assumed that this was a sanctuary mostly used by Latin people, although

\(^78\) Feiken 2011, 3–7.
\(^79\) Sevink et al. 2023, 3–5.
\(^80\) There are tentative indications that part of these canals pre-date the Roman occupation of the Pontine plain, see Sevink et al. 2023, 9–13.
\(^81\) Feiken 2014, 269.
\(^82\) Sevink et al. 2023, 13.
\(^83\) De Haas 2017, 478–479.
\(^84\) For example, the proto-urban settlements of Caracupa Valvisciolo and Contrada Casali. De Haas 2011, 241–246; Attema 1993, 139–180 for field surveys in their respective hinterlands; Feiken 2014, 268, 274–277.
objects with an Italic character also occurred. Traces of permanent settlement in the inner plain are scarce, but archaeological indications for marginal use of the area do occur as isolated finds.

The coastal landscape, especially the coastal strip, was settled much earlier. During the Middle Bronze Age, there was a sudden increase in settlements, mostly confined to the coastal area between Nettuno and Astura and the Campana area. During the Final Bronze Age, two sites involved in the production of salt were founded along the coast. The earliest remains at Antium, located on the macco outcrop of Le Vignacce, also date to this period. The development of nucleated, proto-urban settlements at defendable locations in the area, such as Antium and Satricum, started during the Iron Age and resulted into the formation of small city-states with urban features by the Archaic period. Whereas the data for Antium is limited because the ancient settlement is largely covered by the modern town of Anzio, Satricum provides extensive evidence for urbanisation.

The protohistoric settlement of Antium is located on the Le Vignacce hill. Archaeological remains are scarce, but an extensive agger dated to the Late Iron Age is attested as well as burials and votive deposits. The occurrence of a defensive wall of a considerable size can be seen as an indicator for the importance of Antium during the Archaic period.

The Archaic remains at Satricum are far more abundant. A clear development from an Iron Age village with huts and a cult site to a nucleated Archaic settlement with urban features can be traced. A substantial sanctuary was built during the 6th century on the acropolis for the goddess Mater Matuta. Large monumental buildings, a pottery workshop and possibly a smithy were located around this sanctuary. A second sanctuary was located in the southwest part of the settlement. Other Archaic-period features include a second workshop, houses and a monumental road connecting Satricum to Antium. The defensive system consisted of an agger on the southwest side of the acropolis, with the other sides being naturally defended by steep slopes.

This development towards larger nucleated settlements is traditionally assumed to be accompanied by a process of rural infill between the Late Iron Age and the Archaic period. However, a recent reassessment of the coastal dataset argues that the process of rural infill was gradual and limited during the 6th century. It rather reconstructs a system of territories with an urban centre – Antium and Satricum – surrounded by satellite villages marking the territorial boundaries and some isolated farmsteads.

The urbanisation process was accompanied by the more pronounced development of ethnic/cultural identities in the wider Pontine region during the Archaic period. From Roman and Greek literary sources (see discussion below), we know that Volscians, Latins and Romans were present in southern Lazio. Furthermore, on the outskirts of the region, in and beyond the Alban Hills, Lepine Mountains and the Ausoni Mountains, other cultural groups, such as the Aequi, the Hernici, the Aurunci and the Sidicini had their territories. They are occasionally mentioned in written accounts as allies or as groups that raided the Pontine area. However, due to the fragmentary nature of the archaeological data for the Archaic period, with the notable exception of Satricum, it is difficult to associate

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different groups to different types of material culture and to thus connect the archaeological data with the historical narrative known from later written sources. Nonetheless, there are tentative changes in the major settlements in the Pontine region during the 5th century that point to conflicts between but also cohabitation of different ethnic groups in the area.

2.3.3 The Republican period (5th–1st centuries): Colonisation and integration

Historically, the late 6th century and the start of the 5th century were marked by the foundation of the first colonies within the Pontine region (Table 2.3). The period between the first foundation of the Latin colonies of Circeii, Cora and Pometia and the end of the Latin War in 338 was characterised by struggles between different ethnic groups controlling local urban centres and the gradual rise of Rome. Because of variation in the settlement patterns between the coastal area, with its urban centres, satellite villages and farmsteads and the ‘empty’ marshland of the Pontine plain surrounded by colonies, the social consequences of these historical developments varied considerably between the two case study areas. However, the political end result by 338 was the same: the whole Pontine region was incorporated within the Roman territory.

Early and Mid-Republican period: colonisation of the Pontine region

Antium and Satricum are mentioned for the first time in written sources in relation to Early Republican colonisation. Antium is mentioned in the first treaty between Rome and Carthage from 508/509. In the same year, Rome also asked for grain from the Volscians in the area. Both Livy and Dionysius of Halicarnassus mentioned Antium and Satricum as the scene of power struggles between Volscians and Romans, with especially Antium being (in)famous

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97 Polyb. 3.22.11.
98 Livy 2.9–14; Dion. Hal. Ant. Rom. 5.21.
99 Livy 2.33, 63, 65; 3.1, 4–5, 10, 22; 6.6–9, 31–33, 59; 7.27; 8.1, 12.
100 Dion. Hal. Ant. Rom. 4.49.1; 6.3.2.
for its pirates and coastal raids.\textsuperscript{101} Around the same
time, Satricum was listed as one of the Latin cities that
rebelled against Rome at Lake Regillus.\textsuperscript{102} Later, in 488/487, Satricum became Volscian after it was
conquered by Coriolanus in 491.\textsuperscript{103}

Satricum was probably under Volscian rule until it
became a Latin colony in 385. Connected to this
were, according to Livy,\textsuperscript{104} land allotments to 2000
colonists.\textsuperscript{105} In the following decade, Satricum
changed hands several times until its destruction in 377 by the Latins, after which it came under
Roman rule again. In 348/349, Antium took control
over Satricum through the foundation of a Volscian
colony there. This was soon followed by the final
defeat of first Satricum, which was destroyed by the
Romans in 341, and then the foundation of a Roman
citizen colony at Antium in 338.\textsuperscript{106} After the Latin
War, Satricum rebelled once more against Rome. In
320 the town joined forces with the Samnites, who
stationed their army at Satricum.\textsuperscript{107}

Archaeological remains at Antium from the 5
th century are very limited. During this period, the \textit{agger}
was reinforced with \textit{opus quadratum}. However, the
extension of the defensive wall itself and thus the
size of the settlement is debated, as is the date of
several (unpublished) burials.\textsuperscript{108}

The 5th century data for Satricum is much more
abundant. Several cemeteries are known from this
period. Their location within the former Archaic
settlement points towards contraction of the town.
Furthermore, the composition of the funerary
assemblages suggests a mixed ethnic population,
as evidenced, for example, by an axe with an Osco-
Umbrian inscription and Volscian pottery forms.\textsuperscript{109}
Additionally, the continued use of the second
votive deposit at the Mater Matuta temple points
to a Latin cult tradition.\textsuperscript{110} Other indications that
Satricum was not completely abandoned come from
the restoration of the main road,\textsuperscript{111} indications for
metal working and the establishment of a pottery
workshop.\textsuperscript{112} While the Archaic villages in the coastal
countryside were abandoned, the presence of black-
gloss and chiaro sabbioso pottery at the few isolated
farmsteads suggests continued use throughout the 5th
century. A rural pottery workshop is attested at
the Quarto delle Cinfonare area.\textsuperscript{113}

The largest Archaic settlement in the Lepine foothills,
Caracupa Valvisciolo, was largely abandoned during the 5th century. However, most of the defensible
smaller sites continued to exist. Moreover, Norba
became a more prominent settlement now.\textsuperscript{114} This
was probably related to the colonial foundation
of the town in 492. Its location on a cliff made it
both easy to defend and provided the town with
an excellent outlook over the Pontine plain. Livy
described the colony as "\textit{quae arx in Pomptino esset},
indicating its function as a military stronghold. The
Volscians (from Privernum) conquered Norba in 341
and plundered its hinterland in 330. Regardless of
its possible temporary Volscian phase, the town is
generally described as a loyal ally to Rome throughout
the Mid-Republican period.\textsuperscript{115}

Setia was founded in 383 as a Latin colony and
reinforced with new settlers in 380.\textsuperscript{116} The Volscians
from Privernum also plundered Setia in 341 and again
in 330.\textsuperscript{117} The building of the city wall can possibly be
seen as a response to the ongoing power struggles
between Latin Setia and Volscian Privernum.\textsuperscript{118} During
the Latin War, the town sided with the Latins but it
kept its Latin status also after the war, although it lost
the right to marry and trade with Roman citizens.\textsuperscript{119}
Land distributions around Setia are not mentioned in
the written sources, but are likely to have occurred
in its direct vicinity.\textsuperscript{120} This is tentatively also attested
by the earliest rural settlement in the area, located

\textsuperscript{101} Tol 2012, 8.
\textsuperscript{102} Dion. Hal. Ant. Rom. 5.61.3.
\textsuperscript{103} Livy 2.39.
\textsuperscript{104} Livy 6.21.
\textsuperscript{105} De Haas 2011, 173 and footnote 590.
\textsuperscript{106} Livy 7.27–2; 8.14.8.
\textsuperscript{108} Brandizzi Vittucci 2000 argues for a contraction of the settle-
ment to the Vignacce hill and association of the reinforcement
with the foundation of the Latin colony at Antium in 467. On the
other hand, Chiarucci dates the extension of the \textit{agger} and this
the town from before the colonisation phase. As pointed out be
De Haas 2011, 183, (unpublished) chamber tombs are said to be
located both within the \textit{agger} and in the \textit{agger} itself, although
these could potentially also date later.
\textsuperscript{109} For publications of the individual burial grounds see Waars-
enburg 1994 for the north-west necropolis, Gnade 1992 for the
south-west necropolis, Gnade 2003 for the burials on the acrop-
olis and for the burials in the Poggio dei Cavallari area.
\textsuperscript{110} Bouma 1996. Votive deposit II.
\textsuperscript{111} Gnade 2002.
\textsuperscript{112} Nijboer 1998, 84–87.
\textsuperscript{113} Attema, de Haas & Tol 2011,57–59; Tol 2023.
\textsuperscript{114} De Haas 2011, 246.
\textsuperscript{115} Livy 2.34.
\textsuperscript{116} De Haas 2011, 249.
\textsuperscript{117} Vell. Pat. 1.14.2; Livy 6.30.
\textsuperscript{118} Livy 7.42; 8.19.
\textsuperscript{119} De Haas 2011, 220–221.
\textsuperscript{120} Livy 8.3–5.
\textsuperscript{121} De Haas 2011, 206.
in the hinterland of Setia and dated to the early to mid-4th century. Activity in the plain during the 5th century is only known from the sanctuary of Tratturo Caniò. 

Indications for struggles between different ethnic groups in the 5th and first half of the 4th centuries come forward from both written sources and archaeological remains. The written sources mention power struggles between the Romans, Latins, Volscians and occasionally other groups with the urban centres functioning as strongholds and changing hands often several times. Archaeological data indicates the presence of different ethnic groups, best visible in burials at Satricum, as well as the importance of defensive systems, such as the building of aggeres in Antium and Setia and continued use of the hilltop settlements in the Lepine foothills. After the defeat of the Latins in 338 and the Volscians from Privernum in 330, the situation appeared to have stabilised to the advantage of the Romans.

After the entire Pontine region came under Roman rule in 338, there was a steep rise in the number of rural sites during the Mid-Republican period in both the coastal area and the plain. Moreover, Roman investments were made in the colonies in combination with land distributions, the creation of tribes and investments in regional infrastructure during this period.

The historical sources only seldom mention the Pontine region after its initial colonisation phase, which should probably be seen as an indicator for stability. Most Mid-Republican references are related to the Second Punic War, when Antium was exempted from military levy. Setia refused to supply troops and tribute to Rome, for which it was punished after the war. Satricum is mentioned in the historical sources for the last time when the temple of Mater Matuta was destroyed by lightning in 207.

Archaeological finds of the Mid-Republican period at Satricum mainly consist of votive deposits. Traces of habitation are limited to a re-used isolated Archaic building on the acropolis and some surface remains. The pottery workshop probably continued into the 3rd century, producing votives for the still active sanctuaries. Both the agger and the cemeteries were not in use anymore by the 3rd century. The town was probably largely abandoned by the end of the Mid-Republican period.

Although Antium was re-founded as a Roman citizen colony in 338, no Mid-Republican settlement remains have been published. However, multiple votive deposits and burials are known, strongly suggesting that there must have been a settlement.

Land distribution in the coastal area is only mentioned once in the written sources. This occurred when Satricum became a Latin colony in 385; however, the town changed hands again soon after and the colony might only have been established on paper. There are no indications for the creation of a tribus, which would often be combined with land allotments, in this area until the mid-1st century. However, there are other indirect indicators for land distributions. Firstly, the establishment of the maritime colony at Antium in 338 would normally have been accompanied by land distributions. However, this would only have concerned a relatively small area. Secondly, the rise in rural sites in the hinterland of Antium can be viewed as an indicator for possible land distributions, or at least stability in the area making it more attractive to establish a farm. The more stable political situation in the region provided better and safer circumstances in general. Lastly, the abandonment of Satricum could have led to people moving to the countryside instead.

As at Satricum and Antium, Mid-Republican archaeological remains at both Norba and Setia mostly consist of cultic contexts. The city walls of both of these colonial towns are dated to this period. Although textual and archaeological sources about the colonies are sparse in this period, it is also the first

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122 Attema, de Haas & Tol 2016.
123 Feiken et al. 2012.
124 De Haas 2011; Tol 2012.
125 Livy 27.38.
126 Livy 27.9.
127 Livy 28.11.
128 Bouma 1996 for votive deposit II and III. Smaller votive deposits are known from the southwest sanctuary and the Poggio dei Cavallari area, de Haas 2011, 190.
129 Gnade 2019; Gnade 2007.
130 Nijboer 1998, 129.
131 Gnade 1999.
133 Livy 6.16.5–8; Tol 2012, 8.
134 The tribus Quirina was established in the mid-1st century, see Ross Taylor 1960, 319–321. Some scholars (e.g., Stbbe 1990) assume that the tribus Pomptina was located around Satricum, whereby Satricum is identified as Suessa Pometia.
135 Tol 2012, 363–373 for general settlement patterns. It should be noted however that the information for the period before 350 should be up-dated based on Tol 2023.
Daily life in the Roman Republican countryside

The time that the plain itself is mentioned in the written sources in relation to infrastructural investments and the creation of tribes.

As in the coastal area, land distributions in the Pontine plain are only mentioned once in the surviving textual sources. The passage relates to the conquest of Privernum in 341, after which land was distributed to Roman citizens.136 It is likely that the foundation of the colonies of Norba and Setia were also accompanied by land allotments, although these might have been located mostly in the Lepine foothills. Land distribution in the Pontine plain itself was probably connected to the construction of the via Appia (312) and the creation of the tribus Oefentina (318).137 The construction of the via Appia and the creation of tribes indicates that at that time the land was part of the *ager Romanus* and at least partly *ager publicus*, since consular roads and colonies could only be built on *ager publicus*. The

<table>
<thead>
<tr>
<th>Foundation</th>
<th>Date</th>
</tr>
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<tbody>
<tr>
<td>Circeii (Latin colony)</td>
<td>Tarquinius Superbus</td>
</tr>
<tr>
<td>Cora (?)</td>
<td>Tarquinius Superbus</td>
</tr>
<tr>
<td>Pometia (?)</td>
<td>Tarquinius Superbus</td>
</tr>
<tr>
<td>Velitrae (Latin colony)</td>
<td>494</td>
</tr>
<tr>
<td>Norba (Latin colony)</td>
<td>492</td>
</tr>
<tr>
<td>Antium (Latin colony)</td>
<td>467</td>
</tr>
<tr>
<td>Ardea (Latin colony)</td>
<td>442</td>
</tr>
<tr>
<td>Velitrae – refoundation</td>
<td>401</td>
</tr>
<tr>
<td>Circeii - refoundation</td>
<td>393</td>
</tr>
<tr>
<td>Satricum (Latin colony)</td>
<td>385</td>
</tr>
<tr>
<td>Setia</td>
<td>383</td>
</tr>
<tr>
<td>Creation of tribus pomptina</td>
<td>358</td>
</tr>
<tr>
<td>Satricum (Volscan colony - Antium)</td>
<td>347</td>
</tr>
<tr>
<td>Antium (Roman citizen colony)</td>
<td>338</td>
</tr>
<tr>
<td>Tarracina (Roman citizen colony)</td>
<td>329</td>
</tr>
<tr>
<td>Rome takes Privernum</td>
<td>329</td>
</tr>
<tr>
<td>Creation of tribus oefentina</td>
<td>318</td>
</tr>
<tr>
<td>Construction Via Appia</td>
<td>312</td>
</tr>
</tbody>
</table>

Table 2.3. Overview of the colonies and their (re)foundation dates in the Pontine region.

The construction of the via Appia and Decennovium canal, but also the construction of secondary roads,141 the establishment of roadside settlements (such as Forum Appii and Ad Medias)142 and the creation of an elaborate drainage system. The centuriation of the Pontine plain, including the

136 Livy 8.11.
137 The location of the tribus Pomptina (358) is debated. Historical sources place it around Suessa Pometia and Ulubrae, two towns with an uncertain location but assumed to be modern day Caprifico di Cisterna and Castellone, located north of the Pontine plain (De Haas 2011, 173 footnote 590, refers to Quilici 2004, 2006). However, others assume Pometia is Satricum (Stibbe 1990), which would place the tribus Pomptina within the coastal area. On the other hand, the tribus Oefentina is named after the Oefens river, which runs through the Pontine plain and thus more securely placed within this case study area.
138 Roselaar 2010, chapter 2. It is unclear which land in the Pontine region belonged to colonies and which land was allotted through viritane distribution.
139 De Haas 2011, 206–207.
141 For example the monumentalisation of the road from Norba to the via Appia and secondary roads connecting the plain with the colonial towns in the coastal area.
142 Tol et al. 2014.
Chapter 2. Up-scaling contexts: pots, people and processes

The number of rural sites in the coastal hinterland was stable during the Late Republican period. Most sites founded in the Mid-Republican period were continuously inhabited and some grew into substantial villa complexes. Moreover, there was an increase in the number of sites along the coast from the 2nd century onwards, and the first villae maritimae were established, such as the villa at Le Grottacce. The process of ruralisation thus continued in the Late Republican period. Sites became more diversified, with both small farmsteads and large villa complexes coexisting side by side. Some of these rural sites probably specialised in the production of specific agricultural products, such as fresh fish at the coastal villas and possibly also wine and olive oil at Le Grottacce based on remains of a local amphorae workshop.

Both Norba and Setia are mentioned in connection to the Civil War, when both towns sided with Marius. While Setia was destroyed and many of its inhabitants were killed by Sulla’s troops, the inhabitants of Norba allegedly decided to set their own houses on fire to prevent the occupation of the town by Sulla. After the Civil Wars, Norba disappears from the historical record while Setia is only mentioned in relation its high-quality wines during the Imperial period. The hilltop sites in the Lepine foothills probably functioned as places of refuge for the rural population during the war.

Archaeological data largely confirms the story from the written accounts. Norba underwent major changes in urban lay-out during the 2nd century. These remains are covered by destruction layers dated to the period around the Civil War. Indications for later 1st century and Imperial occupation are scarce. On the other hand, at Setia archaeological remains from the 1st century are more abundant. The city walls were monumentalised in the 2nd or early 1st centuries, a basilica was built, cult places continued or were newly established and several villas also date to this period. Thus, Setia appears not to have been fully destroyed nor abandoned and continued well into the Imperial period.

145 Livy 43.4. The older cult places are mostly abandoned by the end of the 2nd century, see de Haas 2011b, 194.
146 Tol 2012, 5–6; De Haas 2011b, 194.
147 De Haas 2011b, 194; Brandizzi Vittucci 2000.
148 Livy Epit. 80.
150 De Haas 2011, 172; Ross Taylor 1960 for discussion on the different tribes in the area.
151 Tol 2012, 373. Tol notes a possible increase but this is solely attributed to sites with an uncertain Republican date.
152 Tol 2012, 373. See also Tol 2012, chapter 6 for Le Grottacce.
154 App. B Civ. 1, 94.
155 De Haas 2011, 256.
156 De Haas 2011, 254–256.
Daily life in the Roman Republican countryside

The direct impact of the Civil War appears to have been felt less in the rural areas. Many Mid-Republican sites were already abandoned during the 2nd century, likely due to problems with the drainage system.\(^{158}\) Places continuously inhabited throughout the Late Republican period are mostly located in drier areas – along the via Appia, the Rio Martino and the Lepine foothills.\(^{159}\) Some have yielded indicators for monumental architecture such as mosaics and plaster.\(^{160}\) Another indication of that there were drainage problems are the restoration works carried out at the Decennovium canal in 160 by Cornelius Cethegus.\(^{161}\) Meanwhile, investments continued to be made in the local infrastructure, as evidenced by the re-pavement of the via Appia during the Sullan period and monumentalisation of the road from Setia in the second half of the 2nd century.\(^{162}\) These investments indicate that although the number of farms decreased, the via Appia remained an important transport route. Along the via Appia, Forum Appii probably reached its largest extent and functioned as an important focal point for the surrounding rural population, accommodating pottery workshops, a river harbour, bakery and a sanctuary. Ad Medias also continued into the Imperial period, with its own sanctuary, pottery workshops, metal production and the production of dairy products.\(^{163}\) Moreover, the road connection from Setia to the via Appia would have been important for the transport of the famous Setian wines.

### 2.3.4 After the Republican period

The historical trajectories of the coastal area and the plain diverge even more during the Imperial period. The coastal area, with Antium as the most important settlement, flourished economically in the early Imperial period. The construction of a new harbour was ordered by Nero, who was born in Antium. Several Imperial villas and additional villae maritimae were built along the coast. Many of the rural sites continued and at least 14 new ones were established in the hinterland of the town. Moreover, the road connecting Antium to the via Appia was paved.\(^{164}\)

In the plain, on the other hand, settlement dwindled further. Although the via Appia and the Decennovium canal remained in use, smaller sites were largely abandoned. Setia continued to exist but disappeared from the written record. The Pontine plain probably slowly became a wetland again, with agricultural production from villas in the drier areas making use of the surrounding wetlands as pasture.\(^{165}\)

The pronounced variation between the two areas cannot be seen separately from a difference in landscape setting, affecting agricultural opportunities, and wider historical processes determining local investments. Whereas the plain was a focal area during the initial colonisation phase, receiving major investments, the hinterland of Antium took over as economic engine of the Pontine region by the end of the Late Republican period.

The local trajectories also had a profound effect on the rural households. The Early and Mid-Republic periods were initially characterised by power struggles between different population groups. Because of the pre-Roman habitation in the coastal area, it is likely that this affected the population there more. On the other hand, the plain became newly settled, creating the rather unique situation of new households arriving in the area as part of the colonisation process.

Clear indications for stability are visible after the Latin War: there is an overall increase in rural settlement in the whole region, evidence for investments by the state and local elite in infrastructure and urban development, and crucially for the Pontine plain a huge investment in drainage works. Favourable conditions to settle in a now much safer countryside were thus a by-product of the integration of the region into the Roman state. Local economies profited from the increased connectivity through the new road networks. Products from all over the Roman territory could now reach the Pontine region and vice versa. The location of the region, close to Rome and well connected, probably contributed to the economic welfare of the area. The longevity of most farmsteads and the general wealth of material culture furthermore indicates a long period of relatively stable conditions in the region. Only during the 1st century the first local signs of decline became visible and the coastal area and plain started

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158 Tol et al. forthcoming.
159 For the so-called platform villas in the Lepine foothills, see De Haas, Attema & Tol 2011.
160 De Haas 2011, 100–104, 225–226 refers to those sites as class 3 sites; Tol et al. forthcoming; De Haas, Attema & Tol 2011.
161 Livy Per. 46.
163 Tol et al. 2014.
164 Tol 2012, 374–375.
to diverge in their respective trajectories. Whereas investments in infrastructure and large-scale villas were continuously being made in the coastal area, the lack of maintenance and investment in the drainage system that had rendered the plain habitable led to abandonment of many farmsteads. The wetter conditions made farming and living in the plain probably too difficult. Although the urban centres in both areas were impacted by the 1st century wars, only the towns in Lepine Mountains were partially or fully abandoned. On the contrary, Antium received major investments into its harbour facilities, leading to increased economic activity in the countryside too.

2.4 Scale 5: Large-scale processes: the Roman Republic

Over the course of the Roman Republican period, the social and economic circumstances changed drastically under the influence of political developments with long term consequences. Foremost, the process of colonisation led to a new political reality in the Pontine region itself, followed by socio-economic integration into the expanding Roman state. As discussed above, the process of colonisation, integration and unification also had its impact on rural populations, which will be the focus of the final section of this chapter.

Three types of top-down political decisions that had profound impact on landownership and hence the countryside can be identified: colonisation, warfare and agrarian reforms (Table 2.4 for most important dates). However, before we discuss the possible consequences of these political events, we need to consider who owned land and how ownership of land was arranged during the Roman Republican period.

2.4.1 Land ownership and tenancy in the Roman Republic

All land within Roman territory was ager Romanus. It was subdivided in land for communal use, ager publicus, and privately owned land, ager privatus. Besides the state, land was owned by colonists who were allotted land and people who could buy land, mostly elite families. Large portions of state-owned land were leased out to individuals or between individuals. Broadly speaking there were four discernible groups: the Roman state (ager publicus populi Romani), common land owned by colonies and towns, families that held ownership over the land and families that tenured land from either the state or landowners.

People became landowners either by receiving a land allotment as part of the colonisation process, through viriitane distributions, through inheritance or by buying land. During the establishment of a colony or tribus, conquered lands would have been taken as ager publicus, part of which would subsequently be privatised by allotting the land equally to all those families that were enrolled into the colony or tribe. The size of the land allotments varied depending on the status of the colony and the amount of available land and might not always have been sufficient to support a family, in which case people could also have used ager publicus or the common lands of the colony.167

During colonisation, land was thus firstly confiscated, changed into ager publicus and consequently privatised. The people who received land during the initial colonisation of the Pontine region probably included a mixture of Roman and Latin colonists together with local people who were granted enrolment into the newly created colonies and tribes. Most inhabitants of colonies were granted Latin or Roman citizenship and sometimes local people were allowed to keep the land that previously belonged to them. It is thus likely that some previous landowners received their land back after Roman colonisation, while others were expelled. The part of the ager publicus that did not become privatised was open for occupation. Although it legally belonged to the Roman state, original landowners could keep occupying the land but without legal protection. However, the combined size of ager publicus in Central Italy, including the Pontine region, might have been very small.168

The allotment of land resulted in many families owning small plots of land immediately after the administrative incorporation of an area into the Roman state, which was of importance because of the connection between land ownership and army enrolment (see below). However, over time

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166 Roselaar 2010.
167 Roselaar 2010, 25–64 for extensive discussion on public and private land between the Regal period and 133. In general, colonists in Latin colonies would have received larger plots of land than colonists in citizen colonies. However, for most colonies information about the size of the land plots is not mentioned in the written record.
population growth led to increased pressure on the land and a growing group of landless people. When not owning land, one had the option to become tenants on either *ager publicus* or on lands belonging to landowners. The leasing out of public land (*ager censorious*) was probably very uncommon in Central Italy. Private tenancy would instead have been more prevalent. Although all people within the colony or *tribus* initially received a similar sized plot of land, over time wealthier families would have obtained more land from other small landowners, of which a part was probably leased out to tenants. It is unknown how old the tenancy system is but, by the 2nd century at the latest, land tenure contracts became formalised through the principle of *locatio conductio*. Alongside these legal contracts, land was also tenured ‘in precarium’ at the discretion of the owner, an arrangement which provided less protection to the tenants. 

Land was usually leased out with a farm (*fundus*) and in some cases also equipment was supplied by the landowner. Contracts were for longer time periods; five years was the standard with the option for indefinite extensions. Contracts were tied to the land, so with a change of ownership, the contract would automatically be transferred. Consequently, the same tenant family could lease the same plot of land for extended periods. Tenants were not a socio-economically homogenous group. Based on the size of tenured land, the quality of the soil and the types of suitable crops, a lot of variation existed between them. What they shared was a social and economic dependency relation with their landlords.

The landowners, which during the Early and Mid-Republican period in the Pontine region might have included the majority of the population, and the tenants, a group probably growing in numbers over time, constituted the households that lived on the studied farmsteads. They were certainly not homogenous, neither in ethnic identity nor in socio-economic status. However, the landowners shared their legal status as Roman citizens and their duty to pay tribute to the Roman state through serving in the army and/or by paying tax.

### 2.4.2 Politics of Rome affecting the countryside

Rome formalised its relationships with first its Latin and later its Italian neighbours through the process of colonisation. Often, colonisation was preceded by earlier elite connections between Rome and other cities, mostly on a familial basis. With the formal decision of establishing colonies, cities and their surrounding lands became integrated into the political, administrative and legal system of the Roman state.

Besides warfare causing damages to the countryside around the battle fields and army stations, Rome also put military requirements on their colonies. These were based on two factors: the legal status of the inhabitants, which was connected to the legal status

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169 Roselaar 2010, 147, 152.
170 Kehoe 2016, 619. Launaro 2011, 170–177. The formalisation of the *locatio conductio* can also be seen as an indirect indication for the increase in larger landholders that made use of tenants.
171 Kehoe 2016, 619.
172 Kehoe 2016. Foxhall 1990, 108 suggests that only large scale tenant farmers would have a contract including farm and equipment.
173 Foxhall 1990 for discussion on different types of tenancy relationships and why both landowners and tenants would be interested in a tenancy construction.
174 Terrenato 2014. The right of intermarriage between the Archaic Latin city-states is also an indication for the importance of elite networks.
Chapter 2. Up-scaling contexts: pots, people and processes

of the colony, and land ownership in connection to wealth.\textsuperscript{175} Moreover, the requirements placed by Rome on the colonies and allies could change over time. Increased requirements of not only tribute in cash but also manpower could be used as punishment.

The colonies founded before 338, which includes all the colonies in the Pontine region, are Latin colonies founded by the Latin League (Table 2.2).\textsuperscript{176} The legal status of a Latin colony came with full Latin rights for the inhabitants, consisting of a mixed ethnic population of Romans, Latins and locals, and the requirement to supply manpower.\textsuperscript{177} These early colonies, often founded at places with an already existing town such as Satricum, thus had an ethnically and culturally mixed population that was legally equal. After the dismantling of the Latin League in 338, Rome took full control over the Latin colonies. Sometimes, the status of a colony would be changed later on, either as a way of punishment or as a reward for loyalty. Rights could be taken away, duties could be increased, or additional rights could be granted by changing the legal status of a town from a colonia to a municipium.

The Roman citizen colony – \textit{colonia civium romanorum} – is a distinct type of colony. The earliest examples date from 338, and include Antium and Terracina. These colonies were settled exclusively by Roman citizens. They were usually small in size and located along the coast as military strongholds.\textsuperscript{178} However, sometimes they were located at places with a previous Latin colony and a local population, such as Antium. In these cases, the local non-Roman citizen population would legally become distinct from the Roman colonists, obtaining a different legal status in relation to Rome.\textsuperscript{179}

In connection to the legal status of the inhabitants of colonies and tribes, the amount of land owned by individual families mattered because of its connection to army subscription. Landowners would pay part of their tribute to Rome through army duty. The amount of land owned was proportional to the time you had to serve and your rank within the army.\textsuperscript{180}

Legislation around landownership was interwoven with social struggles between different socio-economic groups. The earliest agrarian law, the Licinio-Sextian law of 367, was connected to the Struggle of the Orders between the plebeians and patricians in Rome. The \textit{lex di modo agrorum} limited the amount of land that could be owned as well as the maximum amount of cattle that could graze on the \textit{ager publicus}.\textsuperscript{181} This should have freed up more land for the lower classes.

The late 2\textsuperscript{nd} century Gracchan reforms had a profound effect on landownership in rural areas. The plan was set out to redistribute part of the \textit{ager publicus} to poor, landless people. Families occupying more than 500 \textit{iugera} of \textit{ager publicus} had to return excess land to the state.\textsuperscript{182} However, the legislation was only concerned with \textit{ager occupatoris}. This specific type of \textit{ager publicus} was not available within an 80 km radius around Rome. The \textit{ager publicus} within this area was all \textit{ager in trientabulis}.\textsuperscript{183} Consequently, the Gracchan reforms had limited to no effect on landownership in the Pontine region.

The \textit{lex agraria} of 111 is of importance as it declared categories of land formerly leased from the state as well as land occupied by or taken from Latins to be private property. This came with better protection and, in the case of Latins, an extension of their rights making them equal to Roman landholders.\textsuperscript{184} Although it did not include land distributions like the Licinian or Gracchan laws, it did provide more

\begin{footnotesize}
\begin{enumerate}
\item See Erdkamp 2006 for an overview of changes in organisation, enrolment requirements and structure for the Roman Republican army. Roselaar 2009 for Mid-Republican military enrolment from the colonies in connection to land allotments and land holding.
\item See Pelgrim 2014, 18–20 for Latin colonies and their military importance in relation to arguments made earlier by Salm-on (1969). Salmon argues that especially those Latin colonies founded after 338 were strongholds, while the earlier Latin colonies were not. However, based on the location of at least the Latin colonies in the Lepine Mountains, I would argue that these too provided important military support against raiding groups.
\item Cornell 1995, 301–302; Salmon 1969, 40–54; Salmon calls the group of Latin colonies from before 338 \textit{priscae Latinae Coloni}-ae to set them apart from the later Latin colonies. He makes the distinction based on the assumption that those earlier Latin colonies are founded as a joined effort through the Latin League.
\item Salmon 1969, 70–81.
\end{enumerate}
\end{footnotesize}
security to a wide variety of landowners. Lastly, warfare potentially had an impact on the countryside in three different ways: battles leading to local destruction,\textsuperscript{185} military service of the male members of the landowning class and less tangible but eventually the most profound, the long-term effects of conquest and integration of new areas. Military mobilisation has often been used as an argument to explain rural decline after the Second Punic War.\textsuperscript{186} However, it is questionable how many farming families were actually forced to join the army. Considering that army enrolment of Roman citizens depended on land holding, the number of men that had to leave might have been relatively small. Although the colonies and allies also had to contribute manpower, fighting was mostly seasonal during the conquest of mainland Italy. Farmer-soldiers would thus not have been away for years in a row. This only changed during the Second Punic War and the conquest outside Italy.

The long-term effects of warfare are complex to reconstruct. Overall, the conquest, integration and unification of the growing territory of the Roman state created favourable conditions for living in the countryside during the Republican period. The end of the Latin War unified the Pontine region under the umbrella of the Roman state, leading to a long period of stability and peace. Increased market integration and expanding markets created profitable trading opportunities at overseas markets from the 2\textsuperscript{nd} century onwards, especially for areas well connected to Rome.\textsuperscript{187} Indirectly, this led to an intensification of agricultural practices, exemplified by the establishment of the first villas in the mid-1\textsuperscript{st} century.\textsuperscript{188} The market for consumption was also growing due to an influx of people and general population growth. The Roman conquest of the Mediterranean thus in the long term perspective created new opportunities for rural areas and directly affected the lives of the rural households.

\textsuperscript{185} See discussion in section 2.3. There are no battle fields known in the Pontine region, but several of the towns have been impacted by different wars, most notably the ones connected to the colonisation process and the Social War.

\textsuperscript{186} Brunt 1971; Toynbee 1965.

\textsuperscript{187} Launaro 2011, 169–170.

\textsuperscript{188} Launaro 2011, 156, 169; Marzano 2007 for discussion on villas and their different purposes.
Chapter 3
Pots, people and processes: cooking wares as reflections of habitual behaviour

What we eat and how we prepare our food is reflected in the objects we use. Cooking wares are used on a daily basis to prepare meals. However, because of the habitual use of cooking pots and pans, use often occurs almost unnoticed. Foodways are so tightly connected to who we are that we often do not actively think about how to prepare a meal and what kind of equipment we use.

Cooking wares are part of the almost invisible background noise of daily life. They are part of the group of mundane objects that set the frame for normative, habitual behaviour deeply entrenched in our identities. It is through what Miller calls “the humility of things,”189 that these mundane objects have a great but often hidden influence on our daily routines. Awareness of this background noise often only arises in challenging situations, for example, when the object breaks or when the need arises to define ourselves in relation to others.

Whereas the previous chapter discussed the different spatial scales (blue in Figure 3.1), this chapter focuses on behaviour. I will argue that behaviour takes place at the intersection of the spatial scales and related processes, connecting and freezing the existing relations between them at that moment and place in time, thereby leaving traces in the archaeological record related to specific activities (the ‘action’ box in Figure 3.1). Action is what leads to the production, distribution, consumption and eventually discard of cooking wares. These elements together can be captured in a flow model of the life cycle of pottery (green in Figure 3.1). Life cycles provide a framework to understand the contextual relationship between behaviour, objects and people through the reconstruction of so-called behavioural chains. The study of sets of objects or assemblages provides the needed site-level context for a dataset that lacks the stratigraphical detail of excavated materials. Emphasis is placed upon the need for the fitting of new elements (change) into pre-existing material worlds (continuity). The concluding part of this chapter explains how behavioural archaeology connects theory with method in a conceptual framework of scales, processes, behaviour, people and their things and why it therefore is a suitable theoretical framework for the study of daily life in the Roman Republican countryside.

3.1 Human behaviour at the intersection of scales

Behavioural archaeology is a practice-based approach that focuses on everyday life behaviour and its effect on the archaeological record.190 Primarily it is concerned with the relationship between people and things.191 Through various activities, people create a material world. Behavioural choices are bound by social, economic and ideological norms and morals, grounded in a wider societal framework. Therefore, behaviour is contextual and temporal, in other words culturally specific and follows societal ‘laws’. People and things can be equated with household and pot in the theoretical model (Figure 3.1). These

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190 Schiffer 1972 for first formulation of life cycle flow model. Schiffer 1987 focusses especially on formation processes. These are not captured in the general flow model used for this study.
191 Schiffer & Skibo 2008.
Figure 3.1. Theoretical model, inspired by Schiffer 1972, Peña 2007 and Braudel 1966. In the green box the part that is central for this study. P=production, D=distribution, C=consumption.
are bounded by socio-cultural norms that function on the larger scales of local, regional and the Roman Republican state level. This forms the backdrop for the behavioural system.

An underlying ordering of the behavioural system, activities and (inter)actions is assumed within behavioural archaeology (Figure 3.2). Human behaviour in general includes any activity by a person. The repetition of these activities leads to behavioural patterns. On the smallest scale, there are single acts. An action requires interaction between a person and at least one other person or object. Actions are grouped together in activities. Activities consist of sequences of related actions. Activities are contextual in space, time and the people and things involved. Different activities are linked together in processes, which form the basis for the individual parts of the flow model of the life cycle of objects. The complete flow model forms the behavioural system (Figure 3.3). Activities are recurrent in behavioural systems, leading to contextual patterns that can be recognised in the archaeological record. Specifically daily life activities, such as cooking, working, buying food and sleeping, are carried out on an (almost) daily basis. This high frequency of reoccurring daily activities makes them both habitual and highly visible in the archaeological record. These daily activities are part of the broader behavioural system, which also includes activities that are carried out less frequent such as weddings, religious festivals and harvesting. A behavioural system is “the entire set of interactions taking place with reference to a group of people during an interval of time.” This definition thus includes a temporal scale and a socio-spatial scale. It encompasses the societal norms and morals as well as i.e., environmental constraints. I would also suggest that behavioural systems are cumulative and that the boundaries are flexible and relational between separate interactions.

Behavioural archaeology is centred on so-called life cycles of objects, divided into five distinctive processes or activities: procurement of raw materials, manufacture, use, maintenance and discard. Combined, these processes form the systemic or living context. After discard, objects enter the archaeological record by becoming refuse. The movement of objects through these processes can be visualised in a flow model of life cycles (Figure 3.3). This study uses the general life cycle model of pottery production (procurement and manufacture), distribution (including the specific action of exchange) and consumption (intended use and re-use) as a structuring mechanism to understand daily life in the Roman Republican countryside, mirrored in the structure of the chapters itself. On a more detailed level, the individual chapters discuss the behavioural chains specifically for production, distribution and consumption by looking at cooking wares as sets rather than individual objects (see also below).

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192 Schiffer & Miller 1999 refer to this as difference in size of analytical units. It is my own choice to label this hierarchical.
193 These can also be referred to as action or performance.
194 Schiffer & Miller 1999, 16.
196 In my opinion, processes can be seen as locational-specific sub-systems in the larger behavioural system.
198 Schiffer 1972.
Each process can be divided into smaller activities, for example the steps needed to make a pot, to create a behavioural chain. Behavioural chains present the sequence of possible behavioural options within the contextual societal limits, which can be tested against the archaeological data or through experiments to provide the most likely life history path. Different choices are represented by convergent (addition), divergent (removal) and alternate (accounts for variation) options within the behavioural chains. The concept of behavioural chains is similar to the French chaîne opératoire; however, whereas the chaîne opératoire approach in ceramic studies is usually focussed only on the production phase, behavioural chains extend to all the processes in the life cycle of an object. This allows emphasising the reciprocal relationship between different parts of the life cycle and how choices made influence later phases. It also allows for giving credits for the mutually shaping power of both humans – as creators of objects – and the objects themselves – as directing human behaviour. Finally, it provides the possibility to suggest different options or choices within the same model, leaving enough space for alternative interpretations within the specific context. These are important factors to explain what to us might seem ‘illogical’ choices.

3.2 Opportunities, constrains and socially acceptable choices – behaviour as connector

One of the strengths of behavioural archaeology is that it allows for the reconstruction of an array of possible behaviours. However, to perform correctly, the interactor, either being a person or an object, has to have the required capabilities. These are called ‘performance characteristics’, defined as “(...) a capability, competence, or skill that could be exercised – i.e. ‘come into play’ – in a specific performance and thus is behaviourally relevant in a given interaction.” Behavioural chains are well suited to illustrate these different choices and required capabilities within the environmental possibilities, physical object restrictions and the constraints of social acceptability.

There are technical and non-technical or illogical choices made especially during the production process. Choices made affect the performance characteristics of the object during later phases of its life. Technical choices relate to the design process of objects and take into account factors such as availability of raw materials, production technology and intended function of the object. Technical choices can mostly be explained from a rational viewpoint. Intended function often poses specific requirements on physical properties that are general. For example, drinking vessels require different

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200 Schiffer 2011, 30.
201 Roux 2019 for specific application to ceramics.
202 The chaîne opératoire originally was focussed on procurement of raw materials and production, but is sometimes extended to also include use. See Lewis & Arntz 2020 on discussion of the development of chaîne opératoire approaches within archaeology and Skibo & Schiffer 2008, 9–10 for the connection between chaîne opératoire and behavioural archaeology.
203 See also Van Oyen 2016, chapter 1, on the link between production, distribution and consumption through external forces and object agency (internal forces).
204 This is missing in the chaîne opératoire approach that follows a rather rigid social logic path. See Schiffer & Skibo 2008, 20–22.
205 Schiffer & Miller 1999, 16.
206 Schiffer & Skibo 2008, 11.
permeability properties than storage jars. However, technological choices are to a certain degree also influenced by less tangible factors relating to what Lemonnier labels ‘illogical’ or non-technical choices. Illogical choices are not related to practical concerns but to ‘non-technical determinations’ such as social and symbolic factors. They are influenced by norms and morals and follow societal logic that can occur to us as illogical.207 In other words, the choices made need to fit into an existing framework, they need to be possible (both physically – technical and socially – illogical) and acceptable within the wider context. Illogical choices are what foremost makes objects culturally specific; it embeds specific choices leading to specific behaviour into societal systems, while technological choices make objects functional for their intended use.

The focus on physical properties and performance characteristics connects not only people and things but also theories of behavioural archaeology to material science methods, as first illustrated by Tite in 1999 and Sillar & Tite in 2000. They stress the relationship between material properties determined during production and how these relationships affect performance characteristics during use while also keeping in mind the context of the objects.208 Within behavioural archaeology, a distinction is made between properties and characteristics. Properties are intrinsic to an object, while the characteristics are related and defined in connection to a specific action.209 Properties thus influence characteristics. It is the physicality of things,210 or the stuffiness of stuff,211 that provides secondary agency to an object in the moment of action. The performance of objects is always relative to people because objects have physical effects on human behaviour, thereby preferentially directing production, distribution and consumption practices.212

The use of objects in our daily routines is often taken for granted and only becomes noticeable when something is not working the way we want it to, thereby forcing us to adjust our behaviour. Within behavioural archaeology, this is called a below-par performance that failed because one of the interactors did not meet the required performance characteristics.213 If you, for example, bake pancakes in a frying pan without a non-stick layer, you will have to adjust your behaviour to assure that your pancake will not stick onto the pan by adding more oil or butter in comparison to if you prepare your pancake in a frying pan with a non-stick layer. Similarly, the form of a pan is connected to what you cook in it. A pan without non-stick layer has very similar properties to a metal cooking pot. However, a pot has high walls making it more complicated to flip your pancake than when you make your pancake in a pan with low walls with easy access and plenty of space to manoeuvre around with a spatula. These two examples show how different choices made during the production process, adding a non-stick layer and the form, influence the use of a vessel later in the life cycle. Importantly, most of these behavioural adjustments are made in a split second, without one actively having to think about it because they are connected to our everyday habits.

While the pancake example illustrates the impact of more practical considerations on behaviour, non-technical factors also have a directional influence although these are more varied and complicated to trace due to their connection to specific contexts. A good example to illustrate the ‘acting’ of objects in directing human behaviour is offered by Van Oyen, when she discusses Roman terra sigillata and how this ceramic group both tells and makes history. Terra sigillata drinking cups have a highly standardised form that makes it easy to stack them. Consequently, the stackability of these cups makes distribution easier. More of them can be transported simultaneously because the cups nest into each other. The highly standardised form (together with other specific object characteristics such as colour and pictorial scenes) make them easily recognisable for consumers. Due to the standardised object characteristics, terra sigillata as a group became conceptualised and categorised in relation to other groups of objects, leading to these cups functioning as ‘jokers’ within pre-existing sets of objects. In turn,

207 Lemonnier 1993. Critique Schiffer & Skibo 2008, 12 on Lemonnier (and more general chaine opératoire approaches) is missing of importance of performance characteristics and technology beyond production.
208 Tite 1999; Sillar & Tite 2000, 182.
209 This division is similar to the division made by Jones (2002) between content (physical properties relating to Lemonniers technical choices) and context (determined by non-technical choices and thus historically contingent and spatially specific).
210 Boivin 2008, 129. She calls this physicality of matter materiality.
211 Miller 2010.
212 This principle is also known as affordances (Gibson 1986) and strongly connects to technology (Boivin 2008).
213 This is similar to the fixing principle of Hodder 2012.
this process of categorisation by consumers affects production due to the characteristics becoming more restricted, leading to centralisation of mass production and distribution networks.\textsuperscript{214}

Through limitations and opportunities of objects, determined by technical and illogical choices, human behaviour is thus preferentially directed. Behavioural processes (actions accumulating into trajectories, see below) are context specific and directional through the possibilities offered by the environment and physical laws, socially acceptable choices and the object itself. The study of the different possible options for this directed behaviour shows how material is active by shaping human behaviour. However, the question remains how active objects are in their relationship with people.

3.3 Intertwining things and people

Initially, flow models of the life cycle of objects were human-centred. However, the influence of social factors through technology\textsuperscript{215} and a more nuanced view on human-thing relationships\textsuperscript{216} has been added over the past decades, leading to a balanced conceptual framework to interpret the archaeological record.\textsuperscript{217} Through the focus on technological aspects of objects, such as performance characteristics (colour, feel) and physical properties (thermal expansion, strength), behavioural archaeology connects scientific archaeological methods with human behaviour while at the same time connecting people and things. Object agency within behavioural archaeology lies in how objects through their performance characteristics affect human behaviour. These performance characteristics are determined by people making choices during production and adapting objects to their use-context.

By placing the initiative in the hands of people, behavioural archaeology takes a different standpoint in the agency debate in comparison to much of the recent theoretical work around this topic.\textsuperscript{218} Behavioural archaeology barely uses the term agency. What is elsewhere referred to as agency is instead termed performance or action. Although not explicitly stated by Schiffer, the consideration of object performance opens the door to study object behaviour as well. Thereby, behavioural archaeology moves away from solely being centred on human behaviour to also incorporating object behaviour as part of people and thing relationships.

I suggest that objects only act or have agency in relation to a human being. Only people have intentions behind their behaviour and they therefore have the primary, initiating power to act. However, almost every human action involves objects and these objects do influence our behaviour. Object agency is thus secondary and a form of distributed human agency.\textsuperscript{219} A similar standpoint is articulated by Knappett, who views behaviour as the link between mind and matter (objects).\textsuperscript{220} Human agency prevailing over object agency also comes back in theories about object biographies. These theories have a resemblance to life cycles, aiming at reconstructing how human behaviour shaped an object through the process of use.\textsuperscript{221}

Secondly, in this study, objects are viewed as being connected to identity. Although mundane cooking pots are not necessarily direct, conscious expressions of identity, they are connected to identity because on a very basic level we are what we eat. Objects are materialisations of identities, reflected in the household assemblages of the farmsteads of the Pontine region.\textsuperscript{222} Or, as stated by Maldonado and Russell, “identity happens” and it happens to involve and emerge within the material world.\textsuperscript{223} People are both born in a material world and (re)create a material world.\textsuperscript{224} The residual force of objects on our behaviour is provocatively called material habitus by Meskell\textsuperscript{225} but also bears similarities to the concept of object agency as a shaping force for

\textsuperscript{214}Van Oyen 2016. She explicitly makes use of Actor Network Theory (Latour) as a framework.
\textsuperscript{215}Schiffer 1992. Especially influential are the models from Science and Technology Studies (SCOT).
\textsuperscript{216}Skibo & Schiffer 2008. Notably, object agency is not part of the adjusted model for the Roman period from Peña 2007.
\textsuperscript{217}Gifford-Gonzalez 2011; Plog 2011.
\textsuperscript{219}Gell (1998) discusses works of art as having secondary agency being distributed human agency, with humans as the primary agent in this relationship. However, people do get ‘caught up’ into the interartefactual domain, or in other words, the material world they are born in through what Gell calls abduction.
\textsuperscript{220}Knappett 2005.
\textsuperscript{222}Maldonado & Russell 2016.
\textsuperscript{223}Maldonado & Russell 2016, 10.
\textsuperscript{224}Meskell & Preucel 2007 on social archaeology and identity, see Webmoor & Witmore 2008 on specific critique against social archaeology as defined by Meskell & Preucel 2007. This is close to the concept of habitus, which argues that socialisation takes place in an existing material world.
\textsuperscript{225}Meskell 2005, 3, taking inspiration from Miller (1987), Tylor (1977) and the concept of habitus from Bourdieu (1977; 1980).
human behaviour through material trajectories.

According to Douglas & Isherwood, the consumption of ‘composite commodities’\(^{226}\) (sets of objects) marks social group boundaries.\(^{227}\) This concept of things forming coherent sets as markers of groups is a useful concept for ceramic assemblage analysis. Through consumption, people can enrol into a group. Consumption itself is a specific type of behaviour, encompassing different acts, including buying, using and eventually discarding objects. Consumption relates to both social, economic and sometimes political behaviour and needs to follow societal rules to be appropriate. These rules are materialised into archaeological assemblages, thereby marking different groups.\(^{228}\) Therefore, the association of specific objects with other objects can indicate group identities shared across different spatial scales as reflected in archaeological assemblages.

Trajectories provide generic possibilities for categories of things, such as the terra sigillata drinking cups or cooking jars. Rather than studying specific objects, trajectories focus on groups of things (i.e., assemblages) and how they shape the possibilities for human behaviour. These material trajectories form the object-side to the identity focused notion of the consumption of composite commodities. Object characteristics lead to preferentially directed behaviour by people. In other words, assemblages or sets have specific histories and material characteristics that shape human behaviour in a general, but also context specific way. At the same time, human behaviour shapes material trajectories. People produce, distribute and use the objects they need.\(^{229}\) These trajectories are considered to be cumulative (like behavioural systems), with objects and sets grounded in history through their material connections with older types.\(^{230}\) It makes objects and assemblages layered with historical relations. Thereby, trajectories also form a connection to the temporal-spatial scales. The study of trajectories offers the opportunity to focus on the process of how things shape human behaviour and thereby history. It provides a connection between material-based studies and larger historical questions through the contextualised study of production, distribution and consumption of groups of objects as grounded in historical trajectories.\(^{231}\) It emphasises the mutual relationship between objects and humans while not losing sight of the wider societal and historical context.

Besides the focus on historical contingency in trajectories, the study of groups of things, or sets of objects, is also valuable for two other reasons. Firstly, objects do not appear and are not used in isolation. Besides relationships between people and objects, objects also relate to other objects, in the case of this study the archaeological assemblages. Secondly, the introduction of new types of objects can only be successful if they fit into the current set. New additions need to make sense, they need to be acceptable. Individual elements need to fit into the whole, which needs to maintain its coherence. Groups of the same thing or sets of a variety of related things, also have their own behavioural characteristics. They limit and enable what people can do within the material world they (re)produce.\(^{232}\)

Considering groups of objects as sets fits the material of this study. The ceramic assemblages constitute the contexts of the studied cooking pots. A cooking pot is not used in isolation, it is part of a larger set of objects used for the preparation, serving and consumption of food (Section 2.2). During the Republican period, these ceramic sets become more and more standardised. This is reflected in the fact that in the Pontine region, more or less the exact same types are found on every rural site.\(^{233}\) A clear functional division into several categories exists: transport, storage, cooking, serving. As a consequence, cooking pots were probably also conceptually categorised as such in the Roman period. The longevity of specific types and the use of specific production technology, with an increase in standardisation over time, indicates the developing concept of what a cooking pot should look like and how it should be made. Therefore, it is possible to consider cooking pots as a group of objects because they were and still are recognisable as a specific category. At the same time, this historical conceptualisation process started before the Roman period and continued into the Empire, creating a material trajectory.

\(^{226}\) Douglas & Isherwood 1980, 96.
\(^{227}\) See however Van Oyen & Pitts 2017, 9 for critique on social approaches to material culture as being too representational.
\(^{228}\) Douglas & Isherwood 1980, chapter 3, 5 and 6; Greene 2008 for consumption studies in Roman archaeology.
\(^{230}\) Van Oyen 2016, 134.
\(^{231}\) Van Oyen & Pitts 2017, Introduction.
\(^{232}\) Gosden 2005.
\(^{233}\) See Chapter 7 and 8 and Appendix V for assemblage analysis.
The conceptualisation of cooking sets offers the possibility to see how the use of cooking pots within the household assemblage changed over time in relation to historical processes on the local and regional scale. Minor differences on the site level can on the other hand indicate differences in foodways on the household level. The known introduction of new types of food in the Republican period is an example of how new elements (change) are fitted into existing sets of objects (continuity). Furthermore, the process of categorisation and standardisation also created the opportunity for competition, since there is a common ground to compare cooking pots to each other.\textsuperscript{234} This could be reflected in for example differences in functional quality or aesthetics. Lastly, the study of performance characteristics as determined during production links production to the contexts of distribution and consumption because they are affected by choices made during production. In this way, the material science approach to cooking pots is connected to a contextual approach of use.

3.4 Things, people and scalar processes: human behaviour as the connector

The theoretical framework of this study focusses on the centrality of foremost human and secondly object behaviour as the connector between temporal-spatial scales (Chapter 2), with action as the moment of the freezing of a variety of relationships involving people and things and as a connector between the past and the archaeological record, which can be studied with methods focussed on sets of objects, trajectories and context (Appendix I).

In summary, behaviour is viewed as historically contingent and contextual through the relationships it forms between people, things and society, with people always having the initiative. These relationships are an essential but complicated part that overarches the chapters and ties production, distribution and consumption together into a coherent whole in the same manner the introduction of new objects are fitted into the existing set through relations to maintain a coherent whole. Relationships, as well as the artificial boundaries between the scales, are constantly moving and flowing. The moment of activity freezes the existing relationship at that moment and place, leaving a cumulative mark in the archaeological record.

When it comes to daily life activities, most action takes place without us being really aware of why we do something and how what we do relates to other objects, people and wider society. This makes our daily routines and the objects that are involved in them so powerful as an area of study. Change in routines can be slow and gradual, but also sudden in case of disrupting events. The relationship between the variety of scales and their influence on each other, as well as the element of awareness, is dependent on the context. Although ultimately this study is about daily life, the cooking pots first needed to be made with a production context, which is the topic of the next two chapters.

\textsuperscript{234} Van Oyen 2016 for the process of categorisation and competition in terra sigillata.
Chapter 4

Cooking ware production in Republican Italy

Part 1: The behavioural chain of Roman Republican cooking ware production

Through productive activities, people create a material world. The preparation of food starts in essence with the production of foodstuffs and cooking equipment. In the case of ceramic cooking wares, the life cycle of a pot starts with the collection of raw materials by a potter who shapes a vessel out of these. The process of cooking ware production is the focal point of this chapter.

To understand the production process of Republican cooking wares, we have to understand the behavioural chain of how cooking pots are made. This can be reconstructed based on options available to choose from within the different steps of the production process, known from archaeological and ethnographic studies. These choices are environmentally, technologically and culturally embedded. Furthermore, choices made during the production phase also influence the later parts of the life cycle.

The behavioural chain and the reconstructed ideal cooking pot based on performance characteristics can subsequently be compared to (in)direct indications for the production process observed in the studied material. This is informed by the macroscopic analysis, fabric groups and morphology of the selected samples with a focus on change and continuity in the decision-making process over time. Not all possible choices leave traces on the ceramic material itself, so focus is laid upon those decisions that can potentially be read from the ceramic fragments.

This chapter ends with a discussion of whether there was a general concept of what a cooking pot should look like in the Mid- and Late Republican period. The following chapter considers the bigger picture of cooking ware production organisation during the Republican period in Italy. The production process is embedded in wider societal structures through production organisation and socio-cultural traditions. Here we need to bridge a gap, since this study is concerned with ceramic fragments from consumption sites identified in surveys rather than from excavated production sites. Information about production technology (behavioural chain) and standardisation that come forward from the ceramic material are used as indirect indicators for cooking ware production organisation during the Republican period. This is combined in the next chapter with a discussion on regional coarse ware production sites as well as the few excavated examples of Republican cooking ware production sites to be able to frame the ceramic data from the Pontine region into the wider historical framework of the Roman Republic.

4.1 The behavioural chain of making cooking pots

The production process of cooking ware consists of four sequential activities: procurement of raw materials,235 preparation of the clay paste, forming and surface treatment and lastly firing. Each step is built up of a sequence of smaller actions and within these actions a variety of technological decisions is made by the potter. The sequence of possible behavioural choices creates a behavioural chain, 235 Fuel is needed for the firing but the type of fuel cannot be reconstructed based on ceramic materials alone and will therefore not be discussed any further. For fuel practices in the Roman world, see Veal 2017.
Chapter 4. The behavioural chain of Roman Republican cooking ware production

with choices represented by decisions that are either divergent, convergent or alternate from the standard process of production (Figure 4.1).236 The choices made during procurement and clay paste preparation heavily influence the characteristics of the fabrics. In this way, the fabric classification based on variation in the combination of clay matrix, inclusions and voids is connected directly to the behavioural chain of the production process.

Choices made early in the production process affect the possible options for subsequent steps. These choices are grounded in cultural traditions. The visual appearance of a cooking pot, especially its form and colour, are related to cultural norms and the intended function of the object. These are determined during production. For example, the colour depends on type of clay used and the firing conditions. Furthermore, what a pot is used for, in this case cooking, is embedded in cultural practices of food preparation. The intended function thus influences the decision-making process during production through expectations of the user about cooking pots. The first step of the selection of raw materials is thus already very much bound to the intended end product.

Cultural traditions and thus also decisions made during production are bounded in time and space: they depend on the production location and on what is (usually locally) available as well as social-cultural norms and technological knowledge. Consequently, the choices made during the production process can frequently inform us on the production location.

Some steps in the production sequence are essential, while others are optional (technological) choices related to the intended use of the pot and existing social-cultural traditions. Cooking wares, with their specific function, require specific performance characteristics that are behaviourally relevant in relation to the activity of cooking. To achieve these desired performance characteristics, potters can make different technologically informed decisions at different stages of the production process to improve the functional quality of the end product. The capability to withstand repeated and rapid cycles of heating and cooling (i.e. thermal shock) and to facilitate heat transfer between the exterior and interior of the pot (i.e. thermal conductivity) are among the most important performance characteristics for cooking wares. Yet, thermal conductivity is not necessarily always an advantage for cooking pots – it depends on how and for what purpose the pot is used. High thermal conductivity is good for food that is (quickly) prepared at high temperatures and in direct contact with fire such as in frying pans, while lower thermal conductivity is more beneficial for dishes that require long simmering on embers (like porridge and stews).237 This shows that there is an intricate relationship between desired performance characteristics, intended use and choices made during the production process.

4.1.1 Step 1: Procurement of raw materials: How to select and obtain suitable clay and temper?

The selection of clay and temper is not only defined by the environment of the production location but also depends on intended function of the object and cultural traditions.238 Whereas the clay and inclusions provide an indication for the geological origin of fabrics, intended function relates to technological choices while both of these factors are also entrenched in cultural traditions.239

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236 See Chapter 3 with discussion on behavioral chains.
237 Müller 2017, 619.
238 Roux 2019, 16.
239 Lemonnier 1993.
On a technological level, not all clay is equally suitable for cooking ware production and most clays require some sort of modification before they can be used (see preparation of the clay paste below). Suitability of raw clays depends on their malleability, plasticity, ductility, tenacity and drying capacity (shrinkage). Due to the specific function of cooking wares, the pots preferably are also able to resist repeated cycles of heating and cooling, an aspect which could be improved with clays and temper that increase the hardness and tenacity of the clay paste. This puts an additional factor into consideration for clay selection, since some clays and their naturally occurring mineral inclusions are more heat-resistant than others. Recent research into thermal shock resistance and thermal conductivity indicates an intricate relationship between them and how they are affected by a multitude of factors such as calcareous content, firing temperature, shape, size and amount of pores and inclusions.

The thermal conductivity of non-calcareous clays and calcareous clays is related to firing temperature and the process of vitrification. Calcareous clays have a slightly higher thermal conductivity at firing temperatures between 550–850°C. Inclusions that may increase thermal conductivity include for example coarse granite (feldspars) whereas platy inclusions like phylite decrease conductivity and thermal shock resistance. However, inclusions are only one factor affecting thermal conductivity and they are not always beneficial. It appears that especially inclusion ratios over 20–30% have a negative effect due to the often increase of cracks and pores related to higher amounts of inclusions, even though higher amounts of inclusions also increase thermal shock resistance. For cooking pots, it is important that crack propagation is limited, so clay pastes that are too fine are also problematic. Coarse clay sources or the addition of coarse temper up to 20–30% of the clay matrix seems to be beneficial to a certain extent.

4.1.2 Step 2: Preparation of the clay paste: How to prepare a clay paste suitable for your intended pot?

The objectives of paste preparation are to improve the properties and characteristics of the raw clay material based on the subsequent steps in the production process and the intended aesthetics and function of the object. The choices made are based on knowledge about raw materials and how they behave during forming, firing and use. The action of the preparation of the clay paste thus transforms the natural base clay into an anthropogenic clay paste.

The preparation of the clay paste involves acquiring the right level of hydration and the homogenisation of the clay paste right before forming. Additionally, two related actions can be performed. Firstly, additional alteration of the hydration level of the raw clay to a dry, moist or wet state, followed by the second step of modifying the composition of the base clay. This last step provides a wide array of technological choices to the potter to alter the characteristics of the clay paste. Based on ethnographic and archaeological data, it appears to be common to perform both of these additional steps, which are described in more detail below.

**Optional: Modification of the base clay:** most potters modify the base clay to improve workability and plasticity of the clay paste and to achieve the desired physical properties in relation to the intended end product. Indications for modification of the base clay are however difficult to deduce as most of the indications can potentially also occur naturally in (heterogeneous) clay sources and some potential choices do not leave traces on the sherds. Furthermore, consequent steps in the production process can erase indications of clay paste modification. To argue in favour of modification of the natural clay thus requires the combination of different types of indications.

The mixing of different clay types or clay and temper happens according to volume. Consequently, since no exact ratios are used, minor variation commonly occurs between clay paste batches made according to the same recipe, especially when the potter does
Temper is the addition of material to the base clay and involves three choices: the type of non-plastic inclusions, the size of the inclusions and the amount of inclusions. The main consequences of adding temper are a reduction of the plasticity and the amount of pores through wedging. Dehydration of wet clay can be indicated by the occurrence of clay lumps when hydration and the absorption capacity of the clay. This step is closely connected to the next step of homogenisation. Dry clays need to be hydrated. The use of dry clay or a clay mixture can be indicated by the occurrence of clay lumps when hydration is incomplete. Dry clay can be hydrated through immersion (soaking in water), humectation (adding water and mixing it in) or impregnation (mix fine dry clay with wet coarse clay), but the chosen method cannot be inferred from the examination of the finished object. Dehydration of wet clay pastes (slurries) to make them drier can also not be detected.

Obtaining the desired level of hydration of the clay paste: the clay paste or base clay is likely to not have the right level of hydration for the potter to perform the forming action. Therefore, the potter will need to adjust this level depending on the current state of hydration and the absorption capacity of the clay. This step is closely connected to the next step of homogenisation. Dry clays need to be hydrated. The use of dry clay or a clay mixture can be indicated by the occurrence of clay lumps when hydration is incomplete. Dry clay can be hydrated through immersion (soaking in water), humectation (adding water and mixing it in) or impregnation (mix fine dry clay with wet coarse clay), but the chosen method cannot be inferred from the examination of the finished object. Dehydration of wet clay pastes (slurries) to make them drier can also not be detected.

Homogenisation of the clay paste: the goal is to improve malleability of the clay paste through homogenisation (even distribution of non-plastic particles and water) and to decrease the size and amount of pores through wedging. The degree

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251 Rye 1981, 198; Santacreu 2014, 70.
253 Ho & Quinn 2021, 2–3.
254 Roux 2019, 32. Cuomo di Caprio 2017, 104, notes that sieving was probably only done with wet clay mixtures and on a limited scale.
256 Quinn 2013, 156; Santacreu 2014, 68; Eramo 2020, 12.
258 Ho & Quinn 2021.
259 Roux 2019, 33.
260 Quinn 2013, 171; Roux 2019, 39–40; Eramo 2020, 8.
of homogeneity is usually examined in thin-section based on the distribution of inclusions and particles, the amount and sizes of voids, colour variation in the matrix and the occurrence of clay-rich features in the matrix such as lamination, streaks and swirls. A high level of heterogeneity can be seen as an indication for a lower time investment on the part of the potter in achieving proper homogenisation.

4.1.3 Step 3: Forming method: How to form the intended object?

The forming method depends on the form, size and intended primary function of the final object. Furthermore, the preparation of the clay paste is partly related to the chosen forming method. Depending on the forming method, requirements on coarseness of the clay paste and plasticity (hydration) can vary. The forming method can occasionally be divided into two steps: the shaping of the clay into the intended (rough) form, also called primary forming, and the optional next step of (minor) modification of the form to complete its final form, also called secondary forming. Secondary forming is optional and does not include surface treatment (next step, Section 4.1.4). The final form of the vessel is archaeologically related to typologies.

Each forming method can potentially leave specific types of traces related to the forces applied to the clay paste and the directionality of these forces. These traces can be visible on the surface and in the fractions on the macroscopic level and in thin-section. However, part of the traces can also be erased during subsequent steps in the production process, while some forming methods lead to similar indications. The absence of specific indications should never be used as direct evidence for the use of a specific forming method.

Alignment and orientation of inclusions, voids and clay domains are the parameters that are most visible in the microstructure of thin-sections, while surface topography, wall thickness and fracture orientation can be observed easier at the macroscopic level. The different steps and choices made during forming are discussed below.

Primary forming

Primary forming is when the potter creates the basic intended form of the object. There is a variety of forming methods Republican potters used for this:

- Wheel throwing: a lump of clay is placed on the wheel and formed under constant rotation. The speed of the wheel can be adjusted for the forming of the different parts of the vessel or for the throwing of different forms. Indications for wheel throwing at the macroscopic level are: spiral, parallel grooves on the inside of the vessel; compression ridges in a vertical or slightly diagonal direction where the form is narrowing; the presence of slurry (very similar to slip) with an irregular distribution if water is added during forming; laminar fractures; and alignment of inclusions best visible in fresh fractures. Indications for wheel throwing in thin-section are a strong alignment of inclusions and voids to the margins. An indirect indication is the coarseness of the clay paste, as a high percentage of coarse inclusions would lead to abrasion of the potters’ fingers due to the rotational forces of the wheel.

- Coil building: coils of clay are rolled out or squeezed by hand and bonded together by wetting and smearing. Indications for coil building at the macroscopic level are: variation in wall thickness between the coils and joins; fractures following the coils horizontally; and a ‘cubic’ structure of fractures. Indications in thin-section are: the concentric orientation of inclusions and voids, following the directions of the coils and voids between the coils.

- Coil building combined with turntable: combination of using coils followed by forming the final form and smoothening the surface with the use of a turntable. Indications, both in hand specimen and thin-section overlap with coil building but could be obscured due to the smoothening of both the surface and a more regular wall thickness.

Optional: Secondary forming

Objects are usually left to dry to a leather-hard state before secondary forming. Secondary forming
alters the surface topography and removes traces related to the primary forming stage. This is an optional step and can be carried out using different techniques:

- **Trimming or shaving** is when material is cut from the surface with a sharp tool (knife, string). Indications for this action at the macroscopic level are: irregular facets on the surface, whereby the edge of the facets can vary between sharp to tearing depending on the degree of hydration of the clay paste; and sometimes drag marks if coarse inclusions are present.\(^{273}\)

- **Scraping** is the removal of excess material with a tool. It scrapes off and displaces material on the surface, leaving drag marks from coarse inclusions. Other possible traces resulting from scraping depend on the type of tool used and the directionality in which the tool was applied.\(^{274}\)

### 4.1.4 Step 4: Optional finishing: Surface treatment

The action of finishing is optional and changes the surface but not the form of the object (as opposed to secondary forming). Like secondary forming, the surface topography is altered and thus obscures traces from primary forming. Surface treatment can be carried out for aesthetic or functional reasons and can affect the behaviour of the pot during firing and use.\(^{275}\)

Cooking pots that received surface treatment to prevent the penetration of water into the clay body are less susceptible to spalling but more at risk of thermal cracking.\(^{276}\)

Finishing can be carried out directly after primary forming when the pot is still in a wet state or when the object is dried to a leather-hard state after primary or secondary forming. The whole surface can be treated, or only parts of it. Surface treatment can often be well observed macroscopically. Depending on the type of surface treatment, traces can also be visible in thin-section.\(^{277}\) The following choices occur for Republican cooking pots:

- **Wiping with a wet cloth** to smoothen the surface. The macroscopic indication for wiping is the presence of a thin layer of fine clay in the same colour as the matrix on the surface. This layer can be difficult to discern from a slip layer but might be less continuous than slip and display patches of parallel lines.\(^{278}\)

- **Slip** is the application of a thin, liquid, clay-rich coating on the surface of the object, usually visible both macroscopically and in thin-section. Due to the different texture of slip and body leading to mechanical discontinuity, cracks can form during firing leading to chipping of the slip layer. The slip can be made of the same clay as the vessel or of a different clay.\(^{279}\)

### Drying before firing

It is important to let the vessels dry properly before firing. If too much water is left in the vessel voids or around the clay particles, there is a chance the pot might explode during firing due to rapid evaporation of water. It takes at least several days for an object to properly dry. To prevent stress on the vessel due to shrinkage during drying, it is important to achieve a slow, uniform and gradual drying process whereby pots are not directly placed in the sun.\(^{280}\)

Indications of too rapid drying causing stress on the ceramic body are: S-shaped cracks on the base of wheel thrown pots; thin, elongated, parallel voids caused by differential shrinkage and thin ring voids around inclusions.\(^{281}\) However, it is to be expected that pots that cracked before firing are discarded and thus do not end up on consumption sites.

### 4.1.5 Step 5: Firing: How to fire cooking pots?

Firing is the last action in the production process. It marks the transition from clay paste to fabric with the onset of irreversible changes of the clay paste into an undeformable, durable object.\(^{282}\) The firing atmosphere can be reconstructed based on ceramic fragments. Depending on other indications, tentative conclusions can also be drawn about the firing temperature and duration. Other elements related to firing in a kiln, such as kiln type, how pots were stacked in the kiln and fuel types used, can only be reconstructed based on excavated production locations.\(^{283}\) However, these elements do affect firing

\(^{273}\) Rye 1981, 87.
\(^{274}\) Rye 1981, 86.
\(^{275}\) Schiffer et al. 1994.
\(^{276}\) Schiffer et al. 1994, 209.
\(^{277}\) Quinn 2013, 181; Santacreu 2014, 82.
atmosphere, temperature and duration. All choices regarding the firing process are closely connected to each other. The outcome of firing is, however, not only dependent on the firing itself but also heavily influenced by the composition of the clay paste, the form of the object and the type of surface finishing.

**Firing**

There are three elements that the potter can influence during firing: the atmosphere in the kiln, the firing temperature and the duration of firing, including soaking time. How and to which extent the potter can actually influence these elements is co-dependent on the kiln type, fuel type and professional knowledge.

- Atmosphere during firing and cooling relates to the mix of gases, specifically the supply of free air and the amount of free oxygen available within the kiln. When there is more oxygen available than needed for fuel combustion, the free oxygen reacts with the clay paste leading to the removal of organic matter at 300°C followed by iron oxidation after complete removal of all organic content at 600°C. As a consequence of these processes, the clay will turn red, orange or brown. When there is no free oxygen available, the atmosphere is reduced. Processes in the clay take place at a low rate or are absent due to the lack of free oxygen. The colour of the fired object will be grey to black. Both types of atmosphere lead to differences in colour based on duration of the firing, wall thickness of the vessel, porosity and composition of the clay paste. Complete oxidisation or reduction can only be achieved when firing duration is long enough. Colour is further altered during cooling. Usually cooling takes place in an oxidising atmosphere leading to red to orange colours on the surface. Cooling in a reducing atmosphere requires specific actions from the potter or kiln master, as the draft needs to be blocked after the last fuel is added or damp fuel is used to create smoke. If these conditions are met, the carbon particles will penetrate the surface, leading to black and grey surface colours on the fired vessels. Consequently, a wide spectrum between oxidisation and reduction is normal, leading to different types of ‘sandwich’ cores.

Reconstruction of firing atmosphere relies mostly on colour observations and is therefore carried out during macroscopic analysis. Thin-sections can provide more detailed information about sandwich cores and the transition in colour between core and margin (sharp vs. diffuse).

- Duration of firing depends on a range of variables, from kiln structure and fuel type to density of stacking and the form, size, thickness and dryness of the vessels before they entered the kiln. Generally speaking, thicker walled vessels will require longer to fire completely than thin walled pottery. The duration of the needed soaking time to achieve complete reduction or oxidation depends on kiln structure (size and insulation), vessel properties and the method of stacking. The exact duration cannot be detected on the ceramic material beyond basic statements about soaking time being sufficiently long enough to achieve complete reduction or oxidation. Too rapid cooling leads to horizontal cracks (dunting cracks) on the fired vessels.

- Temperature of firing can be tentatively reconstructed based on thermally induced changes to the clay and some types of inclusions. The clay matrix of non-calcareous clays will start to ‘melt’ as part of the sintering process between 800–850°C before it reaches vitrification around 900–1000°C. This is easiest to detect in ceramics fired in an oxidising atmosphere examined in thin-section with crossed-polarised light based on the optical activity of the clay matrix. Some specific types of minerals change colour or composition at specific temperatures (e.g. hornblende, glauconite, mica, feldspars, quartz and calcite).

**4.1.6 Conclusion: the ideal cooking pot**

The properties of a hypothetical ideal cooking pot are based on technical experiments focussed on thermal properties and ethnographic studies on the production process. These studies indicate lack of control during open firing.

284 Cuomo di Caprio 2017, 335.

that there is an intricate relationship between choices made at different stages during the production process and the different elements of a fabric (inclusions, voids and matrix). This makes it complicated to formulate what the hypothetical ideal cooking pot based on performance characteristics would be; however, there are three main elements that do come forward:

1. Raw material selection and preparation of the clay paste: clay pastes that include a considerable amount of coarse (igneous) inclusions, but not surpassing 20–30%, perform better because of increased thermal shock resistance (toughness) against crack propagation (at the cost of strength) and increased thermal conductivity.294 Preferred temper from a techno-functional perspective would thus have been coarse, non-platy inclusions and temper types including quartz and igneous inclusions. The decision to use non-calcareous clay or calcareous clay seems to have limited effect on thermal conductivity when firing temperatures remain below 850°C.295

2. Forming and finishing: the shape and orientation of voids can create heat barriers.296 Fewer and round rather than elongated voids are thus preferred. Finishing the cooking pots with a slip layer can have varied outcomes. While it decreases the chance of spalling, it increases the risk of thermal cracking.297 Because the risk of spalling is connected to the penetration of liquid into the clay body, the usefulness of slip layers in cooking pots might also depend on what type of food is prepared in the vessel.

3. Firing: higher firing temperatures lead to vitrification of the ceramic body which increases thermal conductivity but decreases strength and toughness.298 Higher firing temperatures are thus not always beneficial.

For our hypothetical cooking pot with optimised performance characteristics, we also need to consider the different functions of cooking wares. There could be variation in the importance of thermal conductivity or thermal shock resistance based on intended use. However, all types of cooking pots would benefit from having coarse inclusions in the range of 10–30% of the total fabric. The literature tentatively suggests that quartz and inclusions with an igneous origin might be preferable to increase toughness and thus thermal shock resistance in general.

Jars used for the preparation of (semi)liquid foodstuffs at lower temperatures but left simmering above a fire for a long time would benefit from good thermal shock resistance because of repeated cycles of heating and cooling whereas thermal conductivity is maybe of less importance for those vessels. Pans used for the preparation of low to non-liquid foodstuffs, especially those employed for frying and sautéing at high temperatures, benefit from high thermal conductivity combined with good thermal shock resistance, toughness preventing crack propagation and non-stick layers such as slips. Also, fewer voids lead to better thermal conductivity and less of the liquid being absorbed, preventing spalling in a similar way as slip layers. Portable ovens consist of two elements requiring different performance characteristics: the bottom tray would have needed similar qualities as pans while the cooking bells mostly needed to be able to retain heat.

These theoretically ideal cooking pots do not take into account cultural preferences, which might be of considerable influence. The section below discusses the production process of the cooking pots from the consumption sites in the Pontine region, allowing a comparison between production choices made during their manufacture and the above discussed characteristics of the ideal cooking pot. This will make it possible to assess the technological functionality of the sampled cooking pots and tease out any divergences from the reconstructed ideal performance characteristics that might have been culturally informed.

4.2 Introduction to the ceramic dataset: limitations and opportunities

Cooking wares from eight coastal consumption sites and eight consumption sites in the Pontine plain, dated between the late 4th century BC and the 1st century AD, have been studied in more detail. The selected material covers the main shapes of cooking wares in use during this time span. It includes four types of cooking jars (Olcese olla 1, olla 2, olla 3A and olla 3B), five types of pans (Olcese tegame 1–3, casserole, general baking tray), three types of lids (Olcese coperchio 1–3) and three types of cooking bells (Olcese clibanus 1–3) (see Chapter 2
for introduction of the sampled types). Only rim fragments have been studied and sampled for thin-sectioning.

A total of 111 fragments from the coastal area and 317 fragments from the plain were examined macroscopically. These were classified into 27 macroscopic groups based on visual variation in inclusion types, abundance and shape of inclusions as well as texture and colour. The macroscopic groups are coded with M-fabric followed by a number for the groups from the plain or a letter for the coastal groups (e.g. M-fabric 2; M-fabric J). These 27 macroscopic groups have been sampled further for the thin-section analysis for which at least one sample from each macroscopic group was taken, with fifty samples from each area. The microscopic fabric analysis based on the thin-sections resulted in two main fabric families (Table 4.1). The volcanic fabric family includes four groups indicated with a V (V.1 – V.4, N total=36, including sub-fabric V.4) and eight loners (VL.A – VL.H). The quartz-feldspar fabric family is indicated with QF and includes six groups (QF.1 – QF.6, N total=53) and three loners (QFL.A – QFL.C). The samples are described in more detail in Appendices II–IV. Descriptions of the reconstructed behavioural chains for the individual fabrics can be found in Appendix IV as part of the fabric descriptions under the heading ‘comments, production’. In the text, discussion of macroscopic fabrics is indicated by the use of the term M-fabric, while the use of fabric without the prefix M always refers to the microscopic thin-section fabric groups.

The thin-section analysis indicated that discerning different Republican cooking ware fabrics based on a macroscopic examination is complex. Many of the different macroscopic fabrics needed either to be merged together or split up further upon microscopic examination (see Appendix IV, ‘relationship to M-fabrics’ sections for the individual fabrics). However, the two main fabric families (volcanic and quartz-feldspar) could relatively easily be recognised macroscopically because of the contrasting colours of their inclusions and their respective main types of inclusions, with black inclusions as the main characterising element for volcanic fabrics and white, shimmering and milky inclusions for quartz-feldspar fabrics. Furthermore, some very specific fabrics were correctly identified in hand specimen because they clearly stand out both macroscopically and in thin-section (e.g. M-fabric 14 = QFL B; M-fabric 8 = VL D; M-fabric A1/G/H = V.2 or QF.2).

The main obstacle for the reconstruction of the behavioural chain of production is that all samples were collected from consumption sites rather than production sites. Consequently, all indicators for the production steps are indirect and often tentative. With this dataset, it is therefore not possible to make a direct connection between a ceramic fragment or fabric and an excavated production context. Furthermore, only those choices in the production process that leave traces on the final object can be reconstructed. Lastly, in this study, small-scale data (fabric analysis) is used to answer much larger scale questions on change and continuity in pottery production. This means that there can be problems of abstraction and up-scaling. Although these are very common issues in archaeological research, they need to be acknowledged and dealt with. The small-scale fabric data is dealt with in this chapter, while the following chapter aims at bridging the gap between individual ceramic fragments and wider societal trends through an assessment of standardisation and excavated examples of cooking ware production sites in Central Italy.

Focus below will be on traces of the production process visible on the ceramic material and how these relate to aspects like standardisation and production organisation. The connection between different scales is studied by emphasising differences and similarities between fabrics and change and continuity over time. This is grounded in the assumption that change at one scale also affects other scales.

4.3 The behavioural chain of making cooking pots: steps and choices reflected in the fabrics of the Pontine region

Possible technological choices made during the production of cooking pots and the formulated hypotheses on the ideal cooking pot based on performance characteristics are the basis for comparison with the Pontine region dataset. Information about fabric classification, typological classification and firing of all the macroscopically examined cooking wares are stored in an online, open access database. The descriptions of the

299 Olcese 2003.
<table>
<thead>
<tr>
<th>Fabric</th>
<th>N</th>
<th>Temper type</th>
<th>Clay mixing</th>
<th>Hydration</th>
<th>Kneading</th>
<th>Forming - alignment</th>
<th>Slip</th>
<th>Firing atmosphere</th>
<th>Firing temperature</th>
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<td>moderate</td>
<td>x</td>
<td>oxi</td>
<td>600-800</td>
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<tr>
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<td>strong</td>
<td>x</td>
<td></td>
<td>oxi</td>
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<td>oxi</td>
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<td></td>
</tr>
<tr>
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<td>moderate</td>
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<td>x</td>
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<td>strong</td>
<td>incomplete oxi</td>
<td>oxi</td>
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<td>strong</td>
<td>x</td>
<td>oxi</td>
<td>&gt; 800-850</td>
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<tr>
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<td>x</td>
<td>incomplete</td>
<td>poor</td>
<td>strong</td>
<td>oxi, red cool</td>
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<td>S-shape - coils</td>
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<td>weak</td>
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Table 4.1. Overview of production indicators in the different thin-section fabrics from the Pontine Region. X = certain indication; * = tentative indication. See Figure 4.2 for overview with photos and descriptions of the quartz-feldspar family and Figure 4.3 for the volcanic family.
Daily life in the Roman Republican countryside

Quartz feldspar family

GROUPS

QF:1 Quartz and feldspar rich fabric
Dominance of sub-rounded to rounded quartz in a narrow size range, combined with fine-grained rock fragments, feldspars, chert, clay pellets and iron nodules and occasionally clinopyroxenes. The matrix is iron-rich and heterogeneous.

QF:2 Bimodal quartz and feldspar fabric with iron nodules
Equal mix of sub-angular to sub-rounded quartz and feldspar accompanied by smaller quantities of rock fragments, chert, clinopyroxene, clay pellets and iron nodules set in a homogeneous, iron-rich matrix with feldspar particles.

QF:3 Heterogenous matrix with fine quartz, feldspar and iron nodules
Fine quartz and a larger sized set of inclusions consisting of iron nodules, rock fragments, sanidine, chert and clinopyroxene set in a heterogeneous matrix with iron nodules, quartz/feldspar and biotite particles.

QF:4 Compact and fine quartz-feldspar fabric
Strongly bimodal, high amount inclusions (30%) of predominantly quartz and feldspar and small amounts of clinopyroxene, chert, iron nodules and clay pellets. The matrix is compact, homogeneous, iron-rich and low calcareous and rich in quartz/feldspar particles.

QF:5 Bright red clay matrix with quartz
Bimodal fabric, predominantly quartz and varying quantities of clinopyroxene, rock fragments, iron nodules and clay pellets set in a heterogeneous matrix with two different clays.

QF:6 Clay pellets and quartz
Low amount of inclusions (5%) consisting of dark orange clay pellets and quartz, accompanied by small amounts of clinopyroxene, microcrystalline quartz, microcline and iron nodules set in a compact, iron-rich matrix.

LONERS

QFL: A Coarse angular quartz with rock fragments
Iron-rich, highly optical active, heterogeneous matrix with strongly aligned angular quartz and feldspar inclusions.

QFL: B Sand with bright orange clay pellets
Sub-rounded to rounded quartz inclusions combined with smaller amounts of bright orange and dark orange clay pellets and igneous inclusions set in a clay matrix with clay pellets and iron nodules.

QFL: C Plagioclase and biotite fabric
Plagioclase and smaller quantities of biotite, clinopyroxene, rock fragments and iron nodules. The inclusions are set in an iron-rich, clay matrix with clay pellets and textural features.

Figure 4.2. Overview of the quartz-feldspar fabric family. Specific production indicators can be found in Table 4.1. All photos are taken with crossed polarised light (XP), magnification 20x, width of photos: 22.4 mm.
Chapter 4. The behavioural chain of Roman Republican cooking ware production

Volcanic family

GROUPS

V.1: Quartz and olivine fabric
Large sized olivine and quartz with sub-angular to sub-rounded shapes accompanied by clinopyroxene, feldspars, chert, rock fragments and clay pellets. The heterogeneous matrix is iron-rich with feldspar and biotite particles.

V.2: Sand and clinopyroxene
Heterogeneous fabric group with a mix of smaller sized quartz-feldspar inclusions and generally larger sized clinopyroxenes and olivine inclusions set in a heterogeneous, iron-rich matrix.

V.3: Volcanic inclusions and clay pellets in iron-rich matrix
"Red augite" Clinopyroxene, biotite, chert, feldspar and quartz with smaller and varying quantities of olivine, leucite, clay pellets and rock fragments set in an iron-rich matrix with biotite and feldspar particles.

V.4: Bimodal sandine and clinopyroxene & V.4 sub: non-bimodal version
Varying amount of coarse fraction inclusions consisting of a mix of sandine, quartz and clinopyroxene. Fine fraction with quartz, feldspar and clinopyroxene. The matrix is homogeneous and iron-rich.

LONERS

V.L. A: Hornblende and clinopyroxene
Large rounded inclusions of hornblende, clinopyroxenes and nepheline and hematite. The matrix is homogenous and compact with very few particles.

V.L. B: Opaque inclusions, olivine and clinopyroxene
Hematite, olivine and clinopyroxene set in an iron-rich, heterogeneous matrix with large iron nodules and a grey slip.

V.L. C: Clay pellets, biotite and clinopyroxene
Bright orange clay pellets and weatherered volcanic inclusions set in an iron-rich matrix with small clay pellets in few feldspar particles.

V.L. D: Leucitite and (aegerine) augite
Wide range of inclusions, most notably calcareous grog containing microfossils and occasionally feldspar and clinopyroxene inclusions, aegerine augite, quartz and olivine set in an iron-rich, heterogeneous matrix.

V.L. E: Calcareous clay with quartz, clinopyroxene and red chert
Rounded quartz set in a low calcareous, compact, heterogeneous matrix containing feldspar/quartz and biotite particles.

V.L. F: Rounded sand and olivine
Rounded to well-rounded quartz inclusions and a small quantity of clinopyroxene, feldspar, chert and rock fragments set in an iron-rich, pure matrix with very few particles.

V.L. G: Compact fabric with quartz and clinopyroxene
Compact, fine-grained quartz, clinopyroxene and feldspar set in an iron-rich homogenous and compact matrix with feldspar and biotite particles.

V.L. H: Aegerine augite and rock fragments
Wide range of volcanic inclusions in varying sizes, with aegerine augite as the most common one. Iron-rich with striation, speckles and variation in optical activity.

Figure 4.3. Overview of the volcanic fabric family. Specific production indicators can be found in Table 4.1. All photos are taken with crossed polarised light (XP), magnification 20x, width of photos: 22.4 mm.
Daily life in the Roman Republican countryside

data are found in Appendix II – samples overview including typology; Appendix III – macroscopic fabrics; and Appendix IV – thin-section fabric descriptions. Appendix IV also includes descriptions of the behavioural chain for each individual fabric group. An overview of the indications for the different production steps for each fabric is found in Table 4.1. Summaries and photos of all the fabrics are provided in Figure 4.2 for the quartz-feldspar family and Figure 4.3 for the volcanic family. Below, each step in the production process is discussed and illustrated with examples from the data in an effort to reconstruct the behavioural chain of cooking ware production in the Pontine region during the Roman Republican period. In the text, discussion of macroscopic fabrics is indicated by the use of the term M-fabric, while the use of ‘fabric’ in the discussions refers to the thin-section fabric groups.

4.3.1 Procurement of raw materials

Based on the bright orange to red colour of the fired end product, the macroscopic study indicates that the majority of the Republican cooking wares in the Pontine region were made of iron-rich clays. Yet, also some groups with buff colours are present in the coastal area (M-fabrics 4, 5, 14 and 15; Ntot=6). These observations are confirmed by the thin-section analysis. For fifteen out of the twenty-one fabrics a red to orange firing, iron-rich base clay was used. However, six fabrics were made using (low) calcareous clays either as a base clay or mixed with an iron-rich clay (see below for indications of clay mixing).302 Four fabrics were made using two different clays, of which three are a mixture of an iron-rich with a possibly low calcareous clay (QF.3, QF.5, VL.B) whereas one fabric is a mixture of two different types of non-calcareous clays (QF.6).

Temper types can be difficult to distinguish from naturally occurring inclusions in the base clay. However, based on multiple indications it appears that a variety of temper sources might have been used, including rounded quartz and/or feldspars (fabrics QF.1 – Figure 4.4; QFL.A; QFL.B; V.2; V.4; VL.F), angular quartz-feldspar (QF.2; QFL.A; QFL.C; VL.E) and different mixtures of volcanic inclusions including feldspars, clinopyroxene, hornblende, biotite, lava and plagioclase (fabrics VL.C – Figure 4.4; VL.D; VL.G).

4.3.2 Clay paste preparation

None of the studied fabrics contains anthropogenic temper such as grog. Therefore, only fabrics with multiple indications for temper use are considered to be tempered with the exception of the bimodal fabrics QF.2 and V.4. These two fabrics have a strongly bimodal inclusions size distribution and in the case of V.4 also a sub-fabric without temper. This is not the case for the bimodal fabrics QF.4 and V.3, which are not firmly assumed to be tempered because of the lack of other indications for the use of temper. Two more fabric groups (QF.1; V.2) and eight loners (QFL.A; QFL.C; VL.C–G) are tentatively presumed to be tempered for varying but multiple reasons, such as the variety of temper sources and the use of clay mixtures.
Figure 4.5. Indications for clay paste preparation. A: granulometric sorting of temper in QFL.C (XP 20x). B: bimodal fabric QF.2 with uneven distribution of the larger sized temper (XP 20x). C: clay mixing in QF.5 with narrow bands of clay and poor hydration (clay pellets) (XP 20x). D: clay mixing in QF.6 (plain polarised light (PPL) 20x). E: poor homogenisation in QF.1 (XP 20x). F: poor hydration and homogenisation in QF.6 (PPL 20x). Width of all photos: 22.4 mm.
as narrow size ranges, well-rounded inclusions or very angular inclusions.

Besides the choice of temper type, potters also needed to decide how much temper to add to the clay paste and in which size range. There are several fabrics with inclusions occurring in a narrow size range, indicating that the temper was subjected to granulometric sorting (QF.1; QFL.C – Figure 4.5A; V.2; VL.F; VL.G). In some cases it is likely that quartz and/or feldspar rich sand was used because of the roundness of the added inclusions (QF.1; VLE; VLF), while in other fabrics the narrow size range is combined with an angular appearance of the inclusions (QFL.A; QFL.C), suggesting crushing of coarse material (stones) to create temper.

Variation in the amount of added temper is significant between the fabric groups and was determined based on the desired properties of the clay paste. There is no threshold for the amount of inclusions used for something to be considered tempered. However, significant variation in the amount of inclusions between samples belonging to the same fabric can be a tentative indicator. This is for example the case for QF.1 with inclusions ranging between 15–25% and QF.2 with inclusions ranging between 20–30% (Figure 4.5B), whereby the variation is mostly related to varying amounts of the larger sized inclusions. Lastly, uneven distribution of inclusions is not only a tentative indicator for poor kneading but can also tentatively indicate temper use because the inclusions that are not natural to the clay occur in clusters. This indicator only has value in combination with other indicators for temper, but can be observed in fabric QF.1 (Figure 4.5E), QF.2, VLE and VL.G.

As has become clear from the above, indicators for temper use vary between fabrics with some fabrics containing many while in others these indications are more tentative. Based on these indicators, eleven out of twenty-one fabrics (52% of the samples) appear to have been tempered.

Another four fabrics (QF.3; QF.5; QF.6; VL.B; 19%) show evidence of clay mixing. Clay mixing is a widely distributed phenomenon in the Mediterranean, specifically the mixing of a non-calcareous red clay (terra rosa) with a fine-grained calcareous clay, leading to a calcareous clay matrix with streaks and clay lumps resulting from the red clay.

A probable example of such a mixture is fabric QF.5 (Figure 4.5C). Streaks of brighter orange set in a more buff-coloured pinkish base clay are visible in hand specimen. In thin section, streaks and clay lenses in two different colours are distinguishable, pointing towards the mixing of two types of probably moist or wet clay. This fabric is also bimodal, which is likely to be the result of use of two clays with differently sized naturally occurring inclusions rather than temper. Also QF.3 is a mixture of an iron-rich and low calcareous clay, leading to bands of different colours and bright orange clay pellets (due to incomplete hydration of one clay source). Fabric VL.B with its laminated speckled matrix and uneven distribution of particles is also assumed to be a mixed clay paste similar to QF.3 and QF.5. Lastly, QF.6 also shows colour variation (streaks) and especially darker coloured clay pellets in comparison to the matrix (Figure 4.5D). In this case, the mixing of two iron-rich clays is tentatively assumed.

In total, fifteen out of the twenty-one fabric groups (71% of the samples) thus show clear signs of modification of the base clay through either the addition of temper or the mixing of different clays. Besides these two options, potters could also have chosen to alter the base clay through granulometric sorting. This type of alteration is difficult to detect; however, fabrics QF.4 and V.4 have combinations of features that hints at levigation, including bimodal grain size distribution with a clear cut-off for the fine fraction; dominance of the fine fraction (90–97%), a lack of clay pellets and other textural features and a general homogeneity of the matrix.

Before the clay paste can be used to form a pot, the clay is usually homogenised and hydrated to the desired level through kneading or wedging and the addition of water. Hydration is assessed based on the occurrence of clay pellets and clay bodies within the matrix, indicating incomplete hydration (and as could be seen above also sometimes indicative for clay mixing). About half of the fabrics appears to have been incompletely hydrated. In combination with poor homogenisation, indicated by an uneven distribution of particles and inclusions, this could indicate a lower time investment in the preparation of the clay paste. The combination of these two characteristics often seems to co-occur (Figure 4.5E–F). Only three fabrics with incomplete hydration are well-kneaded (QFL.C; VLC; VLD) and one fabric has variation in the homogeneity of the matrix (V.2).

303 Santacreu 2014, 75.
The other eight fabrics (QF.3; QF.5; QF.6; QFL.B; V.3; VLB; VLG; VLI.H) are both incompletely hydrated and poorly kneaded.

4.3.3 Forming

Typological variation occurs within seven of the ten fabric groups. QF.3 (N=3), QF.6 (N=3) and V.1 (N=3) contain only one type of cooking ware, which is in all cases the Olcese olla 2. Because of the limited number of samples belonging to each of these groups, it is not possible to be certain of specialised production in only Olcese olla 2 pots in these fabrics. Indeed, all the other (larger) groups contain at least three different types of pots. There thus does not seem to be a relationship between specific fabrics and general forms or specific types. Furthermore, there also does not seem to be a connection between lids and jars based on the fabrics.

All samples except the loner VL.C are likely to be primary formed on a wheel based on the moderate to strong alignment of the voids and inclusions as well as mostly elongated voids (Figure 4.6). Variation in the degree of alignment of inclusions and voids could tentatively point to variation in the speed of the wheel during forming. The groups with weak to moderate alignment (QF.6; V.3; VL.C) mostly contain Mid-Republican fragments. In general, the Olcese olla 3A samples have the strongest alignment of voids. This could potentially indicate an increase in the speed of the wheel over time. Furthermore, there are indications for variation within fabric group QF.1 and V.2 based on form, with ollae displaying a stronger alignment than lids, baking trays and clibani. Fabric VL.C stands out because of both voids and inclusions following an S-shape in the profile of the thin-section. This makes it likely that this Olcese olla 2 pot was formed by coil building (Figure 4.6A).

There are no indications for secondary forming through scraping, trimming or turning for any of the fabrics, although this could partially be related to the fact that only rims were sampled for this study.

4.3.4 Finishing

The majority of the 27 macroscopic and 21 thin-section fabric groups have no traces of surface treatment. There are eight M-fabrics with indications of slipped surfaces or smoothening, comprising 22% of the total macroscopic sample. Two of the M-fabric groups, 1B – red augite fine (N=7) and A1/H – augite and green inclusions with coating (N=68), are classified as sub-fabrics with orange coatings. During the thin-section analysis, all of the selected samples (N=12) from these two groups were classified as V.2 or QF.3 (match with M-fabric A1 and H) and V.3 (match with M-fabric 1B) with the exception of two samples. Furthermore, these two macroscopic groups appear to be typologically rather restricted, with 95% Olcese olla 2 or Olcese coperchio 1 sherds. The same limited typological range also occurs in the smaller groups of M-fabric 3 (N=3) and G (N=8), both also exhibiting orange coatings, implying that coating is related to the intended function of these vessels during the Mid-Republican period.

A different picture emerges from M-fabric 16. Not only do fragments belonging to this group have a grey coating, the form repertoire is limited to Late Republican types (although note the small sample...
size of N=3, QF.1; QF.2; VL.B). M-fabric 11 (N=8, QF.2), consisting only of Olcese olla 3A samples, appears to also have received a very thin layer of slip. This is interesting because these two macroscopic groups are part of two larger thin-section groups (QF.1 and QF.2), within which there is variation in the application of slip. Moreover, it shows that occasionally also jars were still slipped during the Late Republican period.

There are a couple of small macroscopic groups from the coastal area that appear to have wiped surfaces based on the observation of very thin layers of fine clayey material and small stripes on the surface (Figure 4.7). These are M-fabric 2 – shimmering mica (N=3), M-fabric 8 – pink inclusions (N=1) and M-fabric 14 – buff clay with mica and sand (N=1). M-fabric 8 (VL.E) and M-fabric 14 (QF.B) are very different fabrics but both come from clibani sherds. Also the one thin-section of M-fabric 2 is classified as a loner (VL.C).

The application of slip layers or wiped surfaces thus appears to be more common in the Mid-Republican period than in the Late Republican period and most pans (6 out of 8) and all baking trays (N=3) are slipped; this is likely related to function. There are no other consistent patterns between form and slipping or wiping.

4.3.5 Firing

During the macroscopic analysis, the firing atmosphere of 426 samples was noted (Figure 4.8A). 313 (73%) samples were fired in an oxidising atmosphere, 63 (15%) samples in a reducing atmosphere and 50 (12%) samples show colour variation between interior and exterior that could also be caused by post-firing use.305 The vast majority of the sherds thus had an orange to reddish appearance in hand specimen. When we take a closer look at the 100 samples from the thin-section analysis, a similar picture emerges. 78 samples were fired oxidising (with 11 samples displaying darker use-related colours), 11 samples were incompletely oxidised, 2 samples were incompletely reduced and 9 samples were fired completely reducing. There appears to be no relation between firing atmosphere and type of cooking pot.

The following discussion will focus on the thin-section fabric groups only, since the loners cannot be compared to other examples of the same fabric. Three fabric groups (QF.1; QF.2; V.4) have variation in the firing atmosphere but oxidised firing is dominant, while samples belonging to the other seven groups (QF.3–6; V.1–3) are all fired exclusively in an oxidising environment (Figure 4.8A–B). Of the three groups with varied firing conditions, V.4 (N=14) shows the most variation in firing atmosphere. Only half of the studied fragments were fired oxidising and the other half are characterised by a mix of reduced firing and oxidised firing with reduced cooling. Group QF.1 (N=20) and QF.2 (N=21, Figure 4.8C–D) contain three and respectively two samples that were not fired.

304 Rye 1981, 116; fig. 104; column B has been used for the classification of the material into different groups of firing condi-

305 Oxidising atmosphere: light brown, pink, orange and red colours. Reducing atmosphere: dark brown, grey and black colours. From the fragments affected by post-firing use, the firing atmosphere could not be established with certainty anymore.
reducing and two and respectively three samples that were fired reducing but cooled oxidising.

Considering types instead of fabric groups provides more information on change and continuity over time. Two form groups, lids (N=9) and cooking bells (clibanis, N=9), only occur in oxidised colours. Pans (tegami, N=13 and baking trays, N=3) show slightly more variation, with two Olcese tegame 2 samples being fired reducing. However, most variation occurs in the largest group of jars. Considering the Mid-Republican Olcese olla 1 (N=2) and Olcese olla 2 (N=37), there were only 3 out of 39 sherds fired in a reducing atmosphere. This picture is different for the Late Republican Olcese olla 3A (N=24) and Olcese olla 3B (N=2), with 6 out of 26 being fired reducing. There is thus a change in the ratio of reducing fabrics from 8% in the Mid-Republican period to 23% in the Late Republican period.

Firing temperature is assessed in thin-section based on the optical activity of the clay matrix. This only provides a very general picture of temperature, but the lack of minerals in the fabrics which could exhibit thermally induced changes does not permit further specification. Seven fabrics (QF.2; QF.5; QFL.C; V.3; V.4; VL.A; VL.E) have no optical activity when examined with crossed polarised light (XP) and in some cases exhibit a melted structure of the matrix, suggesting temperatures above 800°C and sufficient soaking time. Three fabrics (VL.B; VL.D; VL.G) have low optical activity or only optical activity in some
parts of the matrix, suggesting a firing temperature around 800°C or insufficient soaking time above 800°C. Seven fabrics (QF.3; QF.4; QFL.A; QFL.B; VL.C; VL.F; VL.H) have medium to high optical activity, indicating firing temperatures above 600°C but below 800°C. Lastly, four groups (QF.1; QF.6; V.1; V.2) show variation in optical activity between samples.

If we compare the combined data for the firing atmosphere and firing temperature, we can see that only QF.1 shows variation in both aspects whereas QF.2 and V.4 display variation only in firing atmosphere while their firing temperature is consistently above 800°C (Table 4.1). Assuming that homogeneous colour of the pots within one firing is the primary goal, colour variation within fabric groups could be indicative either of a lack of control over the kiln firing or a lack of interest in achieving homogenous colours, in which case it is a choice.

4.4 Conclusion: change and continuity in the behavioural chain of the cooking pots from the Pontine region

Based on the reconstruction of the behavioural chain of the cooking ware fabric groups from the Pontine region, we are able to draw out similarities and differences between fabrics as well as observe change and continuities in choices in the different production steps over time.

The prevailing choice for using iron-rich clays appears to be a choice grounded in tradition. Although these clays are abundantly available within Central Italy, the occurrence of many other ware groups in buff colours in contexts in this area shows that it was a deliberate choice to use these specific clays for cooking wares. The use of these clays occurs both in the Mid- and Late Republican period and dates back to pre-Roman traditions. Several of the fabric groups exhibit close similarities to Archaic fabrics from for example Satricum.306

The choice of temper sources appears to be more varied and (slowly) changed over time. Whereas volcanic temper, especially clinopyroxene, is more typical for the Mid-Republican period, quartz and feldspar are more common in the Late Republican period. The use of black coloured inclusions as temper, in combination with red and orange firing clays, is well attested within the region during the Archaic period too and thus seems to be a long-standing cultural tradition.307 On the other hand, the use of quartz-feldspar tempers by local potters is attested for the Late Republican productions at both Ad Medias and Forum Appii.308

Technological knowledge on the suitability of different temper materials for cooking wares to improve performance characteristics seems to have been widely shared knowledge within the region and beyond.

The forming method of all analysed vessels is uniform with the exception of one coil-built Olcese olla 2. All other vessels were made on the wheel. Variation in alignment of voids and inclusions points to variation in the speed of the wheel, with tentative indications that Olcese olla 3A pots were made on a faster wheel than any other type of examined cooking vessel. The use of a wheel thus seems to be a well-grounded part of the production process.

4.5 Firing atmosphere and temperature

Firing atmosphere was mainly oxidising throughout the Republican period. However, variation increased especially in the groups of jars between the Mid- and Late Republican period. Firing temperature varied across both periods.

Continuing traditions from the Archaic period into the Republican period as well as tentative changes between the Mid- and Late Republican period led to a different visual look of cooking pots over time. This is important to note because it can potentially be related to changes in consumer demands. In general, a pattern can be observed with bright orange to red cooking pots with black inclusions, often with a slip layer, during the Mid-Republican period to more variation in colour combined with white shimmering during the Late Republican period.

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306 Attema et al. 2003, 371–377. Especially fabric family I and II show similarities in choice of raw materials. Also the clay sources used for ceramic production at Satricum are iron-rich and non-calcareous.


308 Borgers et al. 2018.

309 The majority of slipped Mid-Republican vessels come from site 14019 in the Pontine plain.
inclusions and the limited use of slip layers during the Late Republican period.

Based on the many shared technological features between the fabric groups, the communities of potters appear to have been well connected. The use of similar types of clays, temper and forming techniques suggests that technological knowledge was widely shared. The change in, for example, temper type and increased speed of the wheel appears to have spread over time, leading to most Late Republican fabrics exhibiting those technological traits. The potential existence of a shared concept also implies the existence of a (cultural) standard. So, to be able to hypothesise the existence of a general concept of what cooking pots should look like, we also need to consider uniformity and variation within groups and over time as a measurement of standardisation. This is the topic of the next chapter.
The reconstruction of the behavioural chain of the production of cooking wares from the Pontine region provides a material-based bottom-up approach to the ceramic data. However, the production process was embedded within a societal system. The making of pots and the decision-making processes during production were influenced by societal norms, cultural traditions and economic structures. To understand the link between small-scale data and the broader picture in which this production occurred, we need to make a connection between sherds and production organisation. This connection is not straightforward whereby different types of organisation can easily be understood based on material characteristics. This gap between small-scale data from ceramic sherds and large-scale structures of production organisation thus needs to be bridged, which will be done through the assessment of standardisation of form and fabric, followed by a discussion of data from production sites within southern Lazio. The latter serves to provide additional information from excavated production sites as more direct evidence for production organisation. The combination of standardisation based on the ceramic data and information from excavated production locations will make it possible to understand how change and continuity observed in the cooking wares from the Pontine region relate to socio-economic developments during the Roman Republican period.

5.1 Degrees of standardisation

Discussions in archaeology concerning standardisation and production organisation often revolve around the question if and when specialisation occurred within society. Economic specialisation is viewed as an indicator for increased societal complexity as it implies the possibility that producers can depend on consumers for part of their livelihood and vice versa. Measurements of the degree of standardisation are used as indicators for specialisation and in turn production organisation.

What is here meant with specialisation is that producers are focussed on the production of a restricted range of goods, for example specific types of ceramic wares or specific form repertoires. Connected to this definition is the implication of increased level of skills of producers who limit their production to specific objects. Through repetition their skill level increases over time. Specialisation can occur in different fields and within societies with very different types of social, economic and political complexity. The process of craft specialisation already started in the pre-Roman period in Latium Vetus, as part of the process of urbanisation during the Archaic period.

Although there is no doubt about the occurrence of specialised production in Roman Italy, the question whether it also included cooking ware production is unresolved, as also the degree of standardisation and what it implied for production organisation.

311 Rice 1981; Costin 1991 and Costin & Hagstrum 1995 for discussion on different types of specialisation.
312 Rice 1996, 179.
314 The existence of a standard also has implication for distribution and consumption, see Chapter 6 and 7.
The degree of standardisation can presumably be ‘measured’ from the ceramic material itself. This is connected to the implicit theoretical assumption that there is a relationship between the degree of standardisation and production organisation. Thereby, standardisation can establish a link between small-scale ceramic data and larger scale topics related to the organisation of the Roman economy through an assessment of its relationship to production organisation.

5.1.1 Measurements of standardisation and uniformity

The Cambridge dictionary defines standardisation as “the process of making things of the same type all have the same basic features.” Within archaeology, standardisation often refers to the degree of uniformity. This can be uniformity within a specific group of objects, for example cooking jars, or between smaller sub-groups, for example within different fabrics used for the production of cooking jars. Furthermore, standardisation and thus uniformity can be limited to one feature while other features may not be standardised. For example, size can be standardised while colour might not be. The degree of uniformity can also be site specific and is often connected to assumptions about production organisation. At the same time, standardisation can also be seen as a process rather than a state of being. Through the process of standardisation, objects become more uniform over time, leading to a standard or shared concept.

Despite the double meaning of the term standardisation (as a process and as a state of being of objects), I use the term standardisation to refer to the process of cooking ware production over time. This is studied by comparing fabric groups of cooking wares from the Mid-Republican period to those of the Late Republican period. The terms homogeneity and heterogeneity are used to describe the relative degree of uniformity or variability of groups of objects and thus refer to the ‘static’ status of the materials. Standardisation thus requires comparison between groups (inter-group comparison, based on for example fabric groups or chronology), while degree of uniformity as a possible outcome of this process is assessed based on comparison within a group (intra-group comparison).

The process of standardisation offers the possibility to compare objects with each other or with a chosen standard. Standard is a social construct, agreed upon between producers and consumers, influenced by societal requirements of objects and governed by technological possibilities. The degree of uniformity can vary across products, time and space based on what society views as appropriate. Generally speaking, high status objects are often valued for their uniqueness and thus low degree of standardisation and high variability, while more mundane objects often display a higher degree of standardisation and uniformity.

Archaeological indicators for uniformity will vary between societies. Nonetheless, there are a couple of measurable metric indicators that are often used within ceramic studies such as wall thickness, rim diameter, and volume of the vessel. Other indicators that are commonly used are firing temperature, firing atmosphere and decoration. Some of these indicators are assumed to standardise over time because they mostly relate to motor habits and are thus mechanical, assuming increased production output will lead to increased uniformity. Other elements relate to intentional choices made by the potter. However, through repetition and increased intensity of production, all of these elements should start to display less (metric) variability because of increased skills of the potters.

Another issue when examining degrees of uniformity is the occurrence of cumulative blurring. Some degree of variation will always occur in objects made by hand. The assumption is that the degree of variability will be larger when different production events are considered. So objects made by the same potter or workshop over time will show a higher variability compared to objects that derived from only one production batch. Furthermore, when we consider workshops as the unit of analysis (which is the case below) we also need to take into account the variability introduced by different potters working in the same workshop.

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316 Roux 2003.


319 Rice 1996; Costin & Hagstrum 1995.


Because standard is a social construct, it varies between different societies and over time. Thus, to measure the degree of uniformity in relation to the process of standardisation, we need to understand what the desired cultural standard was for Roman cooking pots between the 4th and 1st centuries. Since there are no written sources on this topic, this can only be filtered out through the examination of the material itself and by isolating patterns through comparison. The unit of analysis for the assessment of uniformity are the identified fabric groups (Appendix IV). This is chosen on the assumption that each fabric group relates to a different production site. Consequently, variation and uniformity between fabric groups could indicate variation in choices made by potters during the production process but also indicate wider, shared standards across time and space. On the other hand, variation within fabric groups can provide more specific information on the uniformity of specific parts of the production process and possibly also on choices being made regarding which features needed to be standardised and which did not.

5.2 Measures of uniformity in the Pontine cooking wares

If we look at the cooking wares of the Pontine region as one assemblage two aspects stand out as being relatively consistent: colour in relation to firing atmosphere and the choice of raw material sources. Out of 426 examined cooking ware fragments, 313 fragments (73%) have been fired in an oxidising atmosphere, 63 (15%) in a reducing atmosphere and 50 fragments (12%) have colour variation between interior and exterior that could also be caused by contact with fire during use. The vast majority of cooking pots produced during the Republican period thus had an orange or reddish-brown colour, suggesting technological uniformity in chosen firing atmosphere across different production locations. Reduced firing atmospheres occurred in lids and ollae and only in small numbers, with only minimal proportional variation if we compare Mid- to Late Republican types. Nevertheless, there is a tentative suggestion towards more colour variation in the Late Republican period.

Furthermore, choice of raw material sources also appears to be relatively consistent. To obtain a red-brown or bright orange colour, chosen clays need to be preferably non-calcareous and contain iron compounds. Iron compounds, such as finely dispersed hematite, are the most important chemical element to determine colour because of their strong reaction to oxygen during firing leading to bright orange to reddish-brown colours. Iron-rich clays usually have a sedimentary origin. Amongst the Pontine material, only one fabric (VL.E) is made with a calcareous clay. Four fabrics (QF.3; QF.4; QF.5 and VL.B, N=10) are likely to be a mixture of an iron-rich and a (low) calcareous clay but still have an orange to red colour.

The dominance in the fabric groups of inclusion types with a volcanic origin suggests a preference for clays with a volcanic origin or volcanic temper sources for the production of cooking wares. Clinopyroxene (black or dark green in hand specimen) and a mixture of feldspars and quartz (white, shimmering in hand specimen) are the dominant types of inclusions (hence the name of the two fabric families in the classification system). During the Mid-Republican period (N=56), quartz-feldspars or clinopyroxene occurred in respectively 46% and 54% of all sampled fragments. During the Late Republican period (N=40), quartz-feldspar became more common with 63% of the samples belonging to that fabric family. Tentatively, the data thus hints at a shifting preference over time, best visible in the Late Republican olla 3A samples (N=24), all of which are classified within the quartz-feldspar family, with the exception of six fragments belonging to V.4. The (slow) process of standardisation in the choice of inclusion and temper types thus seems to have taken place between the 4th and 1st centuries, leading to more uniformity in the types of inclusions that are common in the cooking ware fabrics, while the preference for iron-rich clays remained consistent.

In comparing fabric groups and periods three factors are considered: 1) variation in the production of form repertoires, 2) forming technique and 3) the optional choice of surface treatment.

1) When it comes to the production of specific types, it needs to be noted that most types considered in this

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323 For the ideal cooking pot based on performance characteristics, see Section 4.1.6. 324 See Quinn 2013, 117–118 on the provenance principle. 325 Coperchio 1: 11% / 5 out of 46; Coperchio 3: 100% / 1 out of 1; Olla 2 14% / 37 out of 269; Olla 3A 18% / 18 out of 101.
study have very long date ranges. The introduction of morphological changes to general forms, such as jars and pans, was thus very slow and forms an element of continuity spanning centuries. Longevity of at least the morphology of the rims (up to 200-year timespans) suggests long standing traditions. Interestingly, most morphological changes to the rims occurred around 200. Furthermore, the number of co-existing types of cooking wares increased between the Mid- and Late Republican period and date ranges of specific types became narrower during the Late Republican period. The pace of morphological change thus increased with time.

Variability in the production of different forms is considerable between fabric groups. Out of the ten fabric groups, seven contain more than one type of cooking ware (Figure 5.1). The three groups with only one type of cooking ware (QF.3; QF.6; V.1) are all small (N=3 per group) and all include Olcese olla 2 fragments only. Because of the small size of these fabric groups, specialisation at their production location in one type (ollae) cannot be convincingly argued even though the type repertoire for these fabric groups is limited to one.

When we compare the two largest fabric groups, QF.1 (N=20) and QF.2 (N=21), we see a difference in how many types are present in each group: whereas QF.1 contains eight different types, QF.2 only has four. Furthermore, jar types Olcese olla 2 and olla 3A constitute the vast majority of the QF.2 group (19 out of 21; 90%) while they only make up less than half of the QF.1 group (9 out of 20; 45%). Although the proportional distribution of specific types within each group is partly related to consumption practices, the occurrence of eight vs. four different types tentatively suggests that a wider range of cooking ware vessels was produced in the QF.1 fabric than in the QF.2 fabric. Arguing along that line, the production centre of QF.2 might thus have been involved in the production of a more uniform set of forms, reflected in a more limited form repertoire in comparison to QF.1.

2) As already mentioned in the previous chapter, forming technique was homogenous between the groups. The majority of fabrics showed moderate to strong alignment of the inclusions and the voids to the margins, pointing to the use of a fast wheel. However, there are a couple of fabrics with indications for a different forming technique based on the alignment of voids and inclusions and specific patterns in alignment. VLC (olla 2) has voids and inclusions that follow a minor S-shape in profile,

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329 See Olcese 2003 for type overview and date ranges.
suggesting coil-building rather than wheel throwing. VL.G (coperchio 1), VL.H (olla 2) and QF.6 (olla 2) have weak to moderate alignment, hinting to forming on a slow wheel or coil building, followed by finishing on a slow wheel. Furthermore, groups QF.1 and V.2 show variation in the alignment of voids and inclusions within the group and in general Olcese olla 3A samples have a stronger degree of alignment than the olla 2 samples. Although the use of a wheel thus appears to be the standard, there is likely to have been some variation in the speed of the wheel itself in cooking ware production. This variability is tentatively related to the specific vessel type rather than the fabric group (reflecting production location) and could be related to practical reasons. The exception is the group of jars, where a tentative increase in speed between the Mid- and Late Republican period is likely.

3) While the majority of the studied cooking pots has no slip layer, a couple of small fabric groups and loners did receive a slip layer (QF.3; QF.4; QF.6; VL.2; VL.3; VL.H; VL.E; QFL.A). The application of a slip layer seems thus to be associated with specific production locations. The presence of a slip layer tentatively also appears to be associated with some specific types. All baking trays (N=3) and olla 1 (N=2) samples have a slip layer, although both of these groups are relatively small. If we compare the Mid-Republican olla 2 with the Late Republican olla 3A, we can see a clear shift from slips being rather common for the olla 2 (16 out of 37; 43%) to being rare for the olla 3A (1 out of 24; 4%). On the other hand, most of the pans (6 out of 8; 75%) were slipped. The application of a slip thus was more common but not uniformly applied to Mid-Republican cooking pots, while it became restricted to specific types (tegami) during the Late Republican period, suggesting a functional reason behind the application of slip during the later period.

Uniformity within the ten fabric groups also varies with regards to 1) abundance of inclusions, 2) rim diameter and 3) firing conditions. These three aspects relate to different parts of the behavioural chain, but some variation is only to be expected. The amount of inclusions may vary because of natural variation of inclusions within clay deposits and temper not being weighted but added based on volume. Rim diameter is expected to have varied slightly, but should show little divergence for the same type within each fabric group, especially assuming that measuring tools might have been used, whereas firing conditions (atmosphere, duration and temperature) could vary between different firing batches. Because of the longevity of the studied types, it is unlikely that each fabric group only represents one production event. Consequently, cumulative blurring is very likely to have occurred.

1) Variation in abundance of inclusions within a fabric group leads to paste variability. This variability can be related to natural heterogeneity within the original clay deposit, but can also be influenced by technological choices, such as the modification of the raw materials, and factors influencing the procurement of raw materials. Paste uniformity could thus potentially indicate the use of standardised recipes, although this need not always be the case. Because of the ambiguity of the reasons behind paste variability, I focus only on paste homogeneity in those fabric groups that have clear indications for temper.

The four fabric groups with clear indications for temper (QF.1; QF.2; V.2; V.4) show variation in the amount of inclusions within their fabric groups. QF.1 stands out for having a very homogeneous clay paste. Although this variation is between 15–25%, the outliers are few and most samples contain around 20% inclusions. On the other hand, QF.2, V.2 and V.4 contain varying amounts of temper, ranging from 20–30% for QF.2, 10–15% for V.2 and 10–20% for V.4. Interestingly, for QF.2 the amount of temper seems to be related to form. Olla 3A samples consistently have a higher amount of temper (30%) than the other forms (around 20%). Such a relationship is not apparent for V.4, which has a varying amount of temper between 10–20%.

This suggests that the clay paste for QF.1 is the most homogeneous of the tempered clay pastes, despite its outliers. QF.2 is also quite homogeneous if we take form into account. On the other hand, both V.2 and V.4 show considerable variation in the amount

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331 Complete pots, especially ones with slip layers like black-gloss, often bear small dimples or marks on opposite edges of the foot or rim that suggest a tool was used for measuring either its height or diameter.


333 Arnold 2000, 351–357. Arnold calls these ‘paste preparation variables’.


335 Arnold 2000, 363 however argues that paste uniformity cannot be taken as an indicator for production organisation because of these paste preparation variables.
of added temper without any relationship to form. Fabric V.2 is made from a variegated clay with varying amounts of naturally occurring inclusions. Variation could be related to the potter adjusting the amount of temper based on the amount of naturally occurring inclusions in the clay. The non-bimodal subfabric V.4 is very homogenous. The adding of varying amounts of temper to create the bimodal V.4 variant can thus not be explained in the same way as can be done for fabric group V.2.

2) Variability in rim diameters and morphology can also be used as a measurement for standardisation. The general assumption is that repetition will lead to less variation both in the morphology of the rims and the diameters. However, there are two main caveats in relation to the dataset. Firstly, the number of fragments belonging to the same typological form within each fabric group is relatively small. This makes it complex to truly examine morphological variation. Additionally, the long date ranges of cooking ware types make it unlikely that the same type was continuously made by the same potter. This might be reflected in the data, as some rims stand out as being clearly different if we compare within and between fabric groups. Moreover, variation in general tends to be large for especially the Mid-Republican types, while the morphology of the Late Republican olla 3A appears to be more uniform (Figure 5.2, Appendix II for all drawings).

Secondly, the rim diameter is also connected to the volume of the finished pots (Appendix II and online database). All of the examined types occurred in wide size ranges. Especially the jars and lids had a wide range of sizes, which is also reflected in the data (see Chapter 7 for a broader discussion on diameters). If we only look at the variation in diameter within the larger fabric groups, a couple of things stand out. There are only two groups with multiple examples of the same type occurring in the same diameter. Within QF.1, 4 out of 5 Olcese olla 2 fragments have a diameter of 16 centimetre, while within fabric group V.4 4 out of the 7 olla 3A fragments measure 19–20 centimetre and 2 have a diameter of 24 centimetre. Although QF.2 also contains Olcese olla 3A fragments with the same diameter, the recorded range of sizes is broader, between 12 and 32 cm. For all other fabric and type groups, no standardisation of diameter becomes apparent. However, pans, baking bells and lids occur in similar sizes (and fabrics), which would have made it possible to combine them during cooking.

3) The control of the firing conditions depended on the kiln type and the skill of the potter or firing master. Furthermore, larger kilns could have variation within them when it comes to temperature and atmosphere. This makes the assessment of standardisation of firing conditions complex, especially if we also take into account the possibility of cumulative blurring. For this reason, I mainly focus on firing atmosphere as it is the most visible feature that can be derived from an examination of the pots. Because the subsequent use of a pot above a fire can lead to colours similar to reduced firing, all samples that have a reduced colour were visually examined to see if this colour was caused by firing atmosphere or use related.336

Seven fabric groups exclusively contain samples with at least an oxidised surface (QF.3; QF.4; QF.5; QF.6; V.1; V.2; V.3). QF.3 and V.1 are groups with an orange slip layer but a grey core, indicating a reduced atmosphere with oxygen being released into the kiln during the last phase of firing. Within group V.3, almost all samples have dark or black coloured margins but these are caused by use. The three largest fabric groups (QF.1; QF.2; V.4) show the most variation in firing conditions. V.4 has sandwich structures, with bands of grey and orange alternating in many of the samples. This is also the group with the largest number of samples with reduced colours on the exterior (N=6). QF.1 and QF.2 show variation but generally have an oxidised exterior, with the exception of three and two samples respectively.

The degree of uniformity in firing atmosphere within groups varies. While the majority of groups shows consistency, leading to orange or reddish colours on the surface, the three larger groups show more variation, especially V.4. Within group V.4, all olla 2 fragments are, however, fired consistently oxidising while reduced firing only occurs in olla 3A and tegame 2 fragments. A similar pattern is not observed for any of the other groups.

336 Any fragments with colour variation between orangish to blackish between exterior and interior was subjected to a closer visual inspection of also the core of the fracture. Patchy discol- orations on the surface of the sherds are classified as use relat- ed. Colour variation in the fracture from black to orange on one side are also classified as use-related. In the case of ‘sandwich- es’, the fragment is not classified as use-related blackening be- cause it cannot be ruled out that the colour variation is related to firing atmosphere. See Rye 1981, 116; fig. 104 for different types of sandwich cores.
Figure 5.2. Uniformity and variation in rim morphology. Scale 1:2.
5.2.1 Uniformity and variation in the Pontine region cooking wares: the concept of Republican cooking pots

Uniformity between time periods, fabric groups and within fabric groups varies for the different studied elements within each group and type. The process of standardisation is a decision-making process. Potters can choose which parts of the production process will be standardised and which will not. Although this choice is likely to be influenced by consumer demands (especially the more visible elements such as colour), also other factors play a role, such as production efficiency and individual skill. In the end, variation between fabric groups is always to be expected because of individual decisions made by potters at various workshops.

The most uniform part of the production process amongst the studied materials is the use of a wheel for forming. This characteristic is shared across all but one fabric. The use of a wheel makes production much more efficient and is likely to lead to increased standardisation; at the same time, it does not affect performance characteristics, nor the looks of the final product. However, minor morphological variation between individual pots is still to be expected, since potters’ hands are individual. Furthermore, the noted morphological variation between fabric groups is limited. The same general types of cooking pots were produced at many different workshops. Moreover, many of the rim shapes tie back to older forms from the Archaic period – especially the production of almond-shaped rims had a long tradition within Central Italy.

Additionally, the choice of raw materials and firing conditions also appear to be relatively stable and uniform between and within fabric groups. Raw material selection is tightly connected to the performance of cooking pots. The choice of clay and temper are thus partly technological choices, but also influence the visual aspect of the final object. The slow change from the dominance of black inclusions during the Mid-Republican period to white and shimmering inclusions during the Late Republican period did not influence the performance characteristics much; however, it did alter what a cooking pot looked like. Furthermore, some of the larger fabric groups show variation in the amount of inclusions being added, in some cases in relation to specific types (e.g., olla 3A in QF.2) but often not.

The change in temper is tentatively accompanied by a change in uniformity of firing conditions. Reduced fired cooking pots were very unusual during the Mid-Republican period but appear slightly more frequent, although still in small numbers, during the Late Republican period. This could indicate a slow change towards different firing atmosphere preferences. That being said, it is more likely that it indicates a change in how standardised the firing conditions were at specific production locations. Because firing atmosphere is so important for the appearance of ceramics, less uniformity in colour must also be accepted by the consumers. A change towards more variation in firing atmosphere might thus also indicate that colour uniformity became a less important factor for consumers during the Late Republican period.

Most variation occurred in the optional step of surface treatment. Whereas the application of slip was relatively common during the Mid-Republican period, slip layers only occur on pans (tegami) during the Late Republican period. The application of slip is uniform within groups. The application represents an additional choice, extending time investment in the production of a vessel. Furthermore, it also affects performance characteristics, especially when applied to the inside of the pots. The combination of these two elements might explain why only pans are being slipped in the Late Republican period – to save time by not slipping all cooking pots but only slipping those who benefit from an anti-stick layer based on intended function.

The low degree of variation in general between both fabric groups and morphological types indicates a shared cultural concept of what cooking pots should look like – with room for minor variations between them. Mid-Republican cooking pots were orange to red and speckled with usually black, volcanic inclusions. Jars had almond shaped rims and were sometimes slipped. Pans, baking trays and cooking bells occurred in the same or similar fabrics and shared their size range so they could be used together. Late Republican cooking pots were often still orange to red coloured, although now also occurred in darker brown, grey and black colours. Speckling with black inclusions became less prominent with the increased use of white shimmering inclusions. Jars continued to have almond shaped rims but became less globular and slip layers disappeared. Pans however were consistently slipped.
To conclude: the process of standardisation of the production of cooking pots likely started already before the Mid-Republican period, based on the fact that choice of raw materials, forming techniques, morphology and firing atmosphere were already fairly uniform and shared between different fabric groups (i.e. workshops) in the Mid-Republican period. A tentative change between the Mid-Republican and Late Republican period to less uniform firing atmospheres might be hypothesised. At the same time, we see a change in the application of slip layers to a more limited form repertoire. On the other hand, the degree of homogeneity within fabric groups when it comes to the amount of inclusions and firing conditions is not consistent. Some groups are very homogeneous, such as QF.1, while other groups are much more heterogeneous, such as V.4. The reasons for this might be connected to variations in the organisation of production underlying the specific fabrics.

5.3 From sherds to standards to production organisation

The leap from fabric groups and sherds to production organisation is big. The examination of fabric and form uniformity is therefore needed as a bridge between the two, assuming they are indicators for the degree of specialisation and/or standardisation. The process of standardisation is assumed to be connected to how production is organised; however, how the two are exactly related and how this relationship is expressed in the objects is not well understood. Many models on production organisation and corresponding degrees of craft specialisation exist. Most influential in Roman archaeology is the model by Peacock. Other models that are often referred to outside of classical archaeology are those by Van der Leeuw and Costin. All three models share a basis in ethnoarchaeology and are heavily reliant on excavated production sites for the claims they make about the relationship between technology, efficiency, specialisation or standardisation, time and financial investment and scale of production. Differences between the models mostly stem from a focus on different elements as defining features for production organisation and which parts of wider society are considered to be most influential (social norms, politics, economy, etc.).

Although these models have received considerable critique because of their often implicit connection to societal complexity, evolutionary development towards more complexity and lack of acknowledgement of co-existing modes of production, they are the only models that make a connection between specialisation and production organisation. Especially Costin is explicit about the possible relationship between specialisation, standardisation and production organisation, whereby she views specialisation as a specific way to organise production. She does not only provide indicators from direct evidence (e.g. excavated production sites), but also indirect evidence is used, such as variables related to standardisation, efficiency and skill that can be examined through cross-comparing objects and how these could relate to the degree of specialisation. Granting her model is based on another historical context (pre-Hispanic Andean societies), it is still valuable for its concreteness and combined use of evidence. Furthermore, she acknowledges that production and how it is organised is strongly related to mechanisms of distribution and consumption too.

Costin makes use of four parameters to describe production organisation:

- The context of production is focused on the relationship between producers and the “sociopolitical component of demand.” This refers to whether producers operate independently or are attached to the (political) elite. Independent specialists mostly produce for a general market based on demand and supply principles for utilitarian objects, whereby competition between producers will lead to similar production organisation between workshops. The context level overlaps with the scale of the Roman state. The production of cooking wares could be viewed as independent as they are utilitarian objects and there is a lack of indications for elite involvement in their production, with the exception of some villa productions (see below).
- Concentration is related to the geographical organisation of production and overlaps with the local and regional scales. Distribution of production

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337 Shared technology for the production of cooking wares is also assumed by Olcese (2003, 64) based on similarities in exported cooking pots from Central Italy.
338 Peacock 1982.
340 See Duistermaat 2016 for summary of critique.
341 Costin 1991, 1.
342 Costing 1993, 11.
sites could be based on environmental factors (raw material sources), but also on consumer markets and distribution mechanisms.\textsuperscript{344} The distribution of production locations will be discussed below for southern Lazio.

- The scale of the production units is how a production unit is organised, and relates specifically to the size or output of the production unit. For independent producers, the primary factor for scale is efficiency. A correlation between spatial organisation and production organisation is assumed.\textsuperscript{345} Scale of production sites can be examined through excavation, which will be discussed below.

- The intensity of production relates to the amount of time producers spend on the making of an object and overlaps with the smallest scale of the produced pots. This is connected to full-time or part-time craftsmen, skill and efficiency. Costin acknowledges that intensity is difficult to examine, but she relates it to indirect evidence such as measurements of variation in relation to standardisation, efficiency and skill.\textsuperscript{346}

Costin’s reasoning behind a process of standardisation is important. Implicit in her argument is the assumption that the process of standardisation reduced production costs and is thus mainly driven by economic reasons. These can vary from the most efficient way to make an object to a consumer-demand for standardised objects. Regardless, through standardisation production becomes routinised and thus more efficient and more uniform. Furthermore, standardised objects can be easier to transport, store and price.\textsuperscript{347} As discussed above, which elements are standardised and which are not is partly a choice made by the potters. Because of this, Costin suggests that for the assessment of standardisation, it is important to know which features would be uniform or diverse based on social expectations (of consumers) and technological constraints.\textsuperscript{348} This is why it is important to compare the hypothetical ideal cooking pot to the actual data and ground it in knowledge of Roman pottery production technology.

Based on the examination of indirect indications for variation and uniformity, we can already see that variation was limited in cooking pots from the Pontine region. Technology seems to have been shared widely across different communities of potters and the visual looks of cooking pots were grounded in older traditions and only slowly changing. To better understand these small and slow changes, we now turn to the known production sites within southern Lazio, to gain information on Costins parameters of concentration and scale, before we move to the discussion on change and continuity in the production of cooking wares during the Roman Republic and how it is influenced by its context – i.e. societal developments taking place between the 4th and 1st centuries.

5.4 The ceramic landscape of southern Lazio: pottery production locations

Several pottery production locations active during the Republican period are known within the Pontine region and bordering areas (Figure 5.3 and Table 5.1). They occur at a variety of places, from urban centres (colonies) to roadside settlements and rural sites. At most of the rural production sites only one ware group in a limited form repertoire is attested, while the production of pottery in settlements appears to have been more varied. These production sites have been discovered during field surveys or excavations, and most of them have not been excavated fully. Consequently, the data on both what was produced and the scale of these pottery production locations within southern Lazio is likely to be incomplete.

Due to often patchy published information about pottery production locations, the difficulty of identifying pottery production evidence amongst surface materials and a research bias towards black-gloss ware, it is likely that at least part of the production locations described in the literature as only producing black-gloss pottery in reality also produced other wares.\textsuperscript{349} Consequently, coarse ware production locations might thus be missing from the published archaeological record.

5.4.1 Regional indications for pottery production

In total, 23 production locations are known within the Pontine region and bordering areas (Figure 5.3 and Table 5.1). The majority of them (15) are associated with urban settlements. The 8 remaining

\begin{itemize}
\item \textsuperscript{344} Costin 1991, 13–15.
\item \textsuperscript{345} Costin 1991, 15–16, 29–30.
\item \textsuperscript{346} Costin 1991, 16–18, 32–40.
\item \textsuperscript{347} Costin 1991, 33–36.
\item \textsuperscript{348} Costin 1991, 32.
\item \textsuperscript{349} See for example the overview of black-gloss producers in Di Giuseppe 2012, 100–107; table 7. The vast majority of black-gloss producers in her overview also produced other ware types or terracottas.
\end{itemize}
production locations are situated in the countryside, either at villa complexes, farms, or at nucleated rural settlements like Ad Medias and Forum Appii. What is known about each locations depends heavily on the discovery method.

Information about the size of the workshop is limited to those that are (partly) excavated and yielded structural remains (Satricum, Lavinium, Segni – Fosso San Procolo, Fondi – Torrent S. Anastasia, Le Grottagge and Sora – S. Lorenzo). Kilns have been identified in all these locations, but only at Lavinium and Sora also other related structures provide information on scale. This makes the dataset for the assessment of variation between production sites rather limited.

Pottery production at Lavinium is dated to the 7th–3rd centuries and connected to the sanctuaries, producing mainly votive objects and ceramic building materials (including architectural terracottas). Nine kilns associated with five different workshops have been found. Workshop B and E date to the 4th–3rd centuries and are associated with additional workshop structures. Production included votive terracottas, tiles, coarse wares and black-gloss pottery. Workshop B is specifically associated with the production of cooking ware jars and lids, and one of the excavated kilns was still loaded with cooking ware jars dated to the 3rd century.

The rural site of Sora – S. Lorenzo consists of a house dated to the 3rd–2nd centuries and a small kiln built against one of its walls. The kiln was still loaded and contained cooking ware jars with associated lids and loom weights. The house was located in between the river Liri and a road leading towards Cassino.

These two workshops vary in location (urban vs. rural) as well as size of the workshops and number of kilns, indicating that contemporary scale variation existed. It should be noted that also rural production locations could have had multiple kilns. This is for example known from the geophysical surveys carried out at Forum Appii and Ad Medias. However, at these locations it remains unknown if more than one kiln was in use simultaneously and what the workshop space looked like.

Other production locations are often identified based on the occurrence of wasters, kiln debris or kiln spacers. Consequently, no information about the size and layout of these production location is available. On the other hand, there is often information on which wares, and in some cases which specific types of pottery, were produced. With the exception of five sites (Ardea, Segni – Casa Alvini, Fondi – Monte S. Biagio, site 12317 and site 15106) all documented production sites have indications for the production of multiple wares.

5.4.2 Indications for change and continuity in pottery production organisation

The above overview of known pottery production sites within southern Lazio provides information on three main factors related to production organisation: a) pottery production took place both in urban areas and at smaller sites in the countryside, b) based on the few better excavated/published sites (Satricum, Lavinium, Sora), we can conclude that there was considerable variation in the size of work spaces and kilns and c) coarse ware and/or cooking ware production was always associated with the production of also other types of wares in southern Lazio.

A) Locational variation (concentration)

The occurrence of pottery production locations both in urban and rural areas is in line with what is known from other parts of Central Italy. Although fewer rural production sites are known in comparison to urban workshops, production in the countryside during the Roman period was not uncommon and might even have been more prominent than we currently know due to recovery biases.

Raw material sources, even the preferred ones for cooking ware production, are widely available within Central Italy. Consequently, this does not appear to have been an important factor in the location of workshops. The occurrence of production locations in both rural and urban settings might thus be more related to the location of consumers and distribution possibilities, with for example several rural production sites being located close to roads or rivers (Ad Medias, Forum Appii, Sora) and many cooking ware producers that also manufactured amphorae located on the coast (Minturno, Fondi).

352 Tol & Borgers 2016.

353 This is contra Di Giuseppe 2012, who argues that the lack of rural black-gloss production sites in Lazio is due to the connection of this ware type to the temple economy.
Chapter 5. Standardisation and production organisation

Early to Mid-Republican pottery production at Satricum and Lavinium was connected to the local sanctuaries either by location or through the recovery of material similar in type and fabric from votive deposits. The association between urban pottery production and sanctuaries has also been observed in other areas. Specifically, the production of black-gloss pottery in Central Italy has been linked to cult activities, with for example the vast majority of black-gloss workshops located within 50 metres of a sanctuary. Often, these workshops would also produce additional wares and votives.

Excavated and published pottery production sites within southern Lazio are limited in number. Therefore, it is important to also briefly consider examples from wider Central Italy before addressing change and continuity in scale of production areas.

Very few rural Republican sites that produced cooking wares have been excavated more fully. Exceptions include the rural sites of Allumiere – Macchia di Freddara (Lazio), Chiusi – Marcianella (Tuscany) and Albinium (Tuscany). Although both sites are located in the countryside and produced multiple ware groups sometime between the 3rd and 1st centuries, they vary considerably in size. Allumiere is associated with a villa complex, similar to Sora – S. Lorenzo and Le Grottecce. The production of pottery dates to the end of the 3rd to 2nd centuries. A kiln was located within the corner of a courtyard and surrounded by

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354 Site 15106 is one of the few exceptions to this pattern, which might point to a recovery basis related to archaeological research focus on sanctuaries and urban areas.

355 Di Giuseppe 2012, 95.
<table>
<thead>
<tr>
<th>ID</th>
<th>Site</th>
<th>Context</th>
<th>Date</th>
<th>Structures</th>
<th>Materials</th>
<th>Ware</th>
<th>Coarse ware types</th>
<th>Methods</th>
<th>References</th>
</tr>
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<tr>
<td>2</td>
<td>Antium – Villa Albani</td>
<td>Settlement</td>
<td>4th-3rd c.</td>
<td>Wasters</td>
<td>Votives, amphorae</td>
<td></td>
<td></td>
<td>Excavation</td>
<td>Brandizzi Vittucci 2000, 43; footnotes 189; Tol 2012, 5; Bouma 1996, site 12a</td>
</tr>
<tr>
<td>3</td>
<td>Lavninum</td>
<td>Settlement</td>
<td>7th-3rd c.</td>
<td>Workshop rooms, 9 kilns, Kiln B + E are Republican</td>
<td>Loaded kiln</td>
<td>Votives, tiles, coarse ware, black-glass</td>
<td>Cooking ware jars and lids</td>
<td>Excavation</td>
<td>Fenelli 1984, 339-344; Fenelli &amp; Guatelli 1990, 192; footnote 19</td>
</tr>
<tr>
<td>5</td>
<td>Forum-Apuli – riverside</td>
<td>Settlement</td>
<td>2nd-1st c.</td>
<td>3 kilns, dump jars</td>
<td>Wasters</td>
<td>Building material, coarse ware, amphorae, thin-walled, black-glass</td>
<td>Geophysics, field survey, petrography</td>
<td>Tol &amp; Borgers 2016</td>
<td></td>
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<tr>
<td>6</td>
<td>Ad Medias – area 1-3</td>
<td>Settlement</td>
<td>2nd half 2nd-1st c.</td>
<td>Kiln, levigation tank?</td>
<td>Wasters (dump); kiln debris; kiln floor</td>
<td>Building material, coarse ware, amphorae, metal</td>
<td>Local Olcese olla 3A; fish pan</td>
<td>Geophysics, field survey, petrography</td>
<td>Tol &amp; Borgers 2016</td>
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<tr>
<td>8</td>
<td>Mintumo</td>
<td>Settlement</td>
<td>3rd c.</td>
<td>Dump</td>
<td>Wasters; kiln spacers; moulds</td>
<td>Black-glass; black-on-buff ware, amphorae, building material, votives, coarse ware</td>
<td>Olcese tegame 1; Olcese olla 2; Olcese clibanus 3</td>
<td>Excavation</td>
<td>Olcese 2011, 138-144</td>
</tr>
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<td>4th-3rd c.</td>
<td>Wasters</td>
<td>Votives, amphorae</td>
<td></td>
<td></td>
<td>Excavation</td>
<td>Brandizzi Vittucci 2000, 43; footnotes 189; Tol 2012, 5; Bouma 1996, site 12a</td>
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<td>12</td>
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<td>Loaded kiln</td>
<td>Votives, tiles, coarse ware, black-glass</td>
<td>Cooking ware jars and lids</td>
<td>Excavation</td>
<td>Fenelli 1984, 339-344; Fenelli &amp; Guatelli 1990, 192; footnote 20</td>
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<td>14</td>
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<td>Settlement</td>
<td>2nd-1st c.</td>
<td>3 kilns, dump jars</td>
<td>Wasters</td>
<td>Building material, coarse ware, amphorae, thin-walled, black-glass</td>
<td>Geophysics, field survey, petrography</td>
<td>Tol &amp; Borgers 2016</td>
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<td>Wasters (dump); kiln debris; kiln floor</td>
<td>Building material, coarse ware, amphorae, metal</td>
<td>Local Olcese olla 3A; fish pan</td>
<td>Geophysics, field survey, petrography</td>
<td>Tol &amp; Borgers 2016</td>
</tr>
<tr>
<td>17</td>
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<td>4th c.</td>
<td>Dump</td>
<td>Wasters; kiln spacers; moulds</td>
<td>Black-glass; black-on-buff ware, amphorae, building material, votives, coarse ware</td>
<td>Olcese tegame 1; Olcese olla 2; Olcese clibanus 3</td>
<td>Excavation</td>
<td>Olcese 2011, 138-145</td>
</tr>
<tr>
<td>20</td>
<td>Antium – Villa Albani</td>
<td>Settlement</td>
<td>4th-3rd c.</td>
<td>Wasters</td>
<td>Votives, amphorae</td>
<td></td>
<td></td>
<td>Excavation</td>
<td>Brandizzi Vittucci 2000, 43; footnotes 189; Tol 2012, 5; Bouma 1996, site 12a</td>
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</table>

Table 5.1. Overview of the regional production sites. The ID numbers correspond to the numbers on Figure 5.3.
several semi-open rooms. Tiles, pareti sottili, coarse ware and cooking ware were produced, including dolia and Olcese olla types 1 and 2.  

The pottery workshop of Chiusi – Marcianella was in use between the late 3rd and beginning of the 1st century and consisted of a series of kilns (that were in use consecutively) and smaller buildings with probably an artisanal rather than domestic function. The complex developed over time, with new walls and kilns being added. Attested production included black-gloss pottery, pareti sottili, red slip pottery (ceramica comune a vernice rossa), amphorae, coarse ware and cooking ware, including a wide variety of jars and lids as well as tegami and casseroles.  

The coastal production centre of Albinium is dated to the Late Republican – Early Imperial period. It is located at the river mouth of the Albegna and close to the via Aurelia and is currently only associated with the minor centre (mansio) of Torre Salina. This large-scale production site mainly produced amphorae, but also smaller quantities of terracottas, tiles, lamps and coarse wares including ollae, tegami and pentole. The structural remains are extensive, covering circa six hectares. The two largest kilns uncovered measure 5.1 by 3.2 metres and were flanked by open but roofed structures, covering possible levigation tanks and workshop spaces. Smaller kilns were associated with the production of smaller forms, while the large kilns were used for the production of amphorae and tiles. The size of the complex and the kilns is much larger than at any of the other sites discussed above. Although Albinium might be an outlier because of its sheer size, similarly large scale but urban production centres and potters’ quarters are also known from southern Italy, for example at Morgantina (Sicily), Locri Epizephirii (Calabria) and Herakleia (Basilicata).  

The examples of Allumiere, Chiusi – Marcianella and Albinium, together with the data from southern Lazio, suggest considerable variation in the layout and scale of production sites during the Republican period. Variation in size also has implications for how production was organised, required capital investment, influenced the number of people involved and the output of the workshops. Smaller scale sites, such as Sora and Allumiere with only one known kiln and small workrooms, are associated with rural farmsteads or villas. This could be viewed as a more extensive form of household production, with probably few people involved and work being conducted on a part-time basis. Slightly larger rural sites, such as Chiusi – Marcianella with its multiple kilns and separate buildings, probably functioned in a similar way to smaller workshops located in an urban setting. Lastly, larger production locations such as Albinium, but also for example the black-gloss producers in southern Italy (see below) operated on a larger scale. Potters that were active here were likely working full-time, year-round and possibly even specialised in just one step of the production process. These different scales of production combined with variation in how production would have been organised imply also that there could be variation in the degree of uniformity of products between these workshops. However, as the discussion above shows, a considerable level of knowledge (to achieve the desired performance characteristics) and skill level (wheel throwing) seems to have been widely shared across production locations regardless of workshop size and production organisation.  

C) Production of multiple ware types  

The well investigated examples of Allumiere, Chiusi – Marcianella and Albinium show that although huge variation in the size of production sites occurred, specifically in the number of kilns and kiln sizes, none of them produced only one ware type. All produced cooking wares alongside a wide variety of other ware types that in some cases also would have required very different types of production technology (e.g. black-gloss pottery). This is in agreement with the picture we have from cooking ware production within southern Lazio. According to Olcese, specialisation in one ware type did not occur until the start of the production of terra sigillata in Central Italy. Specialised production of cooking ware appears to

357 Olcese 2011, 101–107, ID no. T011.  
360 Di Giuseppe 2012, 40–41.  
361 Di Giuseppe 2012, 44–45.

363 Similar to Peacocks individual workshop (1982, 90–99) or Van der Leeuws’ workshop industry (1976; table 14).  
364 Similar to Peacocks nucleated workshop and manufactory (1982, 99–113; 114–122) or Van der Leeuws’ village industry or large scale industry (1976; table 14).  
365 Diversification of production is also noted by Olcese 2003, 63 for Central Italy in general.  
366 Olcese 2003, 63. She connects this development with a technological difference between terra sigillata and other ware types, requiring different firing methods.
be mostly a later development, for example Late African cook ware production in Tunesia in the late 2nd century AD\textsuperscript{367} and Pantellerian cooking ware from the small island of Pantellaria south of Sicily in the 5th century AD\textsuperscript{368} although the Hellenistic production of cooking wares on Aegina (Greece) could also be characterised as specialised.\textsuperscript{369}

The production of multiple ware groups at one production location might have had implications for the degree of uniformity of those products. It is unknown how the workload was divided at such production centres. This is very difficult to examine based on the structural remains, although size and number of the workrooms, layout of the workshop area and number of kilns could tentatively point to the number of people involved.

For the smaller workshops with only one or two rooms and smaller kilns, which are likely to form the majority within the research area based on documented kiln remains, it could be hypothesised that the same potter would have produced a wide variety of wares and forms. Consequently, the pots might have been less uniform because motor habits to create one specific type of pot would be less developed than when one potter is only producing one ware type and a limited form repertoire. Standardisation only occurred on the level of morphology and not for the size of the pots. For larger production centres, division of labour might have occurred, leading to the carrying out of repetitive tasks and thus more developed motor habits and thus less morphological variation. However, ethnographic studies show that even part-time potters making a wide variety of pots could achieve a high degree of uniformity.\textsuperscript{370} The occurrence of uniformity within one fabric group thus does not unambiguously point towards a larger scale production centre.

The production of multiple ware groups at one location might, in combination with workshop size and thus output, also be reflected in the differing number of fabrics attested in the Pontine region between the Mid- and Late Republican periods. Among the twenty-one fabrics, thirteen date exclusively to the Mid-Republican period. Among the twenty-one fabrics, thirteen date exclusively to the Mid-Republican period. Among the twenty-one fabrics, thirteen date exclusively to the Mid-Republican period. Among the twenty-one fabrics, thirteen date exclusively to the Mid-Republican period. Among the twenty-one fabrics, thirteen date exclusively to the Mid-Republican period. Among the twenty-one fabrics, thirteen date exclusively to the Mid-Republican period. Among the twenty-one fabrics, thirteen date exclusively to the Mid-Republican period. Among the twenty-one fabrics, thirteen date exclusively to the Mid-Republican period. Among the twenty-one fabrics, thirteen date exclusively to the Mid-Republican period. Among the twenty-one fabrics, thirteen date exclusively to the Mid-Republican period. Among the twenty-one fabrics, thirteen date exclusively to the Mid-Republican period. Among the twenty-one fabrics, thirteen date exclusively to the Mid-Republican period. Among the twenty-one fabrics, thirteen date exclusively to the Mid-Republican period. Among the twenty-one fabrics, thirteen date exclusively to the Mid-Republican period. Among the twenty-one fabrics, thirteen date exclusively to the Mid-Republican period. Among the twenty-one fabrics, thirteen date exclusively to the Mid-Republican period. Among the twenty-one fabrics, thirteen date exclusively to the Mid-Republican period. Among the twenty-one fabrics, thirteen date exclusively to the Mid-Republican period. Among the twenty-one fabrics, thirteen date exclusively to the Mid-Republican period. Among the twenty-one fabrics, thirteen date exclusively to the Mid-Republican period. Among the twenty-one fabrics, thirteen date exclusively to the Mid-Republican period. Among the twenty-one fabrics, thirteen date exclusively to the Mid-Republican period. Among the twenty-one fabrics, thirteen date exclusively to the Mid-Republican period. Among the twenty-one fabrics, thirteen date exclusively to the Mid-Republican period. Among the twenty-one fabrics, thirteen date exclusively to the Mid-Republican period. Among the twenty-one fabrics, thirteen date exclusively to the Mid-Republican period. Among the twenty-one fabrics, thirteen date exclusively to the Mid-Republican period. Among the twenty-one fabrics, thirteen date exclusively to the Mid-Republican period. Among the twenty-one fabrics, thirteen date exclusively to the Mid-Republican period. Among the twenty-one fabrics, thirteen date exclusively to the Mid-Republican period. Among the twenty-one fabrics, thirteen date exclusively to the Mid-Republican period. Among the twenty-one fabrics, thirteen date exclusively to the Mid-Republican period. Among the twenty-one fabrics, thirteen date exclusively to the Mid-Republican period. Among the twenty-one fabrics, thirteen date exclusively to the Mid-Republican period. Among the twenty-one fabrics, thirteen date exclusively to the Mid-Republican period. Among the twenty-one fabrics, thirteen date exclusively to the Mid-Republican period. Among the twenty-one fabrics, thirteen date exclusively to the Mid-Republican period.

Principally, this indicates that there is a change from many different but small quantities of specific productions reaching the Pontine region during the Mid-Republican period to fewer production sites, but possibly with a higher output, supplying the region in the Late Republican period. The Late Republican fabric groups are all continuations of fabrics that already occurred during the Mid-Republican period. At the same time, the number of loners also decreased from seven to three. This change in the number of occurring fabrics could be a reflection of changing supply systems (Chapter 6) but could also be related to changes in production organisation or a combination of the two.

5.5 Change and continuity in cooking ware production organisation during the Republican period: from fragmentation to centralisation

If the change from many too few fabrics is related to a change in production organisation, we might expect it – based on the fabric data – to be a change from many smaller production centres in the Mid-Republican period to fewer but larger ones in the Late Republican period. This would imply a process from a fragmented production landscape to a more centralised production landscape, whereby there is a degree of continuity with a couple of the Mid-Republican production centres surviving and possibly growing at the expense of other Mid-Republican workshops.

When we look at the chronology of the known production locations within southern Lazio, we can see a division between sites dated between the Archaic and Mid-Republican period and sites dated to the Late Republican and Early Imperial period. The ‘breaking point’ is during the 3rd century, when all known earlier production centres fall out of use, with the exception of Segni – Fosso San Procolo and Sora, and new ones are established. The available data is too patchy to draw any conclusions regarding changes in size of the production locations around the same time. Although the known number of production locations increased between the Mid- and Late Republican period, three of these new

\textsuperscript{367} Ikäheimo 2002, 4.  
\textsuperscript{368} Peacock 1982, 79–80.  
\textsuperscript{369} Gauss et al. 2015, 68–71.  
\textsuperscript{370} Schiffer & Skibo 1997.  
\textsuperscript{371} One fabric group (VLD) could not be dated based on diagnostic features.
production sites are situated at the same settlement (Fondi) and one location (site 12317) produced dolia, which are difficult to transport across larger distances. Furthermore, the vast majority of known Late Republican production locations produced amphorae whereas most Mid-Republican production sites produced black-gloss pottery.

Olcese notes that in the area north of Rome, the production of cooking wares mostly took place at small workshops in the countryside, sometimes in association with a villa, during the Early Imperial period.\textsuperscript{372} Clay deposits suitable for the production of cooking wares are abundant in the region, especially in the Tiber valley. The scale of production was limited and production appears to have taken place for the local market only. Specialised production occurred at locations with favourable environmental conditions, such as Vasanello and Celsa, where clay deposits that are exceptionally suitable for the production of cooking wares can be found. These products circulated also outside the region.\textsuperscript{373}

A similar pattern from fragmentation to centralisation can tentatively be suggested also for the production of black-gloss pottery, for which the available data is more abundant than for the production of coarse and cooking wares. For black-gloss ware, also the size of production centres can tentatively be taken into account. The shift from small, isolated workshops to larger scale production centres and potters’ quarters of this ware was accompanied by a geographical shift. Whereas Mid-Republican black-gloss production is well attested within Central Italy until the first half of the 3\textsuperscript{rd} century, many of these producers disappeared by the 2\textsuperscript{nd} century. Simultaneously, there was a rise in (larger) production centres after the 3\textsuperscript{rd} century in especially Campania.\textsuperscript{374}

Although a change from many to fewer production locations and a tentative increase in scale comes forward from the data, there was also continuity in how production was organised.\textsuperscript{375} Large scale production centres such as Albinium or the extensive potters’ quarters in southern Italy were much less common in comparison to the surviving smaller scale workshops in many towns and the countryside. Change and continuity in how production was organised thus went hand in hand during the Late Republican period. The production landscape was varied and adapted to local circumstances related to not only environmental but probably also social and economic factors.

Coming back to Costin’s model on production organisation, a decrease in the number of production locations would lead to an increase in specialisation with fewer producers supplying at least the same number of pots, which would in turn lead to an increase in efficiency and standardisation in the case of independent producers.\textsuperscript{376} If we look at the dataset from the Pontine region, we see a decrease in the number of fabrics reaching the Pontine area during the Late Republican period, but this is not accompanied by an increase in standardisation of those fabrics. Rather the opposite takes place with firing conditions apparently becoming more varied, which could also relate to the earlier noted tendency that production is diversified so it might be related to firing a variety of different wares in the same kiln load.

The reason behind the disappearance of many production centres towards the end of the Mid-Republican period and the possible change from fragmentation to centralisation is likely to have been related to wider social, political and economic developments. The end of the 3\textsuperscript{rd} and the start of the 2\textsuperscript{nd} century was marked by warfare outside of the Italian peninsula. The consequences of these wars against Carthage and the Hellenic World were not only the extension of the Roman territory but also an influx of wealth and people in Italy itself, especially in the urban centres.

Production organisation was potentially also influenced by these societal changes. Besides relocation of black-gloss producers, there is also a change in production scale visible, implying that larger investments were being made into pottery production facilities. Roth, for example, tentatively detects changes in production organisation based on variation within black-gloss fabric groups from Volterra and Capena, their variation in quality

\textsuperscript{372} Olcese 2003, 64–65.
\textsuperscript{373} Olcese 2003, 61–63.
\textsuperscript{374} See Di Giuseppe 2012, 100–107; table 7 for an overview of black-gloss production sites. Based on this table the number of black-gloss production centres within Lazio decreases from 18 before the 2\textsuperscript{nd} century to 1 from the 2\textsuperscript{nd} century onwards, while the number increases from 8 to 16 in Campania. For the whole of Italy, there is a change from 99 black-gloss producers active before the 2\textsuperscript{nd} century to 62 from the 2\textsuperscript{nd} century onwards (34 show continuity between the 3\textsuperscript{rd} and 2\textsuperscript{nd} centuries).
\textsuperscript{375} This continues into the Imperial period – see Olcese 2003, 61–63.
\textsuperscript{376} Costin 1991, 21–22.
and their distribution patterns within Etruria. He argues that the co-existence of black-gloss wares in different qualities was related to the integration of the region into Roman territory. High quality black-gloss production was connected to elite networks of agricultural trade and thus circulated on an interregional scale. The new, lower quality black-gloss producers operated more independently and supplied the local market.377

Roth’s argument is interesting for two reasons. Firstly, he suggests that, although data is limited, quality differences between fine black-gloss and low quality black-gloss were not so much related to the skills of the potters, but rather to variation in organisation of the production facilities. Those products made at larger production facilities, with better equipment available due to higher capital investment, are of a higher quality than the black-gloss made at smaller scale workshops. Because of the needed capital investment, elite involvement is assumed but cannot be further ascertained due to the lack of excavated contexts.378 This variation in production organisation in relation to quality can tentatively be connected to Costin’s differentiation between attached and independent producers. According to Costin, cost efficiency was more important for independent producers, because they competed with each other for the same consumers. On the other hand, attached producers were connected to (political) elites and thus operated within a different system, whereby elites invested in production facilities.379 Two different systems of production organisation could thus exist alongside each other, producing the same types of objects for slightly different consumers, with different prices and using different distribution systems.380

This leads to the second point of Roth’s argument. He connects different types of production organisation to different distribution mechanisms and consumer demands, suggesting market plurality rather than a single pottery market within the Roman economy.381 The co-existence of different scales of production locations is thus connected to different distribution and consumption networks. Although black-gloss pottery of course had a different function than cooking pots, the notion of the possible existence of different networks that supplied different groups of consumers is important to keep in mind.

The local market(s) for ceramics might have undergone significant changes due to warfare around the turn of the 2nd century. The period after the Second Punic War witnessed general changes in the agricultural economy caused by the assumed introduction of slave labour and the consequent impoverishment of the free rural population. It was long assumed that this led to general population decline in the countryside during the 2nd century, although the effect of this appears to have been rather varied.382 The defeat of Carthage was also the start of a relatively peaceful and thus stable period within Italy, since wars were mainly fought elsewhere in the Mediterranean, creating favourable market conditions within the peninsula.

The outcomes of this process were, however, varied depending on local circumstances. The Pontine region probably saw population growth instead of decline, both in the coastal area383 and in the inner plain,384 with a steady increase in the number of sites between the Mid- and Late Republican period.385 This was accompanied by the establishment of the first coastal villas and indications for monumentalisation of some rural sites.386 Population was thus not decreasing within the region, but its social-economic composition might have changed. Consumption demand for cooking pots would have been stable or growing, making it profitable for producers to establish workshops in the countryside close to the consumers at locations such as Forum Appii and Ad Medias.

Changes in one part of the economy (agriculture) could thus also drive changes in other economic domains (production of ceramics) in relation to the location of different groups of consumers. This

377 Roth 2007, 93–94.
378 Roth 2007, 78–85.
379 Costin 1991, 37–39. Roth (2007, 80) argues that a connection for black-gloss production being attached to elite cannot be made because of the lack of excavated structural remains that would make such an association possible.
381 Roth 2007, 85–93.
382 See Launaro 2011 for demographic changes in the Italian countryside.
384 De Haas 2011, 251–252, 256.
385 This pattern of stability in rural population numbers or even small increases is also detected by Launaro 2011 for other areas.
386 The coastal villas and the platform villas of the Lepine foothills both show signs of capital investment (see Attema, de Haas & Tol 2011, 63–64; De Haas 2011, 251–252). Rural sites in the Pontine plain also have indications for monumentalisation with surface finds of mosaic stones, marble and later window glass, but their absolute number is declining (Tol & de Haas 2022).
might also be visible in changing economic networks, reflected in distribution mechanisms and patterns of cooking wares, which are the topics of the next chapter.
Chapter 6

Pontine pottery markets

Distribution and trade are two different but strongly related phenomena. Distribution is the act of transport, which is not visible in the archaeological record itself. Trade is the act of exchange between at least two people, the party offering goods (like pottery) for exchange and the party who wants to obtain those goods. A pot can be traded on multiple occasions before it reaches its final owner. The find locations of pottery are usually the consumption locations and not the place where pottery was physically traded.

Placing dots on a map to visualise pottery distribution patterns has a long-standing tradition in archaeology. However, the interpretation of how pots ended up in specific locations is often problematic. The relationship between distribution mechanisms, specific distribution patterns and market exchange is not well understood. Consequently, distribution and trade can be viewed as the black box within the life cycle of pottery.

To investigate the trade in cooking wares within the Pontine region, the study focuses on 1) the provenance of the identified fabrics and their distribution (including occurrence outside the region), 2) distribution patterns of cooking ware fabrics within the Pontine region and 3) typological variation within fabric groups (Section 6.4). Information on the distribution of cooking wares is combined with additional data from amphorae and black-gloss pottery to obtain a more complete picture of pottery trade networks (Section 6.5). The primary goal is to gain insights into the extent of trading networks and the relationship between the distribution of the fabrics and local trading opportunities (including infrastructure and marketplaces, Section 6.2–3) to understand the mechanisms behind the pottery trade. Possible variation in trade connections and distribution patterns between the coastal area and the plain and between the Mid- and Late Republican period is finally discussed to trace spatial and diachronic change and continuity.

However, the general framework of Roman market integration and distribution mechanisms needs to be discussed first, to provide general background information and economic models centred around Roman trade to compare the Pontine data to. The conclusion of this chapter will tie together the patterns of pottery trade in the Pontine region and their relation to different distribution mechanisms, infrastructure and the process of market integration during the Republican period in Italy. Ultimately, the detected distribution patterns are individual consumption choices – which will be the topic of chapters 7 and 8.

6.1 Roman market integration and extending distribution networks

Pottery trade was part of Roman market exchange, no doubt the dominant exchange mechanism in the Roman period alongside reciprocity (gift exchange) and redistribution by the Roman state (annona). However, the level of market integration (scale of

387 See Stark & Garraty 2010, 1–58 for a discussion on these problems from a theoretical and methodological viewpoint.

388 Holleran 2012 on market exchange; Peacock & Williams 1986, 56–61. Cooking pots are unlikely to have been exchanged as gifts and were not part of the annona.
Chapter 6. Pontine pottery markets

distribution), what pottery markets looked like on a practical level (who was involved?) and how markets changed over time is debated and largely unknown when it comes specifically to cooking wares. Whereas some scholars have argued for a high level of market integration with far-reaching distribution networks, others view Roman market integration as regionally-based with limited integration between different regions. What further complicates the picture is that most studies on Roman market integration discuss Imperial period data and if pottery is considered, the focus tends to be on widely distributed ceramic classes, such as amphora or fine wares.

The widespread distribution of Republican amphorae and black-gloss pottery from as early as the late 4th century onwards suggests that the integration of new territories into the Roman state was accompanied by expanding trade networks. These trade networks profited from the political unification of initially mainland Italy but eventually an area extending across the whole Mediterranean. This political unification came with increased stability and shared economic structures such as legislation and coinage.

The trade in coarse wares is nonetheless often missing in general discussions on the Roman economy. It is usually assumed that these lower value, mundane objects were mostly traded on a local or regional scale. The assumption is that the steady demand for these objects coupled with their low price would provide too few incentives to undertake the effort of long-distance export and the additional costs this would take. However, we can trace the long-distance export of specific fine wares (e.g. Genucilia plates) and a limited repertoire of cooking pots. What probably plays a role in these cases is the higher level of (functional) quality, making it worth to undertake long-distance trade.

The study of coarse wares can balance the picture we have of Roman trade networks, a field of study that has mainly focused on those ceramics that are more obvious non-local products (e.g. amphorae and fine wares). However, the study of regional and local patterns of coarse ware distribution is still in its infancy. Whereas trade networks are traditionally reconstructed based on morphological features of ceramic types, this is usually not an option for coarse wares because of the longevity of specific types. Fabric studies can thus play a key role in the reconstruction of local and regional networks for understanding distribution patterns. Additionally, the reconstruction of local and regional networks is hampered by a lack of knowledge on how different distribution mechanisms (how pots are moved and traded) could lead to different types of distribution patterns. The possible co-existence of different types of exchange mechanisms and different markets for different products within the Roman economy further complicates the picture. Within market exchange, a variety of mechanisms of distribution could have co-existed, as comes forward from the different models discussed below. Discerning specific patterns in relation to specific distribution mechanisms is, however, complex because of potentially similar outcomes of different ways to distribute and trade pottery.

The study by Hodder on Romano-British coarse ware pottery offers three models of marketing mechanisms in relation to the location and scale of production sites. Within the first model, production is took place close to or at a town. The distribution of the products related to the immediate area of influence of the town and was extended by the main infrastructural transport routes. The second model concerns large-scale pottery production centres that often produced both fine and coarse wares. The distribution of coarse wares in this model does not appear to be related to the location of towns or infrastructure. Instead, Hodder suggests that it profited from the larger scale production, keeping the production costs lower and the use of the same ware and mortaria in relation to functional quality. Other examples of long-distance trade in connection to presumed superior quality is the distribution of Pantellarian Ware (Peacock 1982) and chiaro sabbioso basins (Merlo 2005).
networks for distribution as fine wares. A third model concerns small-scale rural production centres. Distribution of their products was highly localised. The market areas of multiple small-scale producers often overlapped, leading to the circulation of a variety of coarse wares within the same local area. Hodder’s models show the influence of local infrastructure and marketplaces for the pattern of distribution. These models are based on an inland area, where roads were the main infrastructure used for transport. Besides roads, transport over water also played an important role in the Roman world. Transport over water was often faster than by road and came with lower risks of breakage of the transported vessels.

In spite of most coarse wares probably circulating within local and regional networks only, Roman shipwrecks also indicate the transport of foodstuffs (potentially as part of the annona) together with a wide variety of pottery (including cooking wares) as secondary cargo, leading to distribution beyond regional boundaries. An example is the shipwreck of Mandrague de Giens (60–50 BC), which is assumed to have left from Terracina to the Gaulish coast. The cargo consisted of Dressel 1 amphorae, with in between these amphorae black-gloss and coarse ware pottery. While the Mandrague shipwreck likely represents direct trade from one harbour to another, other shipwrecks, like the Cala Culip IV, suggest port-to-port cabotage trading leading to a cargo with small numbers of different types of vessels with a varied origin. An example of a distribution pattern associated with this type of smaller scale coastal trade is the distribution of a gabbro cooking ware fabric in northern Etruria.

Lastly, a mechanism whereby pots transfer between different systems of distribution could also have existed. This is hypothesised for the trade in terra sigillata by Van Oyen based on variation in stamps and forms within assemblages. She suggests that there is often an initial relationship between one kiln load and the very directional transport of a large part of this kiln load towards one harbour or warehouse. From there onwards, the kiln load became dispersed through a process of selling smaller batches to individual merchants. These merchants transported the pots further, and sold them off as either a set or individually. Archaeologically, this can lead to assemblages with more variation in stamps and forms, similar to assemblages from ships involved in cabotage trade. In general, we could thus say that the occurrence of sets of things or individual vessels relates to the directionality of distribution, distances covered and mechanisms of selling these vessels.

Behind the transport of pottery over land and water were people moving these objects from one place to another place. For a complete picture, the persons involved in the pottery market and the locations where pottery could have be been sold also needs to be considered. Merchants specialising in the trade of pottery are not attested for the Republican period. Selling of pottery was thus probably carried out by merchants selling a wider variety of (household) goods. However, how the behavioural chain of selling pottery (Figure 6.1) relates to different patterns of distribution is unclear. Additionally, some pots would also have been traded because of their contents and not for their own intrinsic value.

The first possible marketing mechanism would be selling pottery at the production location. The pots were sold by the potter and transported by the consumers themselves or by merchants taking on larger consignments for sale elsewhere. The second option is the selling of pottery in fixed shops (tabernae). Shops specialising in the marketing of pottery are difficult to recognise in the archaeological record, but based on for example characteristics of find assemblages, frescoes and graffiti several shops in Pompeii and Colchester are known. An early Imperial example of a rural pottery shop located along a road is known from inland Tuscany. The third possible marketing mechanism is a more mobile system, with merchants travelling from port to port (i.e. cabotage) or from market to market. Especially for rural areas, the periodic local markets known as nundinae probably played an important role.

Potters themselves could also have travelled to these markets to sell their pottery. Lastly, peddlers could have gone from door to door selling pottery.

Based on the available information about the Roman market economy, I would suggest that there is variation in the extent of networks in relation to distribution mechanisms, but different mechanisms also co-existed and overlapped. Local and regional circulation functioned through a network of local, regular markets (nundinae) and peddlers. Objects traded within these networks had mostly a local or regional origin. Nundinae were organised on a regular basis in cycles that partly overlapped, connecting different regions within Central Italy.\footnote{MacMullen 1970. For display of these cycles, see the Roman inscription in MacMullen 1970, 340; fig. 2.} Road networks formed the main physical connector between the towns that were part of the nundinae system. On the other hand, interregional circulation of objects was more associated with transport networks over water. Harbour towns played a crucial role in this system. Especially within the interregional networks, I suggest that quantity is an indicator for regularity of the trade connection. Well-established trade connections operating on a frequent level would result in higher quantities of goods being traded, whereas irregular connections would lead to loners. Loners are potentially also associated with cabotage trade or the buying and selling of ‘mixed’ consignments by merchants either at shops or markets. Lastly, shops selling pottery were likely to be part of local, regional and interregional networks depending on their location. Shop owners could have bought batches of pottery directly from local workshops or from passing merchants, resulting in them having pots of varied origins on sale.

The quantity and variation in imported ceramics is thus related to the regularity of the distribution mechanism and the location of a site in relation to the broader infrastructural network, including places where pottery was sold. Sites located close to harbours, larger urban centres, rivers and main roads probably had easier access to a wider variety of goods, including imported pottery. Furthermore, assuming that imported cooking wares were more expensive than local cooking wares, the occurrence of imported cooking wares can also be an indication of the socio-economic status of the site. Lastly, in general the import of cooking wares into an area will be dependent on local supply and demand. It is therefore also connected to the local production of cooking wares (Chapter 5) and population size.\footnote{Menchelli 2004, 68 expects higher volumes of imported cooking wares in regions that are lacking specialised cooking ware production. This might have been the case for the Mid-Re- publican period in the Pontine region, for which local cooking ware production is not well attested, in contrast to the Late Republican period with at least local productions in the Pontine plain.}

6.2 Pontine infrastructure: connecting the Pontino to the expanding Roman world

Roads and waterways made it possible for pottery and other products to reach the Pontine region. Consecutively, redistribution and trade of pottery took place in the harbours, colonies and minor settlements of the region or at the door through...
travelling peddlers (Section 6.3).

The Pontine region was already connected within and outwards before the Roman conquest of the area. The different protohistoric city-states of Latium Vetus were connected by regional roads to the north and south, through the via pedemontana transhumance route along the Lepine foothills and with the harbours at coastal settlements (Figure 6.2). With the decline of some of these urban centres, such as Pometia and later Satricum, some of these regional connections were possibly lost while interregional infrastructure persisted.412

The period of early Roman colonisation in the Pontine plain in the late 4th century was accompanied by huge infrastructural investments. New roads, most notably the via Appia (312 BC), were built connecting newly established colonies with Rome and creating transport routes for easier travel southwards. Several road stations were established along the via Appia, and perpendicular roads connected the Tyrrhenian coast, the plain and the Lepine Mountains.413

The late 4th–3rd century investments in roads were accompanied by investments in canals with the purpose of draining the Pontine marshes. The main artery was the Decennovium canal running along the via Appia between Forum Appii and the harbour of Terracina. Probably constructed simultaneously with the via Appia, it formed the fastest route from the plain to the Tyrrhenian Sea. Docking and storage facilities at Forum Appii show the presence of a river harbour and suggest the importance of this waterway for the local transport of products at least in the Imperial period.414 The Decennovium canal was connected to the Cavata river, that flowed down from the Lepine Mountains.

The Rio Martino connected the plain with the coastal area. This Roman canal crossed from the west side of the plain through the marine terraces to the coastal lagoons at Fogliano. Likely, the Ninfa and Teppia streams were connected to this canal, improving the drainage from the Pontine plain. If these streams and canals were navigable, they would have formed a connection between Tripontium and the coast.415 Other natural waterways in the coastal area were probably navigable too. Several streams in the area of Antium flow down from the north. The Astura river connected Satricum to the coast.416 The mouth of the Astura river is located at a sheltered bay, although no harbour structures from before the construction of the Imperial villa are known.417

Mid-Republican infrastructural investments in the road network of the coastal area are not attested. Several roads constructed no later than the Late Republican or Early Imperial period are nevertheless known.418 The via Ardeatina and the via Antiatina connected Ardea and Antium with the via Appia. A third road, known by its medieval name as the via Mactorina, ran parallel to the Astura river and connected Velletri in the Alban Hills to the coast at Astura via the cultic site of Campoverde. Finally, a road whose Roman name is unknown but generally referred to as the via Selciatella, linked Lavinium and Ardea to Antium. The via Selciatella also had two smaller off-branches, one towards Astura and one towards modern-day Nettuno. Doubtlessly, a coastal road existed too, but it is not attested archaeologically except for a small stretch of pavement near Ostia and an inscription from Ardea referring to the via Severiana. It occurs on the Peutingeriana map as a nameless road between Ostia and Terracina, with several road stations along its course.419 Another road, mentioned by Cicero, connected Antium with the via Appia and Tres Tabernae.420 Besides the coastal harbour of Terracina, it is likely that also Antium had a harbour. The location of this harbour is however not archaeologically attested. Antium’s early harbour is mentioned in historical sources under the name Caenon, which was destroyed by the Roman in 338.421 A (Mid-) Republican harbour is likely to have existed in connection to the establishment of the maritime colony at Antium.

412 De Haas 2011, 215, 239; Tol 2011, 12–14; Tol 2012, 14–15. Persistence of connections is based on continuity between the Archaic and Republican period at sites such as Antium and Satricum. The actual roads are complex to date or their course is not exactly known. The via pedemontana was reinforced with polygonal masonry in the Republican period.
413 De Haas 2011, 215; fig. 8.7.
414 Tol et al. 2014. Numerous imported amphorae, discussed in more detail below, further support this.
415 Name Tripontium refers to three bridges.
416 Tol 2011, 12.
417 De Haas 2011, 173; Tol 2012, 14; Tol 2011, 11. Navigability of the Loricana is assumed based on the density and alignment of Archaic – Republican sites along the river.
418 An earlier date is suggested based on the settlement pattern in this area, Tol 2011, 14–15.
420 Cic. Att., 2.12.2 “I had just come out of the Antium district and joined the Appian Way at Tres Tabernae […].” This road is not archaeologically attested and thus not depicted on Figure 6.2.
421 De Haas 2011, 172; Tol 2011, 11.
Chapter 6. Pontine pottery markets

6.3 The Pontine market: where to buy pottery?

The infrastructure in the Pontine region connected the settlements within the region and linked them to those situated further away. Products reached these locations through the harbours, roads and navigable waterways. Consequently, pottery consumers in the Pontine region probably had several options to choose from when it came to where to buy their pots. However, Roman shopping locations are difficult to trace in the archaeological record, especially when relying on survey data. No shops have been identified with certainty in the Pontine region. Based on the function of different types of settlements, different ‘fixed’ locations for the buying of pottery (and other products) within the region could be hypothesised.

Street vendors and pedlars were probably common but are almost impossible to trace due to their high mobility and the generally low quantities of goods they traded. They are therefore not included in the following discussion.

People could have obtained their pottery directly from local workshops (e.g. Satricum and Forum Appii, Section 5.4.1). Retail of pottery outside these workshops likely occurred in the different towns and villages at tabernae or in market spaces. Although not archaeologically attested with certainty, the place names of Tres Tabernae and Forum Appii indicate the existence of shops and a marketplace at these villages along the via Appia. Larger settlements, such as the colonies of Norba and Setia, had fora.

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422 Holleran 2012, chapter 5.
423 Cic. Att., 1.13.1; 2.10; 2.12.2; 2.13.1 references to Tres Tabernae as a place from which Cicero has send letters.
424 The word forum originally indicated a market place. Towards the Late Republican – Imperial period, the forum was increasingly also used for legal and political purposes (Holleran 2012, 159). Since Forum Appii was probably founded at the end of the 4th century, the occurrence of the word forum is likely to refer to an actual marketplace. This also makes sense because of the location: at crossroads and the begin point of a canal towards Terracina.

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Figure 6.2. Infrastructure in the Pontine region.
The marine harbour towns of Terracina and Antium were well connected on the interregional scale and parts of the goods arriving here must have been sold locally too. Smaller harbours are attested at Forum Appii and Astura.

Considering the rural nature of the Pontine region, the regular nundinae markets were probably an important part of the regional economic network. Nundinae are associated with the countryside and short distance trade networks.\textsuperscript{426} These markets provided a regular occasion for the exchange of goods. At these markets, farmers could sell their produce and buy other products. There are no calendars known that include the Pontine region, however, the area is situated right in between different documented nundinae networks.\textsuperscript{427}

Lastly, low frequency markets and fairs were probably organised at the urban centres with larger sanctuaries, such as the sanctuary of Jupiter Anxur at Terracina or the high acropolis of Circeii, or at rural sanctuaries such as Tratturo Caniò. Although fairs in relation to religious festivals were common in Republican Italy, fairs in general are not well attested archaeologically due to their low frequency.\textsuperscript{428}

The rural population of the Pontine region thus had different options available to buy pottery. The investments in infrastructure and the establishments of new road-side settlements and colonies meant that people never had to travel far to reach a possible marketplace.

\subsection*{6.4 Pontine connections: the cooking wares}

In the following section, three elements are discussed to better understand the circulation of cooking wares within the Pontine region: 1) fabrics that match with the Pontine dataset, including both geological and ceramic samples from reference collections and publications focused on Central Italy, 2) the general distribution pattern of the fabric groups within the Pontine region and 3) the relationship between the number of attested fabrics and specific pottery types. Together, these elements provide information about the possible provenance of specific forms and fabrics and the extent of circulation networks, local variation in the distribution networks and possible variation in distribution mechanisms between different types of cooking pots.

\subsubsection*{6.4.1 Provenance of the Pontine cooking ware fabrics}

The reconstruction of the provenance of the cooking ware fabrics (Table 6.1 and Appendix IV) is complicated by the lack of comparable datasets and the occurrence of similar clays and inclusions across Central Tyrrhenian Italy. The fabric groups were compared by the author with reference collections of Central Italian clay samples and cooking wares from the Roman Material Culture Laboratory at the University of California at Berkeley\textsuperscript{429} and the Laboratory for Material Culture Studies at the University of Groningen.\textsuperscript{430} Geological information was used for comparing the samples on a broader level.\textsuperscript{431} Furthermore, a range of publications from different sites containing cooking ware and coarse ware fabric photos and descriptions has been consulted.\textsuperscript{432}

It is important to note that most (previously described) fabrics come from consumption sites and are thus not connected to a specific production location – limiting the reconstruction of provenance even further. However, matches and similarities between the dataset of the Pontine region and other fabrics provides information on the extent of circulation of specific fabric groups. Even though exact provenance might thus be unknown, the occurrence of the same fabrics elsewhere does provide information about the extent of trade networks, while similarities in fabrics point to shared production technology in the broader area.

Table 6.1 provides an overview of the fabric groups (discussed in Chapter 4 and Appendix IV) and their possible matches and similarities with fabrics attested elsewhere. Four fabrics (QF.4; QFL.B; VL.D; VL.H) bear
similarities to fabric groups attested to Satricum. In the case of VL.D, production in the Alban Hills is likely because of the occurrence of leucitite with skeletal leucite. Both VL.H and a fifth fabric (V.3) were likely made from local clays located in or around Satricum based on similarities with either fabrics attested to production at Satricum or local clay samples. Considering that the production of pottery ceased at Satricum during the 4th century, the occurrence of very similar fabrics, such as QF.4 and QFL.B, from a later date indicates that local production probably continued at an unknown location.

Two fabric groups (V.4 and QF.2) match with fabric groups that were previously recognised in the Pontine plain. These also occurred more widely in the hinterland of Rome and the Tiber valley. Fabric V.4 is assumed to derive from that area, while the production location of fabric QF.2 was either in the Tiber valley or northern Campania. Two additional groups (V.2 and QF.1) are similar but do not directly match with other attested groups in the Pontine plain. All these fabrics are similar to groups attested

433 Satricum fabrics with pink lava and skeletal leucite are SAT I ad*Kq.vps(1-4)j; SAT I AD*Kq.vps(1-4)j; SAT I AD*Kq.vps(1-4)j. ab, occ. (large) FeMn / occ. (small) augite. Attema et al. 2003, 371–376. For a photo of a thin-section with pink lava, see http://www.lcm.rug.nl/lcm/teksten/teksten_uk/fabric_sat_1ADK_vps_ab.htm (accessed on 24-10-2023). This pink lava is leucitite with skeletal leucite in it, which is an uncommon type of volcanic rock that occurs frequently in the Alban Hills, https://www.alexstrekeisen.it/english/province/albanhills.php (accessed 25-10-2023).


435 This is also suggested for both Satricum and Norba by Borgers et al. 2023.

in the wider Central Italian region at Vasanello, Ostia, Ciampino, the Tiber valley and Rome without an exact known production location. It should be noted that a fabric similar to QF.1 is also attested at the Late Republican pottery workshop at Forum Appii and a local origin for this fabric can thus not be ruled out. Twelve fabrics could not be matched with any of the other examined datasets, clay samples or literature. The predominant use of iron-rich volcanic clays and volcanic temper for most of these fabric does however point to an origin within areas with volcanic clays – i.e. Central Italy (Tuscan and Roman Magmatic Provinces), the Bay of Naples and Sicily.

The majority of fabric groups, but not the majority of the samples, thus has an unknown provenance and nothing is known about their circulation beyond the Pontine region. This however does not suggest that all were produced locally. The lack of matches with other regional datasets (Satricum, Pontine plain, Norba) as well as the lack of matches with clay samples tentatively suggests a non-local provenance for especially the jars.

The limited provenance data indicates that cooking wares in the Pontine region circulated both in local/regional and supra-regional networks. Products likely produced around Satricum (QF.4; QFL.B; V.3; VL.H) mostly circulated on the local level of the coastal area, but small amounts also reached the Pontine plain. On the other hand, the large QF.1 group might have been produced within the Pontine plain and circulated widely within the whole region.

437 The Central Italian Volcanic Province (Peña 1992) overlaps with what is usually called the Roman Magmatic Province in geological publications such as Peccerilo 2005.

438 One of these fabric groups also occurs in the Norba material from Borgers et al. 2023.
Supra-regional products primarily point towards a connection with Rome (QF.2), the Alban Hills (VL.D) and the Tiber valley (V.4); possibly QF.2). A possible connection towards the south comes forward if we assume that fabric V.2 indeed derived from Campania. Non-local cooking wares outnumber the locally produced cooking wares, especially when we accept that the fabrics with unknown provenance and no parallels are not necessarily local. The majority of cooking wares that was distributed and traded within the Pontine region was thus imported from a considerable distance.

6.4.2 Distribution patterns

Cooking wares of local, regional and supra-regional provenances thus circulated within the Pontine region. The distribution of pots with specific fabrics will now be discussed, to gain insight into possible spatial and temporal variations. The distribution of the fabric groups within each local area is not useful to discuss because of the targeted sampling method towards specific sites. Consequently, the pattern of distribution will be unreliable since it is not representative for the occurrence of these fabrics throughout the region. The variation of fabrics between sites is therefore seen as a consequence of consumption practice rather than distribution mechanisms. Instead, the focus is on circulation on the broader local level, by comparing the fabrics that circulated within the plain to those attested in the coastal area (Figure 6.3).

The three largest fabric groups (V.4; QF.1; QF.2; Ntot=55) circulated both in the plain and the coastal area, but their frequency varied between those two areas. Four fabric groups are only attested in the Pontine plain (V.1; V.2; QF.3; QF.6; Ntot=16) and three only in the coastal area (V.3; QF.4; QF.5; Ntot=18). Lastly, three loners (QF.C; VL.G; VL.H) are attested in the plain only and eight loners are solely found in the coastal area (QF.A; QF.B; VL.A–VL.F).

The largest groups (V.4; QF.1; QF.2; comprising 55% of the samples) are associated with fabrics that also circulated, but were not necessarily produced, around Rome and the Tiber valley. These fabrics occur both in the coastal area and the plain. The distribution network was thus dominated by a restricted number of fabrics that also circulated on a broader supra-regional scale. Other groups were limited to just one of the local areas. What stands out is that the fabrics with similarities to the Satricum production were prominent at the least during the Mid-Republican period in the coastal area. Here we can thus see that also pots produced by a local producer were widely distributed alongside imported groups in a limited area at least during a specific period. This local network was overlapping with supra-regional networks, indicating the co-existence of several contemporary networks.

There is also a change in the number of fabrics that circulated in the Mid-Republican period (N=18) vs. the Late Republican period (N=6) (Chapters 4 and 5). All ten fabric groups occurred already in the Mid-Republican period, but only four (QF.1; QF.2; V.2; V.4) continued into the Late Republican period. Furthermore, out of the ten datable loners, eight date to the Mid-Republican period and only two to the Late Republican period. The two Late Republican loners (VL.A; VL.B) are also less common types of pots within the Pontine region, namely the Olcese olla type 3B and the Olcese casseroles type 1.

Interpretation of this pattern is complicated because the relationship between production organisation and distribution mechanisms is not well understood. However, the more frequent occurrence of loners in the Mid-Republican period and in the coastal area is noteworthy. The occurrence of loners can either be explained through a connection with production organisation – with many products from small rural producers circulating within localised networks as suggested by Hodder – or a connection to cabotage trade mechanisms. While the former could be connected to the earlier posited argument of fragmentation towards centralisation in production, the option of cabotage trade is tied to a difference in number of circulating fabrics and to be sought in local reasons. This also applies to the more frequent occurrence of loners in general in the coastal area. Considering the location of the coastal area within the Roman trade network, products reaching the coastal inland through the different harbours could be a reason behind the number of loners. This would have led to the occurrence of more fabrics within the coastal dataset, related to a distribution mechanism that was more dispersed (as would have been the case with cabotage trade) with smaller quantities reaching the area in comparison to a more

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439 There are two more fabric groups (QF.5; V.3) that might have continued into the Late Republican period, however, that is based on types with date ranges that include also parts of the Mid-Republican period.
centralised system from the early Mid-Republican period in the plain. For the plain, the via Appia could have functioned as a more direct and frequent trade connection both towards the north (Rome, Tiber valley) and the south (the harbour of Terracina).

### 6.4.3 Typological variation

Besides variation and overlap in the networks of the plain and coastal area, the possibility of different types of distribution mechanisms and networks for different types of cooking pots also needs to be considered. Since different types of cooking pots had different functions, variation in distribution mechanisms (and consumption practices) might have occurred. This cannot be seen separately from possible variation in demand for different types of cooking wares. The fact that jars occur in substantially higher numbers than pans, ovens and lids suggests their more frequent use and thus likely also a higher demand and supply of these vessels.\(^{440}\)

The ratio between the number of samples per type and the number of fabric groups indicates two things (Table 6.2). Firstly, it provides information on the minimum number of active production centres for the same type of cooking pot (Chapter 5). Secondly, fabric variation within one typological group can be used as a tentative indicator for distribution mechanisms. Dominance of a couple of fabric groups could potentially indicate a more centralised distribution mechanism in comparison to many fabric groups, especially if it concerns a common vessel form (i.e. cooking jars).

Two patterns clearly stand out: none of the clibani belong to the same fabric group; and the change in the number of fabrics between the Mid-Republican olla 2 and the Late Republican olla 3A. The clibanus is a type of cooking vessel with a very specific function, i.e. a portable oven (Chapter 2). Clibani only occur in small numbers and not on every site, likely because of their limited use and thus longer lifespan. Demand for clibani was thus much lower than, for example, for jars. Consequently, they were probably also produced in smaller numbers. Furthermore, they are large and bulky vessels that would not have been easy to transport.

The cause of the change in variation of fabrics between the Mid- and Late Republican ollae is more likely to be related to production organisation and trading networks. Cooking jars were essential kitchen equipment during the Republican period. Their daily use would shorten their lifespan, making it necessary to replace them often. Consequently, demand always would have been high and relatively stable. This is reflected in the large number of ollae found on every Republican site in the Pontine region. The change from 12 Olcese olla 2 fabrics to only 5 Olcese olla 3A fabrics is thus significant. Furthermore, a more detailed look reveals that the olla 2 group contains samples of 4 loners and 8 groups, while all samples in the olla 3A group belong to fabric groups and no loners are attested. This suggests that smaller scale producers, which existed in the Mid-Republican period, either ceased to exist or no longer were able to get their products onto the Pontine pottery market. The Late Republican market for ollae became dominated by a limited group of suppliers.

### 6.5 Pontine connections: a closer look at amphorae and black-gloss pottery

Other classes of pottery were also used within the Pontine region during the Republican period. Two of those, black-gloss table ware and amphorae, can provide additional data about trade networks. The origin of amphorae is usually deduced from the morphology (particularly the rim) of the vessel

<table>
<thead>
<tr>
<th>Type</th>
<th>Mid-Republican</th>
<th>Late Republican</th>
</tr>
</thead>
<tbody>
<tr>
<td>Olla 1 (N=2)</td>
<td>2</td>
<td>Olla 3A (N=24)</td>
</tr>
<tr>
<td>Olla 2 (N=37)</td>
<td>12</td>
<td>Olla 3B (N=2)</td>
</tr>
<tr>
<td>Tegame 1 (N=3)</td>
<td>2</td>
<td>Tegame 2 (N=9)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Tegame 3 (N=1)</td>
</tr>
<tr>
<td>Clibanus 1 (N=1)</td>
<td>1</td>
<td>Clibanus 2 (N=5)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Clibanus 3 (N=2)</td>
</tr>
<tr>
<td>Coperchio 1 (N=6)</td>
<td>4</td>
<td>Coperchio 2 (N=2)</td>
</tr>
<tr>
<td>Baking tray (N=3)</td>
<td>1</td>
<td>Coperchio 3 (N=1)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Casserole 1 (N=1)</td>
</tr>
</tbody>
</table>

Table 6.2. Overview of types and fabrics.

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\(^{440}\) See Chapter 7 and 8 for further discussion on the consumption and use of these different cooking vessels.
and, on a more detailed level, on fabric variations. Amphorae were traded because of their contents and not because of the vessel itself. The origin of black-gloss pottery is reconstructed based on stamps on the interior bases of open vessel shapes, especially black-gloss bowls, and variations in the gloss.441

When we look at overall amphora consumption trends in relation to the region of origin of the amphorae based on morphology, the pattern in the Pontine region is quite constant during the entire Republican period (Figure 6.4–6.5). In the Mid-Republican period, amphora derived predominantly from mainland Italy and in smaller numbers from northern Africa or Sicily. From the 1st century onwards, we see the occurrence of amphorae from other provinces as well. This started with the importation of Spanish amphorae and provenance became even more diversified in the Imperial period at the expense of Italian amphorae. When we take a closer look at the relative frequency of specific types and fabrics during the Republican period, small differences come forward.

The same Republican amphora types occur both in the plain and the coastal area: the Punic Van der Werff amphora types 1, 2 and 3; the Spanish amphora types Dressel 2–4 Catalan and Haltern 70 and the Italian amphora types Graeco-Italian, Dressel 1 and Dressel 2–4 Italian (Table 6.3). Early onwards, we see the availability of Punic amphorae in both areas. These Punic amphorae are frequently attested in Republican contexts in the region. They were imported from western Sicily (Solento and Lilybaeum) and to a lesser extent northern Africa.444 It is most likely that they reached to Pontine region through the harbours of Terracina and possibly Astura and Antium. Towards the end of the Republican period, Spanish amphorae were introduced. Although absolute numbers of these types vary between the two study areas, the relative portions of the total of amphorae for each area is quite similar with the exception of the Dressel 2–4 Catalan, which was more prominent in the coastal area.

Besides the occurrence of amphorae with a supra-regional origin, the majority of amphorae came from within (Central) Italy. Especially the Dressel 1 amphora appears to be more prominent within the Pontine plain in comparison to the coast, with the exception of the local Dressel 1 type which was produced at the coastal villa of Le Grottacce. This pattern could indicate two things: either the use of different types of vessels for the transportation of wine was more prevalent in the coastal area in comparison to the plain or the import of non-local wine was more frequent in the plain in comparison to the coastal area. Republican amphora production is assumed for both the coastal area and the plain. The production of Graeco-Italian and Dressel 1A amphora took place at Le Grottacce, while Dressel 1 amphora production in the plain is attested to Forum Appii and Ad Medias.445 Fabric analysis of the Dressel 1 fragments from the studied sites points towards the circulation of amphora produced in the plain throughout the region. Additionally, small amounts of amphorae with origins elsewhere along the Tyrrhenian coast.446

To conclude: sites in both the coastal area and the plain imported amphorae from the late 4th–early 3rd centuries onwards. A steady increase occurred over time, with a peak in the 1st century BC–1st century AD (Figure 6.4–6.5). The amphora data shows the early existence of supra-regional connections towards the south, as well as long-distance connections with Sicily and northern Africa. Simultaneously small numbers of locally produced amphorae circulated between the coast and the plain. From the mid-1st century onwards, we see the introduction of amphorae from other provinces. Initially, imports were limited to Spanish amphorae in the Late Republican period, changing to a more diversified imported assemblage in the Imperial period. Minor variations in the frequency of different amphora types occur between the coast and the plain during the Republican period, but only became more pronounced in the Imperial period.447

The trade in black-gloss pottery can be reconstructed based on variation in gloss quality, petrography and, albeit to a lesser extent, stamp types. The exact relationship between different types of black-gloss stamps and specific production centres is not well

441 Chemical analysis can provide additional information on the provenance of black-gloss, but this type of data is not available for the Pontine region.
442 Based on MC dataset.
443 Based on NE04, NE08, NE12, AS04 and AS12 datasets.
444 Jaia 2019.
446 Verhagen et al. in prep.
447 See Tol 2017 for discussion on amphorae consumption trends in the Pontine region during the Republican and Imperial period.
Figure 6.4. Amphorae consumption trend Pontine plain.

Figure 6.5. Amphorae consumption trend coastal area.

<table>
<thead>
<tr>
<th>Type</th>
<th>Area</th>
<th>Date</th>
<th>Nplain</th>
<th>%plain</th>
<th>Ncoast</th>
<th>%coast</th>
<th>N PRP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Haltern 7D</td>
<td>Spain</td>
<td>75 BC–AD 100</td>
<td>29</td>
<td>8,08</td>
<td>18</td>
<td>8,82</td>
<td>47</td>
</tr>
<tr>
<td>Dressel 2–4 Catalan</td>
<td>Spain</td>
<td>75 BC–AD 175</td>
<td>12</td>
<td>3,34</td>
<td>32</td>
<td>15,69</td>
<td>44</td>
</tr>
<tr>
<td>Van der Werff 1</td>
<td>Sicily/Africa</td>
<td>200–100 BC</td>
<td>7</td>
<td>1,95</td>
<td>1</td>
<td>0,49</td>
<td>8</td>
</tr>
<tr>
<td>Van der Werff 2</td>
<td>Sicily/Africa</td>
<td>150–0 BC</td>
<td>4</td>
<td>1,11</td>
<td>4</td>
<td>1,96</td>
<td>8</td>
</tr>
<tr>
<td>Van der Werff 3</td>
<td>Sicily/Africa</td>
<td>225–175 BC</td>
<td>30</td>
<td>8,36</td>
<td>15</td>
<td>7,35</td>
<td>45</td>
</tr>
<tr>
<td>Dressel 1</td>
<td>Italy</td>
<td>150–0 BC</td>
<td>14</td>
<td>3,9</td>
<td>2</td>
<td>0,98</td>
<td>16</td>
</tr>
<tr>
<td>Dressel 1/Dressel 2–4</td>
<td>Italy</td>
<td>150 BC–AD 175</td>
<td>2</td>
<td>0,56</td>
<td>1</td>
<td>0,49</td>
<td>3</td>
</tr>
<tr>
<td>Dressel 1A</td>
<td>Italy</td>
<td>150–50 BC</td>
<td>107</td>
<td>29,81</td>
<td>18</td>
<td>8,82</td>
<td>125</td>
</tr>
<tr>
<td>Dressel 1A/B</td>
<td>Italy</td>
<td>150–0 BC</td>
<td>14</td>
<td>3,9</td>
<td>3</td>
<td>1,47</td>
<td>17</td>
</tr>
<tr>
<td>Dressel 1A/Local type</td>
<td>Italy</td>
<td>150–0 BC</td>
<td>1</td>
<td>0,28</td>
<td>6</td>
<td>2,94</td>
<td>7</td>
</tr>
<tr>
<td>Dressel 1B</td>
<td>Italy</td>
<td>125–0 BC</td>
<td>23</td>
<td>6,41</td>
<td>12</td>
<td>5,88</td>
<td>35</td>
</tr>
<tr>
<td>Dressel 1C</td>
<td>Italy</td>
<td>125–75 BC</td>
<td>2</td>
<td>0,56</td>
<td>5</td>
<td>2,45</td>
<td>7</td>
</tr>
<tr>
<td>Dressel 2–4 Italian</td>
<td>Italy</td>
<td>75 BC–AD 100</td>
<td>43</td>
<td>11,98</td>
<td>39</td>
<td>19,12</td>
<td>82</td>
</tr>
<tr>
<td>Graeco-Italic</td>
<td>Italy</td>
<td>350–150 BC</td>
<td>58</td>
<td>16,16</td>
<td>18</td>
<td>8,82</td>
<td>76</td>
</tr>
<tr>
<td>Graeco-Italic/Dressel 1A</td>
<td>Italy</td>
<td>350–0 BC</td>
<td>13</td>
<td>3,62</td>
<td>30</td>
<td>14,71</td>
<td>43</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td>359</td>
<td>204</td>
<td>563</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 6.3. Overview of the occurrence of Republican amphorae types in respectively the plain and coastal area based on diagnostic amphora fragments (rims, handles and spikes). Excluded dataset: HL.
understood. It is generally assumed that the same stamp types were used across different workshops, with different types mostly indicating a different chronology rather than provenance. Moreover, the use of stamps on black-gloss vessels mostly occurred during the 3rd century and completely disappeared during the 2nd century, with a short revival around 60 BC. Consequently, the stamps can only tentatively inform us about the Mid-Republican trade in black-gloss. For the Late Republican trade in black-gloss, additional petrographic (chemical) data would be needed, which is currently not available for the Pontine region.

The stamped black-gloss fragments from the Pontine region are subdivided into three categories: rosette stamps, palmette stamps and other stamps (usually figurative). Based on stylistic variation and arrangement, these stamps are associated with different production groups or locations and periods. In total there are 148 stamped fragments in the PRP database, of which 131 could be assigned to 61 different stamp types; 75 received a rosette, 31 a palmette and 25 are stamped with other types of stamps. 38 stamps only occur once in the dataset. The other stamps occur between 2 to 13 times.

Most of the stamps found in the Pontine region are associated with the so-called ateliers des petites estampilles group. The workshops producing these vessels were located across Etruria and Latium, but mostly associated with the direct hinterland of Rome and the Tiber valley. The occurrence of multiple fragments with the same stamp type on one consumption site is not common. It only occurred on site 15106, which is assumed to have been involved in the production of black-gloss. Most sites yielded a variety of stamp types. The reason for this variation in stamp types can be sought in the replacement of vessels over time, leading to assemblages with the same vessel form but with different stamps, or it could indicate the unavailability of sets of the same black-gloss bowls on the market or indirect trading mechanisms. This is also reflected in the data, with the majority of stamp types (38 out of 61; 62%) only occurring once.

When we look on the broader regional level, there are three stamp types that stand out for their frequent occurrence. Two types occurred thirteen times each and one stamp, associated with the production at Lucius Feroniae (Etruria), occurred five times in total. One of the most common stamp types occurred four times at site 15106. This specific stamp might thus be related to the local production there. Its distribution across the region might indicate the marketing of the black-gloss from this workshop throughout the area. The more frequent occurrence of a restricted number of stamp types is probably a reflection of a trading mechanism whereby a merchant bought a larger quantity directly from a workshop and sold it through the regional markets in the Pontine area.

Thirteen black-gloss vessels dated to the Mid-Republican period from the plain where studied in thin-section previously. Four different fabric groups were recognised. Half of those samples are likely to have had a regional origin based on their association with a regional black-gloss vessel type, but they did not match with clays or fabrics from the plain nor the coastal area. Regional production is however attested at for example at Ardea and Lavinium. One sample might have come from Campania, mostly based on the grey colour of the fabric and the fourth fabric group has an unknown provenance.

When we zoom out to look at general black-gloss consumption patterns in the region, it becomes apparent that consumption of black-gloss peaked in both the plain and the coastal area during the Mid-Republican period and decreased during the 2nd century. This coincides with a decline in site numbers in the plain, which could partially explain the general consumption decrease. However, it also coincides with an assumed change in the production organisation and (re)location of black-gloss workshops. Most of the ateliers des petites estampilles workshops disappeared at the end of the 3rd century, while new and larger scale black-gloss producers were established in southern Italy and Etruria during the late 3rd and 2nd century. These new black-gloss producers presumably made black-gloss specifically for export. Their products can be found all over the Mediterranean, but also reached regions

446 See Stanco 2009 for black-gloss stamps.
447 Di Giuseppe 2012, 84.
450 Stanco 2009.
451 Tol et al. in prep.
452 This group is known in Italian as the gruppo dei piccoli stam-pigili.
453 Morel 1981 was the first to refer to these workshops as one group.
455 Tol 2017, 375–376.
closer to home such as the Pontine region. During the Late Republican period, we thus see a black-gloss production landscape with small and large-scale workshops co-existing. Their products can sometimes be differentiated based on the form repertoire, the appearance of the slip layer, the fabrics and in rare cases stamps. However, in general, they are not as frequently attested in the Pontine region as the Mid-Republican black-gloss vessels.

The black-gloss vessels dated to the Mid-Republican period are associated with small-scale workshops. Those were located mostly around Rome, but are also attested regionally in for example Ardea and Lavinium and at site 15106. The stamps and the limited fabric data suggests that the black-gloss from the consumption sites in this study came from these workshops. However, without chemical data, it remains complicated to pinpoint their provenance. Nevertheless, the fabric data suggests a supra-regional provenance for at least some of the black-gloss, as does the occurrence of for example specific stamps associated with the production at Lucius Feroniae, combined with regional networks. Moreover, the variation in black-gloss stamps shows a continuous trade in black-gloss throughout this period through indirect trading mechanisms. During the Late Republican period, the consumption and thus also trade in black-gloss decreased. This could be related to consumption practices, but might potentially also indicate the lack of the establishment of new trade connections in relation to the assumed change in production organisation.

6.6 Patterns of pottery trade in the Pontine region

The Pontine region was well connected by road and sea with the other parts of Italy and beyond already before the Roman period. Investments in infrastructure and the establishment of new settlements would have only further increased this (inter)regional connectedness. The small roadside settlements, colonial towns and sanctuaries functioned as possible marketplaces. The connectedness of the region but also the existence of different networks for different types of pottery for different local areas is reflected in the cooking ware, amphorae and black-gloss data. In general, the variation in cooking ware fabric types, amphorae types and fabrics and black-gloss stamps reveals that people had a variety of options available to choose from when acquiring pottery. Local but also personal preferences might be reflected further in consumption patterns.

The general pattern of pottery trade in cooking ware, black-gloss and amphora in the Pontine region shows elements of continuity when it comes to local production and circulation. At the same time, vessels with a supra-regional provenance also reached the area. On a local level, the road and waterways made a difference in determining which parts of the plain vs. the coastal area were most easily reached and from where, but the lack of scientific provenance data makes it impossible to reconstruct trade networks in detail. Nevertheless, the high number of loners in the coastal area could be connected to its location within wider infrastructural networks, with the area being closer to several harbour towns that could have functioned as intermediate stops for ships travelling along the Tyrrhenian coast. The dominance of a limited number of fabric groups in the Pontine plain on the other hand might be more indicative of direct and frequent connections both to the north and south through the via Appia. However, products with similar provenances reached both local areas.

A diachronic view of the pottery trade patterns in the Pontine region reveals a possible connection between the existence of larger scale production centres producing a variety of ware groups and the supra-regional distribution of cooking wares, as suggested by Hodder. The Mid-Republican cooking ware dataset has a fragmented origin, with probably a majority of the vessels of a supra-regional origin. This may not be surprising considering the lack of (known) local cooking ware producers dated to this period. Considering the matches with cooking ware fabrics from Rome and its hinterland and the location of Mid-Republican black-gloss producers, we could hypothesise the combined transport of black-gloss and cooking pots produced at the same location or in the same general area. In this scenario, cooking wares produced at larger scale production locations located north of the Pontine region profited from existing networks for the distribution of black-gloss. The new direct connection provided by the

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456 Di Giuseppe 2012.
458 See also Menchelli 2004 for the suggestion of a supra-regional origin for cooking wares when local productions are lacking.
459 Examples of production sites that produced both black-gloss and coarse wares are for example Chiusi – Marcianella and Lavinium. See Section 5.4 for discussion on these sites.
via Appia and the overseas connection between Ostia and Antium would have facilitated this further. The Late Republican production landscape altered, tentatively reflected in the distribution patterns of black-gloss ware, with smaller quantities reaching sites in the Pontine region and a rise in imported amphorae from elsewhere. Simultaneously, the limited cooking ware data suggests a possible change towards imports from the south as well. Possibly, cooking ware distribution became intertwined with amphora distribution in the Late Republican period rather than black-gloss distribution. This assumption is further strengthened by the known connection between interregional cooking ware distribution in connection to the export of wine in amphorae from the 2nd century onwards.\footnote{Menchelli 2004, 67.} Cooking wares could be piggy-backing with other imports (amphorae) as ballast in the ship haul. The pottery data thus indicates how integrated the economy was, even for 'low value' objects such as ceramics. Furthermore, it shows how top-down processes such as the decision to invest in infrastructure and territorial expansion influence bottom-up consumption practices, because ultimately people made the decision to buy all these pots.
Chapter 7
From cooking pots to meals:
a material-based approach to Roman foodways

Foodways are about behaviour around food. It includes the production, preparation and consumption of food. What and how we eat is related to identity through a combination of individual taste and cultural traditions around food. Therefore, food and the material culture related to its preparation and consumption connect to processes of identity formation. Foodways are a social construct that is expressed and maintained through behaviour around the preparation and serving of food within different socio-economic groups in different types of contexts. This makes it possible to better understand behaviour around consumption of food as a domestic practice through the study of material culture, with objects as remnants of specific types of behaviour.

Food was actively used in the creation of a Roman identity. From the 3rd and 2nd centuries onwards, food became a way to express a ‘national identity’ or romanitas in textual sources. This process was related to territorial expansion and can be seen as a reaction to encountering other cultures leading to the (re)defining of Roman cultural traits.461 Ancient authors created food-identifiers for different cultures with normative foodways as stand-ins for cultural traits.462 Alongside didactic texts, food therefore also frequently featured in plays and poems. Important elements were a ‘Roman’ attitude against ‘Hellenistic’ luxury, the source of food (specifically origin), specific preparation methods, good quality, taste and the right dinner setting and guests. This highlights the importance of banquets where it was important to serve correctly prepared food, showing proper manners and inviting the appropriate people in Roman society.463

Textual sources thus indicate that food was used during the Roman period in the creation, formation and communication of identity. However, these source materials mostly provide information about elite consumption practices.464 To understand non-elite and domestic consumption we need to look at archaeological source materials. Food consumption patterns are heavily influenced by what is locally available and thus foremost what could be produced in a given area. Botanical and zoological remains can provide the most direct information. They reflect food production, processing, consumption and discard patterns of food and food waste.465 The use of botanical and zoological data is complicated by their fragmentary publication and in the case of botanical data a strong focus on pre-Roman and Medieval contexts within Italian archaeology.466 Despite these

461 Purcell 2003; Banducci 2017.
462 Purcell 2003.
463 For discussion on these topics focused on the Republic, see Banducci 2013, 23–71; Purcell 2003.
464 To some extent, the exceptions to this perspective are provided by the agricultural manuals of Cato and Varro. Although they discuss the running of villa complexes, these manuals are more practical in nature and focussed on a rural rather than urban setting.
465 Millett 2015, 98. See MacKinnon 2004, 211, 244 for problematication of link faunal remains – diet.
466 See Banducci 2013, 297–298 and Heinrich 2017, 143–144, 162–165 for problems with botanical data. In general, botanical data for Roman Italy is scarce, especially for the Republican period. Nevertheless, there is some information from non-elite household consumption contexts in the Bay of Naples (Rowan 2017) and rural sites in Tuscany (Bowes et al. 2017; Bowes et
problems with the use of textual and environmental data, they do provide general information about Roman Republican foodways.

As mentioned, our direct sources on what foodstuffs were eaten are both biased towards elite and urban contexts, while high quality botanical and zoological reports are rather limited in number. We therefore need to turn to the objects used in the production, preparation and consumption of food to gain a better understanding of non-elite practices. Especially ceramics provide potentially a less biased view on Roman foodways because they were used for the preparation and serving of food by almost everyone in society. To transform raw food into meals, a wide range of technologies and connected equipment was used in the Roman Republican period. Interpretations of foodways based on ceramics are based on the assumption that there is a relationship between vessel form and the preparation of specific types of food (see Section 7.3 for more extensive discussion on form and function), whereby assemblages can be viewed as codified foodway practices.

The use of ceramics for understanding changes in identities has a longstanding tradition in archaeology. In connection to specifically foodways, ceramics and Roman colonial contexts, the studies of Bats, Principal, Cool, Luley and Banducci all indicate that how food was prepared and served was both connected to local identities and slow changes in material culture over time in relation to wider processes of integration. These studies show how local traditions and new types of food could co-exist and become integrated over centuries, leading to the adoption and adaptation of new types of objects associated with new types of dishes.

The types of food that were eaten were connected to the agricultural potential of a region (local food production), economic factors (what you can afford, importing food, availability), the introduction of new types of food through wider processes of integration and (local) cultural habits connected to different groups of people. These factors all influenced the individual choices made by households in their foodways. Moreover, the preparation and consumption of food in domestic contexts, such as those considered in this study, are less conscious reflections of everyday behaviour. That does however not imply that preparing and consuming food in a household context was solely done for the purpose of nutrition. What it does mean is that the preparation and serving of food in a domestic context is often more of a practical nature and less about the communication of identity. Nonetheless, it is exactly because of this more practical nature of domestic foodways that underlying patterns of food preference can be considered expressions of identity in a more unconscious manner.

Domestic meals in a family setting are thus both grounded in household preferences and cultural traditions around food. These traditions were a combination of shared (‘Roman’) elements, local variations and interpretations and household preferences, leading to regional patterns of consumption based on historical trajectories (Chapter 2), network connections (Chapter 5) and local agricultural production (see below).

To be able to understand regional, local and household preferences in foodways we first need to consider what a Roman Republican meal looked like. This is reconstructed based on textual and archaeological sources (Section 7.1). This is followed by a discussion of the agricultural potential of the Pontine region (Section 7.2), leading up to the reconstruction of potential types of food available within the area (Section 7.3). The remaining part of the chapter focuses on the ceramic assemblages as the main source of information about foodways on the regional and local level (coast and plain), focusing on transport and storage of foodstuff as well as preparation and serving. The emphasis is on regional and local patterns of consumption, to set a general baseline, against which to compare individual sites (Chapter 8). This baseline makes it possible to trace differences and similarities in foodways between the coastal area and the Pontine plain. Lastly, a diachronic perspective on regional and local consumption practices will be taken to shed light on change and continuity in foodways over time.

7.1 Food ‘assemblages’: the Republican meal

What a meal looked like during the Republican period was contextual. What was eaten varied

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467 Bats 1988; Principal 2006; Cool 2006; Luley 2014; Banducci 2021.

468 See Dietler 2006 for the desirability of ‘alien’ or exotic foods in a colonial context.

469 Jones & Taylor 2004, chapter 5 ‘The national diet’ for theoretical assumptions around the existence and creation of national/regional foodways.
depending on different factors, such as time of the day (breakfast or dinner), socio-economic status, location and time period. There is very limited information on mealtime within a domestic, family setting. Moreover, our knowledge is strongly biased towards elite households and the consumption of formal dinners, often with invited guests. These specific types of meals had the important social function of displaying proper Roman norms around dining and status display. What a meal looked like in a less ‘public’, domestic setting in the countryside is largely unknown. On the other hand, we have some information about the different types of meals that people consumed on a daily basis. The cena was the main meal of the day, usually taking place in the evening. Other meals included the ientaculum (breakfast), prandium (around lunch time) and merenda (afternoon snack). Notably, besides the cena, the other meals generally consisted of food that could easily be eaten without the need to sit down. Specifically the prandium was associated with working people and therefore needed to be nutritious.

Textual sources, specifically Cato the Elder’s De agricultura (160 BC) and Varro’s De re rustica (37 BC), as well as a plethora of archaeological sources, provide information on what types of foodstuffs were available and most commonly consumed in Roman times. In addition, recipes allude to specific favoured food combinations. These together add to a picture of food availability and preferences during the Roman Republican period in Italy and make it possible to piece together a general picture of the Republican meal.

The combination of cereals, olive oil and wine is known as the Mediterranean triad. In Roman Italy, cereals and legumes were staples but often accompanied by a wide range of vegetables, fruits, wild plants, herbs and spices to add flavour and texture. Animal products were also consumed, although they probably formed a smaller portion of the non-elite rural diet.

Starch and pulses formed the main nutritional component of the Roman diet. Roman recipes with cereals as their main component can be divided into two broad categories: (semi)liquids including stews, soups and porridges and solids such as cakes and bread. Porridge is often portrayed by the ancient authors as the staple food of the Republican farmer-soldier, while bread and cakes were initially associated with (religious) festivities until the introduction of commercial bakeries in the 2nd century. Although bread and porridge are both cereal based, they require completely different processing techniques and equipment.

Porridge is mostly associated with the ‘traditional’ Roman diet and therefore played a more moralistic role in many texts as a reference to traditional Roman virtues of austerity and simplicity. This might also explain why recipes for bread and cakes are numerous in Cato the Elder’s De agricultura (written for an elite audience) while only one recipe for porridge is provided (and that recipe is for Punic porridge, a more luxurious version). Nevertheless, porridge was also commonly associated with the (poor) rural population.

Bread could be baked at home in portable bread ovens. Bread requires milled cereals, adding significantly to the processing time. Unleavened breads, such as flat breads, are known from the written sources and associated with pre-Roman and Early Republican rituals. These are the traditional Roman breads. Leavened bread gained popularity and over time became a standard part of the Roman diet. When exactly this change from flat to leavened bread took place is a matter of debate, but is likely to have occurred after the conquest of the East in the 2nd century because this was the start of a larger scale import of wheat, the rise of commercial bakeries and the move of Macedonian bakers to Italy, bringing with them the knowledge of leavened bread baking.

Furthermore, the mid-2nd century saw a general increase in Hellenistic influences on Roman culture.

Olive oil was one of the main sources of fat and calories in the Roman diet, especially for the non-

470 Donahue 2018, 95.
472 For an overview of food in Latin literature, see Leigh 2015.
473 Wilkins & Hill 2006, 110.
474 Varro Ling. 5.105; Plin. HN 18.19.83–84.
475 Plin. HN 18.28.107–108 on the introduction of bakeries in Rome after the conquest of the east.
476 For the association of emmer and barley with traditional Roman porridge (puls) see i.e. Val.Max. 2.5.5, Plin. HN 18.19.83–84, Varro Ling. 5.105. For a similar argument on the political-historical argument of the role of porridge in the Roman diet, see Purcell 2003.
477 Wilkins & Hill 2006, 122–123.
479 Furthermore, the mid-2nd century saw a general increase in Hellenistic influences on Roman culture.
elite population that consumed low quantities of meat. Besides cereals and olive oil, legumes formed an important part of the Roman diet. Legumes were consumed as fresh vegetables or more commonly in their dried version as pulses.482 The most common legumes in Roman Italy included lentils, chickpea, and a variety of beans and vetchlings. Legumes are rich in proteins and relatively easy to store when dried. Some types also have medicinal value, improve soil quality or were used as animal fodder.482

Vegetables and fruit often feature in textual sources. Both Cato and Varro discuss a wide range, including turnips, asparagus, radishes, cabbages, apples, quinces, figs, pears, plums and sorbs.483 Figs were specifically associated with the rural poor.484 They could be consumed fresh, dried or cured. They were widely available and thus cheap.485 The variety of consumed fruits appears to have been much broader than the variety of vegetables, possibly because many types of fruit could be foraged. Wild plants, including nuts, were likely consumed frequently, especially by the rural population.486 Nuts could also have been cultivated.487 Because the elite did not supplement its diet with wild plants (with a couple of exceptions such as wild asparagus), the variety of wild plants eaten is not well understood.

Herbs and spices were used to add flavor. Herbs are frequently attested in archaeobotanical assemblages and occur in recipes, including dill, celery, coriander, parsley, fennel and bay leaves.488 Roman elite cuisine and medicinal recipes made frequent use of spices.489 However, because of the value of spices it is questionable if these would have been used in a rural, non-elite, domestic setting.

Meat was relatively costly to produce and would not have been consumed on a daily basis by the majority of the population.490 Cattle, sheep, goats and pigs were the main groups of domesticates consumed. What type of meat was preferred varied across time and space. The general trend for (west) Central Italy is the following: cattle and caprine contribution to meat consumption declined over time, mirrored by an increase in pig. Pork makes up around 50 percent of all bones from Imperial sites in Central Italy, which is the highest in Italy as a whole. However, the breeding of pigs was less pronounced at rural and small urban sites, where the consumption of beef was more prominent instead. This preference for beef contrasts with textual evidence, which does not mention beef frequently. Furthermore, zoological assemblages from rural and small urban sites show that the slaughter age of animals was often older in rural areas than in cities. This indicates that these animals were primarily used for other purposes, for example as working animals, or for secondary products such as wool or milk. There is also some evidence that primary cuts of slaughtered animals might have been exported to urban markets.491

King argued that the preference for pork in west Central Italy this was a regional pattern made possible by the specific socio-economic circumstances in Rome and its suburbium. He hypothesised that this development started already in the 3rd–2nd centuries in Latium but accelerated over time when the increased flow of produce towards Rome (as part of the annona) lowered prices for foodstuffs, which left families with more financial means to buy meat in general but specifically pork. Furthermore, the fertile arable land around Rome was in economic terms more profitable to use for agriculture or high profit pig rearing than as pasture for sheep, goats and cattle.492

For the rural population, meat (together with eggs and cheese) was a supplement to meals. Because these animal products were also produced in the countryside, rural populations had easier and more varied access to animal products than their urban counterparts.493 Animals (with the exception of pigs) also provided secondary products based on their milk, especially cheese,494 eggs and honey.495
The availability of fresh fish is both locational and seasonal. Coastal and lake-side zones had easier access to fish. Fresh fish needs to be consumed within two days, which heavily restricted its distribution. Nevertheless, transport, especially towards urban markets further inland, was not uncommon if there was a demand.\textsuperscript{497} From the late 1\textsuperscript{st} century fish was also kept for breeding at \textit{villae maritimae}.\textsuperscript{498} Fresh fish was a status marker for which both the type of fish and its catching location mattered.\textsuperscript{499} Besides fresh fish, salted and fermented fish products were an important and widely distributed Roman foodstuff. \textit{Garum} was commonly used as an alternative to salt and produced on a large scale, while other preserved fish products such as \textit{liquamen}, \textit{salsamenta} and \textit{allec} were often added for flavour.\textsuperscript{500}

Although wine is not food, it was a pivotal part of the Roman diet. There was a huge variety in quality of wines, ranging from exclusive vintages to cheap table wines. Expensive wines often feature in classical texts, but it is unclear how affordable, available and common it was to drink wine for the rural non-elite population.\textsuperscript{501}

The available data on what was eaten during the Republican period mostly provides information on separate foodstuffs. However, a meal is usually a combination of different ingredients. Textual sources, and especially recipes, provide additional information on Roman flavour combinations. Cato’s agricultural manual is the only Republican source containing recipes. These range from simple salads with cabbage\textsuperscript{502} to a variety of cereal-based dishes such as cake,\textsuperscript{503} bread,\textsuperscript{504} porridge\textsuperscript{505} and snacks.\textsuperscript{506} Food that did not require any heating, such as salads and spreads, were probably a common feature. Flavour was usually added through herbs, vinegar and olive oil. Cakes, breads and porridges were often sweetened with honey and enriched with cheese and eggs.\textsuperscript{507} What a farmer would eat is mostly unknown from literary sources, but the poem \textit{Moretum} gives a (coloured) glance of a rural meal. It describes how a man mills flour to make a bread for breakfast. The bread is baked using a clibanus. In a mortarium he makes a cheese spread, with smoked cheese, garlic and herbs to go with the bread. His garden is filled with a wide variety of herbs and vegetables and meat comes from the market.\textsuperscript{508} On a daily basis, rural foodways might have been quite simple but varied, since a wide variety of foodstuffs was likely available to rural populations, either deriving from their own gardens and land plots, the surrounding landscape or acquired through the market place.

7.2 Food production in the Pontine region

The Pontine region is one of the most fertile areas in Italy. However, there are local differences in soil fertility within the region related to a variation in soil types. The foothills of the Lepine Mountains are characterised by limestone outcrops. Larger Roman sites built on platforms and connected to terraces were established here in the Mid-Republican period.\textsuperscript{509} Both botanical, archaeological and textual sources point towards the cultivation of olives and vines in this area. Pollen samples from the Lepine foothills show the presence of chestnut, walnut, olives, vines and cereals combined with a variety of arboreal pollen natural to the landscape. Archaeological finds include millstones and torculars (press beds) for the processing of cereals and olives. Textual sources specifically mention the area around Sezze as being renowned for its high-quality wines.\textsuperscript{510}

The heavy but fertile alluvial and colluvial clays in the plain are very suitable for cash crops but require proper drainage.\textsuperscript{511} The potential of retrieving palynological data for the Roman Pontine plain is limited due to Roman levels being situated above the modern ground water level, them being ploughed up to the surface or being buried deeply underneath clay

\textsuperscript{497} Wilkins \& Hill 2006, 154–159.
\textsuperscript{498} Higginbotham 1997.
\textsuperscript{499} Fish often features in didactic poems (e.g. Ennius – \textit{The Art of Dining}) and satirical plays (e.g. the work by Gaius Lucilius), with many reference to specific species and locations. See Banducci 2017 for discussion.
\textsuperscript{500} Banducci 2017, 125–126; Marzano 2013.
\textsuperscript{501} Broekaert 2018.
\textsuperscript{502} Cato \textit{Agr.} 156. Cabbage is especially mentioned for its medicinal value.
\textsuperscript{503} Cato \textit{Agr.} 75, 76, 84.
\textsuperscript{504} Cato \textit{Agr.} 74.
\textsuperscript{505} Cato \textit{Agr.} 85–86.
\textsuperscript{506} Cato \textit{Agr.} 77, 79, 80, 82 for sweet snacks, 117–119 for table olives.
\textsuperscript{507} Although this enrichment might be more common for elite cuisine (which is the audience for Cato).
\textsuperscript{508} App.Verg. \textit{Moretum}.
\textsuperscript{509} De Haas, Attema \& Tol 2012.
\textsuperscript{510} De Haas, Attema \& Tol 2012, 205 with reference to Van Joolen 2003 (land-use) and Attema 1993 (pollen data). See fig. 5; 204 for distribution of millstones and torculars in the area. For pollen data, see van Joolen 2003, chapter 6. Textual sources on wines from Setia e.g. Plin. \textit{HN} 14.8.61; Strabo 5.3.7.
\textsuperscript{511} Indications for peat oxidations and integration in different coring transects, see Feiken 2014 for Campo Inferiore test trench and Joolen 2003 for Laghi di Vescovo. For drainage ditches excavated in profile around Migliara 44.5, see Feiken 2014, 269.
Chapter 7. From cooking pots to meals: a material-based approach to foodways

The preservation of both macrobotanical remains and pollen is therefore generally poor.\textsuperscript{512} Available archaeobotanical data comes from the sanctuary of Tratturo Caniò and recent cores taken at Roman drainage ditches around modern-day Pontinia. The macrobotanical data points towards the cultivation of cereals, specifically emmer wheat and hulled barley, and lentils. Plants such as fat hen and sun spurge tentatively point towards weeds associated with arable land. Preliminary analysis of the pollen data from one of the ditches confirms this image, with taxa associated with a moist open landscape.\textsuperscript{513}

The coastal area around Antium is less well investigated when it comes to ecological data and agricultural potential. Geologically it is characterised by the presence of marine terraces. The area lies at a higher elevation than the plain and therefore does not have the same drainage problems. Pollen data from Campoverde (near Satricum) indicates an open landscape with a variety of grasses. Agricultural indicators consist of cereal types and vegetation associated with agricultural fields.\textsuperscript{514} Feiken assumes a relationship between geology and landscape use in this area, with cereal production on the sandy-alluvial soils and marine terraces alternating with an open pastoral landscape.\textsuperscript{515} The importance of cereal cultivation in the area of Antium before the Roman conquest is furthermore tentatively attested by Livy.\textsuperscript{516}

There are also indications for pastoralism and the exploitation of fish resources in the Pontine region. From the Late Republican period onwards, \textit{villae maritimae} were built along the coast.\textsuperscript{517} Although this type of villa is associated with the elite, their primary economic function was fish husbandry.\textsuperscript{518} Fish could also be caught from the sea, lakes and streams in the area. Disc-shaped weights\textsuperscript{519} used to pull fish nets down are regularly encountered as isolated finds in the plain.\textsuperscript{520} Fishhooks are less common but present in the Liboni collection, at Astura and site 14062 in the Pontine plain.

In the inland parts of the region there are indications for pastoralism. Transhumance took place between the plains and mountains and was regulated from at least the Late Republican period onwards.\textsuperscript{521} Veenman suggests that the Pontine plain was also suitable for pig husbandry, while the higher grounds west of modern-day Latina and the marine terraces could have been used as winter pasture for sheep and goats. Only small-scale summer pasture grounds were available in the Alban Hills and Lepine Mountains. Based on these observations, Veenman concludes that the Pontine region did not have the right conditions for long-distance transhumance before the 4\textsuperscript{th} century and that after this period it was just one of the pastoral strategies in the area.\textsuperscript{522} Interestingly, the use of winter pasture would alternate smoothly with the use of the land for agriculture. Possibly, local farmers leased their land to herdsmen in winter.\textsuperscript{523} The field surveys have brought to light a variety of indicators for the processing of pastoral products. Large trapezoid loom weights are frequently encountered on sites in especially the plain, suggesting the processing of wool on the household scale. Spindle whorls are less common and mostly associated with burials or pre-Roman contexts.\textsuperscript{524}

The various local areas within the wider Pontine region all offer different possibilities for agriculture and animal husbandry. The botanical data combined with information on soil types fits well with Varro’s description in \textit{De re rustica} of the relation between agriculture and different types of land: forest in the mountains, vines in the foothills and cereal cultivation in the plains.\textsuperscript{525} Based on the limited all complexes with fishponds.

\textsuperscript{512} Feiken 2014, 279; table 9.5.

\textsuperscript{513} Feiken et al. 2012, 120 and appendix 3. There is no pollen data for the Republican period from Tratturo Caniò. De Haas & Schepers 2022; Tol et al. 2021 for data from Roman drainage ditches. The ditches are confirmed to be Roman based on C\textsuperscript{14} dates, see Tol et al. 2021, 121.

\textsuperscript{514} Veenman 2002, 116–126.

\textsuperscript{515} Feiken 2014, 260; fig. 9.1b.

\textsuperscript{516} Livy 2.9–14 and 4.25. See De Haas 2011, 173 and footnote 587 for discussion. Livy refers to the Pontine region as source for grain to supply Rome in 508 and 432. However, in Livy’s account it is not exactly clear if he refers the coastal area, the Pontine plain, the Alban or Lepine foothills.

\textsuperscript{517} At Nettuno (piscinae A–C), Astura (La Saracca, La Banca and Torre Astura) and at Circeo (Piscina di Lucello and Torre del Fico), Higginbotham 1997, 131–158.

\textsuperscript{518} See for example Varro Rust. for instruction on how to run such a villa complex. See Higginbotham 1997 for an overview of

\textsuperscript{519} These disc-shaped, circular weights could also have functioned as loom weights.

\textsuperscript{520} Tol et al. forthcoming, chapter on loomweights. Tol personal communication.

\textsuperscript{521} Frayn 1979, 34–37.

\textsuperscript{522} Veenman 2002, 113–126.

\textsuperscript{523} This practice, specifically the renting out of pasture, is also discussed by Cato, Agr. 9.149

\textsuperscript{524} The majority of spindle whorls was found during the Caracu-pa/Valvisciolo survey (1988), Attema 1993.

\textsuperscript{525} Varro Rust. 1.6.5–6.
data, it is reasonable to assume that most types of food that potentially could have been part of the Republican meal were available within the region. The occurrence of amphorae in the region also points at the import of foodstuff into the region (alongside the likely export of foodstuff). Although local patterns of food production cannot be reconstructed in much detail due to the limited environmental data available, a closer look at the ceramic assemblages from the coastal area and the plain could potentially reveal local food traditions related to variations in local histories and cultural identities.

7.3 Kitchen objects: fabric + form follows function?

The *batterie de cuisine* included all non-fixed equipment used for the preparation of food (Section 2.1). During the Republican period, most of the objects used for this purpose were ceramic. Non-ceramic tools and objects were also in use but are virtually unknown due to poor preservation (organic materials such as baskets), their higher value and thus less common use (metal, glass) or the potential reuse of these objects (melting of metal objects and glass). However, that ceramic equipment is most abundant in the archaeological record is not only because of its higher survival rate but also reflects reality: most objects in the Republican period related to food were made out of clay, with the exception of tools such as spoons, tongs and stirring sticks.

The set of ceramics related to foodways can be divided in broad functional categories, which also provides the basis for their initial classification used in the PRP database. The functional categories taken into account in relation to foodways are: transport, storage, kitchen ware and table ware. These categories contain specific ware groups, forms and types of pottery based on the assumption that fabric and/or form follows function. There is thus an implicit assumption in the PRP classification system of a relationship between vessel form and vessel use.

Whether form equals function is a subject of debate within ceramic studies. There is the risk of ancient vessels being trapped in our modern-day kitchen vocabulary based on analogies. Furthermore, objects can be used for more than one purpose. However, for multiple reasons I would argue that during the Republican period there was a correlation between fabric, form and function.

Firstly, fabric needs to be taken into account alongside form. Vessels of different functions require different performance characteristics and technical properties that are not only related to form but also to technical choices made in the selection of raw materials during production. This is why production and consumption are behaviourally connected. The intended use of an object determined the choices made by the potter during the production process. This assumes that a potter made cooking ware with the intended function already in mind, and that this intended function was reflected in both the choice of raw materials, the form and the finishing of the object. The physical properties of Republican cooking pots, from their fabrics to their form and selective application of slip, indicate that production happened with intended function in mind. Moreover, it implies that Roman potters were aware of consumption demands. The reconstruction of trade networks can be seen as an indication of how consumer demands were communicated to producers, with very specific non-local groups of ceramics being imported. This consumption-driven production assumption cannot be seen separate from fabric, since the widespread occurrence of very specific ceramic groups is probably connected to the

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526 Shamir 2014.
527 Isings 1957 for glass; Cool 2006, 47–50 for metal.
529 Cool 2006, 50 for tools.
530 Rice 1987, 210–211 for general discussion on this practice. These three elements are also the foundation for Olcese’s typological classification.
531 Rice 1987, 299 for overview of potential risks on assuming a relationship between form, function, composition of ceramic assemblages and variability.
535 Rice 1987, 209.
536 This is also argued by Winther-Jacobsen 2010, 51–56 based on fabric, form, surface treatment, production technology and stylistic elements on Roman pottery from Cyprus.
537 For example the import of chiaro sabbioso basins (Merlo 2005) or during the Imperial period the import of African cook-
functional quality of these products.\textsuperscript{538}

Secondly, while some forms easily could have been used for other purposes, like ollae being used as transport and storage jars,\textsuperscript{539} many other forms have a far more restricted use based mostly on their form. Especially the clibanus and to a lesser extent the tegami are more ‘specialised’ objects in the sense that they are more likely to have been used for a specific purpose. In the case of the clibanus this would have been a function as a portable oven, while the tegame was used as a wide open pan for the preparation of drier foods, which could either have been baked or fried.

Lastly, not only production but also use can be viewed as standardised when specific forms have one specific function. It often leads to optimalisation of fabric, form and function, leading to highly specialised objects. Complex societies often have more varied and complex ceramic assemblages, with more specific relations between form and function. There are indications that this is also the case for Roman ceramic assemblages, which become more varied over time (see below). Furthermore, literary sources suggest sometimes very specific uses for specific ceramic objects.\textsuperscript{540}

At the same time, standardisation of physical characteristics also increased recognisability of the objects. This is not only the case for specific forms but can also be extended to very general characteristics. For example, table wares slipped with black-gloss probably communicated their intended function as serving vessels directly to its users, even if the application of slip had no strict functional purpose.

Thus, assuming a relationship between fabric, form and function and thereby also following the PRP classification, the ceramic dataset from the Pontine region is discussed according to functional categories. This discussion will firstly start with transport and storage vessels, followed by kitchen ware, used for the cold and hot preparation of food, and lastly serving vessels. Each functional category contains general forms that are related to specific types. The focus here is on the forms because they relate most to function, while specific types are mostly connected to chronological variations in rim morphology. The use of these functional and form categories makes it possible to relate the ceramic assemblages from the sites in the Pontine region to behaviour around foodways.

\subsection*{7.4 Pontine pottery assemblages: the material remains of the Republican meal}

The reconstruction of the food-related pottery assemblages\textsuperscript{541} is based on different survey datasets from the PRP database. The aim for each analysed assemblage is to always make use of the largest reliable dataset (see Appendix I on comparability and reliability of the different survey datasets). Consequently, there is some variation in the data quantity used. Therefore, the choice is made to compare areas and time periods to each other based on the proportions of the whole assemblage rather than the count data. For transparency, the data tables do however also contain the count data.

The baselines are created on three levels:

1. The regional Republican-period baseline, representing the Pontine region as a whole. This baseline is based on the general classification into functional groups and the form assemblages from sites dated to the Republican period.

2. The local baselines for the plain and the coastal area, based on the selected Republican sites in respectively the coastal area (N=15) and the plain (N=21). Baselines are created on the level of the broad functional categories (Figure 7.1)\textsuperscript{542} and the more detailed level of forms (Figure 7.2, 7.3 and 7.5).\textsuperscript{543} To aid comparison, the local baselines are combined with the regional baseline in the graphs.

3. Chronological baselines on the regional level for the cooking and serving vessels, subdivided between Roman, Republican, Late Republican and Mid-Republican (Figure 7.6 and 7.8). These baselines are based on varied datasets (indicated in the graphs), varying from the form-based classification of all Roman data (dating based on ware groups and types)

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\textsuperscript{538} i.e. Menchelli 2004 on cooking wares from Lazio and Campania.

\textsuperscript{539} Menchelli 2022.

\textsuperscript{540} Banducci 2021, 74; footnote 10 refers to Columella, Cato and Pliny.

\textsuperscript{541} The focus is only on the pottery groups, thus excluding the Indet and Architecture groups.

\textsuperscript{542} Based on the FINDCLASSES table of the selected sites in the PRP database, only pottery is included in the discussion, thus excluding the functional categories ‘Indet’ and ‘Architecture.’ The raw assemblage data and R script for re-classification of the coastal data can be found on: https://github.com/FVerhagen/Thesis-Roman-Daily-Life

\textsuperscript{543} Based on the Republican sites selected in step 1 from the methodology and their respective ARTEFACTS tables in the PRP database.
Daily life in the Roman Republican countryside

Figure 7.1. Regional and local baselines of pottery consumption based on functional categories. Dataset includes the 36 Republican sites selected for functional assemblage analysis.

<table>
<thead>
<tr>
<th>Function</th>
<th>Region</th>
<th>Region %</th>
<th>Coast</th>
<th>Coast %</th>
<th>Plain</th>
<th>Plain %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transport</td>
<td>6035</td>
<td>31,02</td>
<td>3260</td>
<td>41,35</td>
<td>2775</td>
<td>23,98</td>
</tr>
<tr>
<td>Storage</td>
<td>1198</td>
<td>6,16</td>
<td>734</td>
<td>9,31</td>
<td>464</td>
<td>4,01</td>
</tr>
<tr>
<td>Kitchen ware</td>
<td>8757</td>
<td>45,01</td>
<td>1898</td>
<td>24,08</td>
<td>6859</td>
<td>59,26</td>
</tr>
<tr>
<td>Table ware</td>
<td>3401</td>
<td>17,48</td>
<td>1973</td>
<td>25,03</td>
<td>1428</td>
<td>12,34</td>
</tr>
<tr>
<td>Special function</td>
<td>66</td>
<td>0,34</td>
<td>18</td>
<td>0,23</td>
<td>48</td>
<td>0,41</td>
</tr>
<tr>
<td>TOTAL</td>
<td>19457</td>
<td>7883</td>
<td>11574</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Figure 7.2. Regional and local baselines of pottery consumption based on forms. Dataset includes the 37 Republican sites selected for form assemblage analysis.

<table>
<thead>
<tr>
<th>Form</th>
<th>Region</th>
<th>Region %</th>
<th>Coast</th>
<th>Coast %</th>
<th>Plain</th>
<th>Plain %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amphora</td>
<td>457</td>
<td>16,37</td>
<td>255</td>
<td>34,69</td>
<td>202</td>
<td>9,83</td>
</tr>
<tr>
<td>Storage</td>
<td>21</td>
<td>0,75</td>
<td>15</td>
<td>2,04</td>
<td>6</td>
<td>0,29</td>
</tr>
<tr>
<td>Basin/mortar</td>
<td>52</td>
<td>1,86</td>
<td>27</td>
<td>3,67</td>
<td>25</td>
<td>1,22</td>
</tr>
<tr>
<td>Jar</td>
<td>1036</td>
<td>37,13</td>
<td>152</td>
<td>20,68</td>
<td>884</td>
<td>43,02</td>
</tr>
<tr>
<td>Pan</td>
<td>65</td>
<td>2,33</td>
<td>23</td>
<td>3,13</td>
<td>42</td>
<td>2,04</td>
</tr>
<tr>
<td>Baking cover</td>
<td>35</td>
<td>1,25</td>
<td>16</td>
<td>2,18</td>
<td>19</td>
<td>0,92</td>
</tr>
<tr>
<td>Lid</td>
<td>603</td>
<td>21,61</td>
<td>95</td>
<td>12,93</td>
<td>508</td>
<td>24,72</td>
</tr>
<tr>
<td>Plate/dish</td>
<td>55</td>
<td>1,97</td>
<td>13</td>
<td>1,77</td>
<td>42</td>
<td>2,04</td>
</tr>
<tr>
<td>Bowl</td>
<td>322</td>
<td>11,54</td>
<td>97</td>
<td>13,2</td>
<td>225</td>
<td>10,95</td>
</tr>
<tr>
<td>Cup</td>
<td>31</td>
<td>1,11</td>
<td>14</td>
<td>1,9</td>
<td>17</td>
<td>0,83</td>
</tr>
<tr>
<td>Jug</td>
<td>56</td>
<td>2</td>
<td>23</td>
<td>3,13</td>
<td>33</td>
<td>1,61</td>
</tr>
<tr>
<td>Jar non-cooking</td>
<td>57</td>
<td>2,04</td>
<td>5</td>
<td>0,68</td>
<td>52</td>
<td>2,53</td>
</tr>
<tr>
<td>TOTAL</td>
<td>2790</td>
<td>735</td>
<td>2055</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Chapter 7. From cooking pots to meals: a material-based approach to foodways

The goal is to trace possible local variations between the coastal area and the plain in the consumption of ceramics associated with foodways. Additionally, these baselines will set the scene for comparison of the assemblages from the 16 sites sampled for thin-sectioning (Chapter 8) and are used to evaluate how far these assemblages deviate from the average consumption practice on the regional and local scale. Besides the comparison of regional and local consumption patterns, a second goal is to detect change and continuity over time by using the chronological baselines (Figure 7.6 and 7.8).

7.5 Transport and food storage in the Pontine region

It is unlikely that all food consumed in the Pontine region was produced locally, although the farmsteads that are the focal point of this study probably were self-sufficient to a high degree. Food was packaged and distributed in transport vessels, such as amphorae, jars and smaller vessels, as well as baskets, skins, casks and barrels. Despite their size, amphorae were cheap transport containers. Once they reached their final destination, the packaged products were likely poured out into dolia or casks for storage or smaller containers for sale in smaller quantities and for shorter-term storage before consumption.

Amphora production is attested at several location in the Pontine region (Chapter 5). The villa maritima of Le Grottacce (site 11215) produced amphorae during the Late Republican period. The distribution of these amphorae shows a close tie to farms in the Astura valley, where the wine might have originated. In the plain, amphora production took place at Forum Appii and Ad Medias during the Late Republican period.

Storage vessels were also needed to store agricultural products for the winter or to let products such as wine age. Dolia are commonly found on Roman sites in the Pontine region, as are lead repairs used to fix cracked dolia. Because of the often large size and considerable weight of dolia, making them impractical vessels to transport, dolia production (presumably) took place on a local scale close to where they were needed. In the Pontine region, two dolia production sites are known, one in the plain (site 12317) and one in the coastal area (site 11232).

Besides dolia and reused amphorae, smaller jars including the olla could also be used for storage. The problem of vessels being produced for a specific purpose but frequently also being used for storage complicates the recognition of storage capacity at individual sites. The ceramic assemblage classification only counts dolia as storage, but it should be kept in mind that probably at least part of the amphorae and larger jars were also used to store goods.

The widespread use of amphorae and the importance of storage comes forward from the ceramic assemblages in the Pontine region. Every Republican site interpreted as a farmstead yielded amphorae and often also dolia, albeit in varying quantities. On average within the region based on the functional categories (thus including non-diagnostic fragments), 31% of the assemblages consists of transport vessel and 6% of storage vessels. In the Pontine plain 24% of the pottery assemblages consist of transport vessels and 4% of storage vessels. Transport and storage vessels make up an even larger portion of the assemblage in the coastal area, with respectively 41% and 9% (Figure 7.1). Furthermore, the small group of non-cooking jars (classified as table ware) that comes forward from the form-based data (plain N=52; coast N=5) suggests that also smaller vessels were used for storage, especially in the plain.

7.6 Food processing

Some products would have been ready to eat immediately, such as most types of fruits and many vegetables, while others required processing. This especially applies to fish, meat, most cereals and

544 Menchelli 2022.
545 Peña 2007, 49 states that amphorae were cheaper than skins but possibly close in price to casks.
547 Tol 2012, 373.
548 Borgers et al. 2018.
legumes, olives and grapes. Processing could have taken place at the consumption location but is likely to have occurred more frequently at the place of production. Consequently, most products would have been transported in a somewhat processed state – such as butchered cuts of meat, olive oil, wine and cereals.

The vessels used in the preparation of food comprise a varied group of different forms and functions. They are classified as kitchen ware in the PRP dataset. Kitchen wares – which includes the cooking wares but also some other vessels (see discussion below) are often the largest functional category within the pottery assemblages in the region. The regional average is 45%. On the local level kitchen wares are far more dominant in the plain, on average representing 59% of the pottery assemblage, than in the coastal area where kitchen wares on average only constitute 24% of the pottery assemblage (Figure 7.1). We will now have a closer look at the group of kitchen ware, the different vessels within this group and their occurrence on the local scale.

### 7.6.1 Cold food preparation

The preparation of cold dishes required bowls and basins of different sizes for mixing and grinding. These vessels were also often used in the preparation of hot food, for example for the kneading of dough. I will therefore refer to this group in general as preparation vessels.\(^\text{554}\)

Mortaria and basins are not very common in the coastal dataset (Figure 7.3). The vast majority of sites in the coastal area did not yield any mortaria or basin fragments. 27 examples occur (9%), of which 21 are from the same site (15106). The high number of fragments belonging to these forms on site 15106, which was surveyed at a higher coverage than most other sites in the coastal area, might indicate that mortaria and basins are not easy to identify. This could be because the fabrics and the thickness of these two forms are similar to tiles. 25 mortaria and/or basin fragments are present in the Pontine plain dataset (2%). Here the data indicates that they occurred on most sites, but in low quantities.

### 7.6.2 Hot food preparation

Kitchen structures and objects were related to each other in a functional way. To heat food, three basic structural things were required: a place for the fire, something to hold the cooking pot in or above the fire and the cooking pot itself. The fireplace was either fixed or portable. The holding devices for cooking pots were sometimes separate objects, such as braziers, or the pots could have been legged. In

\(^{554}\) This follows the terminology used by Olcese (2003), who refers to this group as ceramica da preparazione.
Chapter 7. From cooking pots to meals: a material-based approach to foodways

There is a general lack of documented kitchens dated before the 2nd century. However, numerous kitchens have been excavated in Pompeii, Herculaneum and the villas in their rural hinterlands from the Late Republican period. Portable cooking stands and ovens were a common feature in pre-Roman Italy. These objects appear to have been used well into the Republican period, although they are not very common in ceramic assemblages. Possibly a shift occurred in the location and structures used for kitchens, from portable stands and ovens to open hearths and masonry built, fixed stoves and hearths indoors. Consequently, portable kitchens are archaeologically less visible than built-in structural remains except when using field survey data, when it is ceramics that are most visible while fixed kitchen structures cannot be recognised on the surface. As will be shown below, for the Pontine region there are only indications for the use of portable kitchens.

Fixed kitchens had permanent structures to contain the fire. These include stoves, ovens and hearths and they occurred in a range of sizes and models. It is likely that these more permanent cooking installations were predominantly a Late Republican development. Masonry-built stoves are also known from sites dated before the 2nd century but the construction date of stoves is often difficult to determine and it is therefore plausible that they are later additions. The exception is the Auditorium villa (Rome), were a hearth was located near the well in the southern courtyard of the building during the Republican period. Building a fixed cooking place in a house also meant that a specific room was designated for cooking. The Roman word for kitchen (culina) refers to such a room within the house but does not occur frequently in the written sources. References to a fireplace (caminus), oven (furnus) and hearth (focus) occur more frequently but not solely in reference to kitchen activities.

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557 There could be several explanations for this: long life span of these objects and thus low consumption numbers or these objects are not correctly identified in the archaeological record. The latter might especially be a problem for Scheffer cooking stand type III, see Scheffer 1981, 52–54; Banducci 2015, 158.
558 Banducci 2013, 9–10, suggests that this might also be reflected in the textual sources although the pre-2nd century textual references to less fixed kitchens are connected to folk etymologies (Ovid – Fasti and Servius referring to Cato). See also Foss 1994, 69–70.
559 Banducci 2013, 10–11 in relation to the kitchen structures.
560 Terrenato 2001, 7–11. During the 6th – 5th centuries, the hearth and a fixed oven were located indoors.
561 Ault 2015, 209.
I suggest that portable kitchens consist of two main groups with a functional difference: cooking stands (fornello), with an open bottom and supports to place cooking pots above the fire, and portable ovens (clibanus or testum), used for baking and placed directly in the fire. Cooking stands appear to have been in use until the 2nd century in Central Italy. Specifically the Scheffer cooking stand type II is ideal for the support of Archaic and Republican ollae. Despite being well-suited to support ollae, and this type of vessel occurring in large quantities, cooking stands are rarely attested for the Republican period in the Pontine region. Braziers (bracieri) form a third separate group that was not exclusively used for cooking but also as a portable hearth. Braziers are different from stands because they contained the fire, whereas stands were placed over the fire. Braziers are well-known from Classical Greece, but less common in (Roman) Italy in comparison to stands. Other objects used to place pots above a fire were tripods and racks. Tripods are detached braces surrounding the pot to support it above the fire. Racks had a similar function but a different shape. Both occurred in metal or ceramic. No braziers, tripods or racks have been documented during surveys in the Pontine region.

Portable ovens occur in the textual sources and in modern-day typologies with two interchangeable names: clibanus and testum. Whereas the former usually refers solely to a specific object, the latter is a more general term that also refers to a cooking method, to bake something sub testu. The term clibanus is used here, to conform with Olcese’s typology (Figure 7.4). The clibanus and associated baking trays are attested both in the coastal area and the plain, but in low numbers (plain 1%, N=19; coastal area 5%, N=16). They occur on about half of the Republican-period sites in both areas.

A variety of ceramic forms is connected to different types of dishes that required heating. Broadly speaking there were three main groups in the Republican period: jars with an opening smaller than the body (ollae), pans with a wide mouth and straight low walls (tegami and pentole) and lids (coperchi). The clibanus can be viewed as a fourth group but is here considered as part of the portable kitchen (discussed above). The general form of the different groups is of importance. It limits what could potentially be cooked in them or made them more suitable for the preparation of specific types of dishes based on their physical characteristics. For example, forms with a body that is wider than the mouth result in the evaporation of fewer fluids upon heating and are therefore more suitable for the preparation of stews and porridge than shallow pans with a wide opening. On the other hand, shallow open forms are easier to use when food needs to be turned regularly than high-collared jars with a narrow opening.

The olla was the standard Republican cooking jar, associated with the preparation of liquid or semi-liquid food such as porridge, soups and stews based on their form and mentions in recipes. Jars are by far the most common cooking ware form in the Pontine region. They are dominating the food preparation group in the Pontine plain (60%, N=554) and are slightly less prominent in the coastal area, constituting about 49% (N=152) of recorded cooking ware forms (Figure 7.3).

Tegami are identified as ‘frying pans’ but larger specimens are also associated with the clibanus as baking trays. Most of the Late Republican tegami were slipped. Tegami occur consistently throughout the region but in lower numbers than ollae. In the coastal area they make up 7% (N=23) of the form assemblage used in food preparation, while in the plain they form only 3% (N=42) (Figure 7.3). Furthermore, they are more often associated with Late Republican than Mid-Republican sites.

The use of portable ovens is not restricted to the countryside (contra Frayn 1978). Olcese 2003, 40, dates the introduction of the clibanus to the 3rd century, while Zifferero (2004) associates the form already with similar types from the 7th century onwards.
Chapter 7. From cooking pots to meals: a material-based approach to foodways

The last group used in the preparation of food are lids. They were used to cover jars and pans and consequently were made in a variety of sizes. Lids are found on all Republican sites in the region. They occur in a similar frequency in the coastal area (30%, N=95) and in the Pontine plain (34%, N=508). Taking into account their association with jars and the dominance of jars in ceramic assemblages from the Pontine plain, I suggest that jars were (at least in the plain) mostly used without a lid.

7.7 Serving food

The group of ceramics used for serving food is varied, both in form and in ware groups; they generally fall under the so-called table wares. Table wares did not only relate to how people served their food but also indirectly to the served food itself. It is not ideal to eat your soup from a plate or a large piece of meat from a small bowl. Food, cooking pots and serving vessels were thus linked together in sets of ceramics. Table ware forms include the broad groups of cups, bowls, plates, dishes, jugs and jars while the specific ware groups were generally (but not always!) depurated; for the Republican period they include ceramica da mensa, chiaro sabbioso and a variety of fine wares dominated by black-gloss.

Plates, dishes and bowls are connected to the serving of food. Plates are large serving platters with no or a very low walled rim. They would be placed on the table, displaying large pieces of non-liquid food from which everyone could take a portion. Dishes are similar to plates but smaller in size. They are connected to individual portions. Bowls occurred in a variety of sizes. Most bowls in the Pontine region are however small in diameter and therefore likely to have been used for individual rather than large communal servings (Figure 7.9). Bowls had higher walls than plates and are associated with liquid foodstuffs such as stews and porridge. Jars not made in a clay paste suitable for repeated heating, occur occasionally and might be used for serving or storage (N=57).

Within the Pontine region, and especially the Pontine plain, black-gloss is the most common table ware. Plates, dishes and bowls occur in both the coastal area and plain (Figure 7.5). Bowls dominate both in the coastal area (64%, N=97) and the plain (61%, N=225). However, the coastal black-gloss bowl consumption might be skewed by site 15106, which is assumed to have been a production place for such bowls. No less than 60 of the coastal bowls come from this site alone. Taking this into account, bowls were more prominent in the form assemblage of the plain than in the coastal area but were still also the most

571 Olcese 2003, 130; tav. XIX. These lids can also be used to cover storage vessels, but based on their cooking ware fabrics their intended primary function is related to cooking.

![Figure 7.5. Local baselines of pottery consumption related to serving based on forms. Dataset includes the 37 Republican sites selected for form assemblage analysis.](image)
Daily life in the Roman Republican countryside

Figure 7.6. Diachronic baselines kitchen ware.

Figure 7.7. Diachronic baselines serving vessels.
commonly used serving vessel – even when excluding site 15106 – in the coastal area. This, in combination with the dominance of jars (especially in the plain) points towards a strong regional preference for liquid foodstuffs. The occurrence of plates and dishes in lower quantities nevertheless indicates that also drier types of food were consumed (11%, N=42 for plain; 9%, N=13 for coast).

The other forms within the group of table ware are cups and jugs, for serving drinks. They occur less frequently than the food related ceramics. This could partly be because other (non-ceramic) objects could have been used for drinking. Drinking vessels are relatively more prominent in the coastal area (cups 9%; N=14; jugs 15%; N=23) than in the plain (cups 5%; N=17; jugs 9%; N=33), tentatively pointing towards drinking rituals being more important in the local traditions of the former area. Another explanation could be the dual use of bowls for both serving food and drinks. Some of the smaller bowls, for example the black-gloss type Morel 2478, could also have functioned as a cup.

7.8 Pontine culinary practices: sets of things

The agricultural potential of the Pontine region is excellent. The different soil types offers opportunities for the growing of a wide variety of crops. Furthermore, its location and open landscape make it likely that the area was also used for transhumance or stationary pastoralism during parts of the year. Nevertheless, crops attested archaeologically are limited to cereals (emmer wheat and hulled barley), olives, vines and lentils. Rural populations in general had easier access to a wider variety of foodstuffs than their urban counterparts, mainly because they produced foodstuffs themselves. Although the majority of land was probably used for the production of an agricultural surplus to be sold at the market, owning (or renting) land also provided the opportunity to have a vegetable and herb garden. Small numbers of animals could supplement the diet further, initially with secondary products such as milk and eggs, but also for meat. Moreover, rural populations could relatively easily have supplemented their staple foods with wild plants. Regional variation in the availability of foodstuffs within the Pontine region is not well-investigated but could be hypothesised based on variations in the regional landscape. The forests of the Lepine Mountains provided a variety of nuts and wild animals to hunt, while the coastal lakes and sea offered the opportunity to catch fish.

Although direct evidence for the production and consumption of foodstuffs based on environmental data is limited, the pottery assemblages are varied and probably mirror diverse preparation and consumption of food during the Republican period. Storage and transport vessels for foodstuffs were a common feature on most farmsteads. This is not surprising considering their involvement in the production of food, which would require the (temporary) storage of food. Imported foodstuffs, of which the amphorae are indications, was common at most sites too, albeit to a limited extent.

The pottery assemblages related to the preparation of food contained almost all general forms that are known from other Central Italian sites. However, objects related to the containment of fire and the placement of pots in or above a fire are either underrepresented in the dataset or were not used in the Pontine region to the extent attested at some other sites. Furthermore, the lack of information about kitchen structures and use-wear traces on the bottoms or walls of cooking pots make it complicated to reconstruct how pots and pans were placed in or above a fire.

The cooking assemblages involved in the preparation of foodstuffs are heavily intertwined with the choice of serving vessels. This is also clearly reflected in the Pontine dataset. Bowls for the serving of liquid foods are dominant. These were likely connected to the food prepared in jars. Furthermore, these were used for serving individual portions of food, whereas plates and dishes are associated with drier types of food that could be shared from one big plate.

The set of forms that was used for the preparation of food is consistent throughout the Republican period. It consisted of jars, pans, portable ovens, lids, basins and mortars. However, a closer look at the proportions of each form indicates diachronic variation in the likely frequency of use of different vessel forms, thereby indirectly suggesting (slow) changes in what types of food were most commonly prepared.

The main element that changed through time is the frequency of the use of jars (Figure 7.6). Jars make up 88% of the cooking ware form repertoire.

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572 See sites discussed by Banducci 2021 in Etruria; Scheffer 1981.
573 Although use-life of individual vessels of course also played a role.
in the Mid-Republican period, compared to 60% for the Late Republican period and only 46% for the Roman period as a whole. Although jars are the most common type of cooking vessel throughout the Roman period, their dominance decreased over time in the Pontine region. The decreased proportional consumption of jars was compensated by a relative more frequent occurrence of lids, from only 6% in the Mid-Republican period to 31% in the Late Republican period and 42% for the whole Roman period.

Lids presumably used together with jars, but their significant increase coincided with a decrease in the use of jars. Moreover, a clear relationship based on diameters of jars (olla) and lids (coperchio) does not become apparent from the data (Figure 7.8). This indicates that jars were mostly used without lids in the Mid-Republican period. The use of lidded jars points towards the long-term boiling of food. Because of the lid, some degree of monitoring is needed to prevent overflow. The increased number of lids in the Late Republican period might thus suggest a behavioural change in how (and possibly also what) was cooked in those jars. Although the size range of the Olcese olla 3A and Olcese coperchio 3 largely overlap, there are no indications based on the fabrics that lids and jars were sold as sets. The large size range of the Olcese coperchio 3 can also point at combined use with pans of these lids instead of jars. Lastly, it could also be that Mid-Republican lids are not recognised within the dataset, skewing the data to be lower than it was.

Baking trays and covers as well as basins and mortars occurred in low quantities throughout the Roman period, but appear to have been more common in Mid-Republican (4%) than in Late Republican assemblages (3%). However, some of the pans could potentially also have been used as baking trays. If we compare the Republican (2%) to the Roman period (1%), we can see that the use of portable ovens decreased over time after peaking in the Mid-Republican period, while the use of basins and mortars was possibly more common in the Imperial period (5%) based on the peak showing up when considering the Roman period as a whole. However, both forms were only used in minor quantities and not on every site.

Besides change and continuity in the cooking ware form repertoire, a closer look at the diameter data can provide information on the volumes of prepared food (Figure 7.8). Two things stand out: a general increase in diameter for all forms over time and the variation in diameters within some groups. The general increase in size for specifically the ollae is also attested in Etruria, while in Lavinium specific size groups were in use. An increase in diameter is related to a generally larger volume of these jars, which points to the preparation of larger portions of food. On average, the Late Republican Olcese olla 3A had a rim diameter that was on 5 centimetres wider than the Mid-Republican Olcese olla 2. A similar pattern of increased rim diameter tentatively also comes forward for the pans. Not surprisingly, the lids follow suit.

Variation in diameter within each type group varied as well. This might be related to variation in the absolute data, leading to potentially skewed pictures for the smaller type groups (Olcese olla 1, all clibani and all tegami). Nevertheless, the difference between the Olcese olla 2 and Olcese olla 3A stands out. The Olcese olla 2 group had rim diameters ranging between 8 and 40 centimetres, while the Olcese olla 3A’s rim diameter range between 10 and 32 centimetres. It thus appears that the variation within the group of jars decreased over time. However, it could also point towards the use of especially the Olcese olla 2 jars for other purposes than cooking, with larger specimens perhaps being used for storage instead.

Based on change and continuity in the form repertoire of the vessels used for food preparation and cooking, I suggest the following:

1) Food in the Mid-Republican period was regularly prepared in jars, but without lids, leaving space for evaporation. Because of the intended function of jars

574 The dominance of jars is also attested elsewhere, for example in Etruria (Cosa – Bats 1988; Musarna, Populonia and Cetamura del Chianti – Banducci 2021) and southern France (Luley 2014; 2014b), where they usually comprise 60–70% of the assemblages.

575 Although the Mid-Republican, loaded kilns in Lavinium and Sora contained both jars and lids in the same sizes. See Section 5.4.1; Table 5.1 for references. In Lavinium, the sizes of the largest group of ollae (diameter 9–12 centimeter) do also not match with the largest size group of lids, which measure 13–16.9 centimeter (Ebanista 2020, 235; fig. 3).


577 The lids could sometimes be misinterpreted as bowls because of similar forms. In the PRP form classification, there is also a small group called lid/bowl.

578 Banducci 2021, 231–245.

579 Ebanista 2020. The largest size group in Lavinium is 9–12 centimeter (71.8% of the vessels fall within this group), 235; fig. 3.
and their performance characteristics, food cooked in them would have been liquid or semi-liquid. The consumption of such food types, specifically porridge, is also associated with the early Roman countryside by the ancient authors. Cato’s recipe for Punic porridge for example specifically calls for the use of an olla. Furthermore, the frequent occurrence of bowls in the same assemblages strengthens the assumption about the liquid content of consumed food. Alongside jars, small numbers of pans, portable ovens and mortars were used as well, indicating that also other types of food were consumed on these sites although perhaps less frequently.

2) The introduction of the clibani is often assumed to be associated with a change in food preference from porridge to bread in the Late Republican period. However, within the Pontine region, clibani already occurred frequently in the Mid-Republican period (N=69; 4.1%) and even became less common in the Late Republican period (N=27; 3.3%). When looking at the Archaic dataset, baking trays were already part of the assemblages. Baking of bread on rural sites in the Pontine region thus pre-dates the assumed change from porridge to bread. Bread is easier to make with wheat, which is one of the few types of cereals that is specifically attested both in textual and botanical sources for the region. Clibani are also ideal for the preparation of flatbreads. The availability of wheat could positively have influenced the use of these ceramic vessels for the preparation of bread. Furthermore, as discussed above, bread was eaten alongside liquid foodstuffs, using it to absorb the liquids as an improvised spoon. Lastly, baking trays can have a similar function to pans (tegami) and could not only be used for baking but also for frying.

3) The size of jars, and potentially also pans, increased over time. On average, Late Republican jars and pans have a diameter that is almost 5 centimeters wider than their Mid-Republican counterparts. Increased sizes of cooking vessels may point towards the preparation of larger portions of food, perhaps related to feeding larger groups of people. This can thus tentatively point towards either the presence of larger households on sites in the region or the increased importance of social gatherings, requiring the occasional preparation of larger amounts of food. However, there appears to be no standardisation in size of the cooking wares.

The consumption pattern for different forms of serving vessels clearly points to the dominance of bowls in general, but especially during the Republican period (Figure 7.7). It should however be noted that the data for the Late Republican period is not reliable because of the lack of datable serving vessels. This is caused by a dramatic drop in the consumption of black-gloss in the region and the lack of chrono-typologies for

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580 Cato Agr. 85. “Ita insipito in aulum novam.”

Regardless of these data issues, it is remarkable that there are more plates/dishes dated to the Late Republican period than to the Mid-Republican period. This tentatively points to a more frequent use of black-gloss plates and dishes, a preference which continued into the Imperial period. If we take a closer look at the diameter data for the bowls, cups and plates/dishes, the sizes are generally complementary to each other (Figure 7.9). Although bowls come in a wide variety of sizes, the vast majority was 13–15 centimetres in diameter, while the plate/dishes are generally more than 15 centimetres and on average 19.4 centimetres.

The set of cooking vessels found in the Pontine region contains the same general forms as for example the sites studied by Banducci in Etruria. Those assemblages, from excavated household contexts, consist of better preserved ceramics. This provided the opportunity to not only analyse diachronic changes based on forms and types, but also to conduct use-wear analysis on the use of kitchen utensils and sooting patterns. At the sites of Musarna, Populonia and Cetamura del Chianti, there is a lot of continuity in the use of the same forms of cooking vessels during the Republican period. However, each site also had its own pattern of change and continuity, where especially Populonia showed more signs of continuity in vessel form and size than the other two sites. In general, variations over time appeared to be mostly visible in changing sooting patterns – as an indicator for placement of the vessel in or above the fire – and changing vessel sizes combined with the occurrence of a wider range of sizes in general. Late Republican introductions were the pentole and tegami in internal red-slip ware in two distinct sizes. While pentole are not very common in the Pontine region, slipped tegami are also mostly dated to the Late Republican period.

In the Late Republican period, plates and dishes with larger diameters than bowls became more common at Musarna. Banducci connects this observation to the introduction of the internal red-slip tegami and the association of this cooking vessels with the preparation of drier types of food. The form pattern detected for Cetamura del Chianti appears to be rather similar to that recorded for the Pontine region, with jars and bowls dominating in the Mid-Republican period and a decreased use of these forms in the Late Republican period; despite a significant reduction in the size of the jars, they remained the most common type of cooking vessel. The general pattern derived from the jars and bowls towards a more varied pottery assemblage including also pans and more plates/dishes is thus not unique for the Pontine region, although in contrast to Cetamura del Chianti there is an increase in size over time.

On the spatial level, the pottery assemblages connected to foodways appear to be quite similar between the coastal area and the plain. The same functional groups, forms and even types appear throughout both regions. There was a general idea about which set of cooking objects to use, with only minor variations between local areas and between households (Chapter 8). The general functional groups occur in similar quantities and the form-based analysis of the assemblages only points to minor variations. Local variation between the coastal area and the plain tentatively comes forward in two aspects:

1) There is a prominence of cooking jars (ollae) in the Pontine plain in comparison to the coastal zone. Although ollae constituted the largest group of cooking ware forms in both regions, they occurred far more frequently in the plain than in the coastal area (61% vs. 47%). I would tentatively suggest that this could be related to a different cultural background of

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582 This problem does not pertain into the Imperial period, when new types of fine wares like terra sigillate and African Red Slip ware provide reliable dates.

583 Banducci 2021, the sites are: Musarna, Populonia and Cetamura del Chianti. The exception is the occurrence of jugs in cooking ware – they are not present in the cooking ware assemblages of the Pontine region. Furthermore, pentole are very rare.

584 Banducci 2021, 231–245.

585 Banducci 2021, 233.

586 Banducci 2021, 242–244.
the population, assuming that the plain was settled in the late 4th century by people who identified as Roman while the coastal area would have had a more mixed population with Volscians, Latins and Romans. However, this argument is complicated to substantiate additionally since we do not know what Volscian or Latin foodways looked like.

2) Related to the use of jars and thus likely the consumption of more liquid types of food, bowls also appear to be more common in the plain than in the coastal zone. On the other hand, table wares connected to drinking made up a larger portion of the table wares in the coastal zone. Moreover, amphorae that were used for the transport of wine were also more common in the coastal area and wine production is attested around Astura. This might tentatively point towards drinking rituals being a more important part of foodways in the coastal area than in the plain.

The next chapter dives deeper into those variations by looking at the assemblages from individual sites and how they compare to each other on the level of functional categories, forms, types and fabrics, to shed light on foodways on the household level.
The regional and local baselines of pottery consumption discussed in the previous chapter make it also possible to detect divergent consumption choice made by households as represented by the pottery assemblages of individual sites. This chapter will discuss and compare the assemblages of the individual sites on four different levels, from large to small: 1) pottery assemblages based on functional categories, 2) form assemblages, 3) type assemblages and 4) fabric assemblages. These levels are related to each other, where each level constitutes a subset of the general assemblage (Table 8.1). The assemblages will be presented in overview graphs (Figures 8.2–8.3) combined with data tables (Tables 8.2–8.6). The sites from the coastal area have a site identification number starting with 11 or 15, the sites from the plain start with 12 or 14 (Figure 8.1). The sixteen sites sampled for thin-sectioning are marked with an asterix in the tables and graphs. Variation and similarities in consumption practices between sites based on location and chronology are used to further investigate elements of spatial and temporal variation and similarities in consumption practices. The assemblages from the sixteen sites selected for sampling are also presented in Appendix V, together with additional data tables related to the statistical analysis.

8.1 Pottery functional assemblages

The average pottery consumption assemblage on the regional level was dominated by kitchen ware (45%), followed by transport vessels (31%), table ware (17%), storage vessels (6%) and vessels with a special function (<1%). Whereas the average pottery assemblage in the plain follows this order (but with a significantly larger amount of kitchen ware, 59%), the coastal pottery assemblages were dominated by transport wares (41%), followed by table ware (25%), kitchen ware (24%), storage vessels (9%) and pottery with a special function (<1%) (Figure 7.1).

To examine the significance of the deviations of site level assemblage from the regional and local baselines the means, standard deviations and z-scores are calculated for each individual site in relation to the regional and local baselines. This method is an adjusted version of the methodology from the ager Tarraconensis survey, which was designed to detect distribution and supply patterns based on the occurrence of fabric groups. The statistical explanation of the method can be found in Appendix I. The overview of the means, standard deviations and z-scores can be found in Appendix V. The z-scores are used to detect divergences from the regional and local baselines, with a number greater than 1 being considered divergent. Positive z-scores indicate larger amounts than expected, while negative z-scores indicate smaller amounts. In general, it should be noted that the standard deviations for each functional category tend to be large, indicating that the data itself is spread out across broad ranges (Appendix V). This potentially leads to misinterpretation of the significance of the

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588 Z-score greater than 1 suggests that the proportion is more than one standard deviation from the mean. Z-scores of specific sites are mentioned in the footnotes when relevant for the discussion, combined with the proportional data. The first z-score relates to the regional baseline, the second z-scores related to the local baseline.
Table 8.1. Overview of the relationship between functional group, form, type and fabric.

<table>
<thead>
<tr>
<th>Functional group</th>
<th>Form</th>
<th>Type (examples)</th>
<th>Fabric</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transport</td>
<td>Amphora</td>
<td>Graeco-Italian; Dressel 1; Van der Werff 1-3</td>
<td>See Borgers et al. in prep. for Graeco-Italian; Verhagen et al. in prep. for Dressel 1</td>
</tr>
<tr>
<td>Storage</td>
<td>Dolium</td>
<td>-</td>
<td>Quartz-feldspar family / Volcanic family</td>
</tr>
<tr>
<td>Kitchen ware</td>
<td>Jar</td>
<td>Olcese olla 1, 2, 3A, 3B</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Pan</td>
<td>Olcese tegame 1, 2, 3</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Lid</td>
<td>Olcese coperchio 1, 2, 3</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Portable oven</td>
<td>Olcese clibanus 1, 2, 3</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Mortar / basin</td>
<td>Olcese bacino 1, 2</td>
<td></td>
</tr>
<tr>
<td>Table ware</td>
<td>Bowl</td>
<td>Morel 2783/84, Morel 2583</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Plate / dish</td>
<td>Morel 2233, Morel 2255</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Cup</td>
<td>Morel 4342</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Jug</td>
<td>Morel form 5121, Olcese olpe 2</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Jar non-cooking</td>
<td>Morel form 3800, Morel 7200, Olcese brocca 1</td>
<td></td>
</tr>
<tr>
<td>Special function</td>
<td>Loom weights</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Fish net weights</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Oil lamps</td>
<td>-</td>
<td></td>
</tr>
</tbody>
</table>

Table 8.1. Overview of the relationship between functional group, form, type and fabric.

proportional data of the assemblages (Figure 8.2 and Table 8.2\(^{589}\)), which can be illustrated by comparing the proportional variation of the site assemblages in relation to the baselines and the z-scores. For example, based on proportions, two coastal sites have considerably smaller amounts of transport vessels than the regional and local baselines while also completely lacking storage vessels: site 15068 (12%) and 15108 (11%). However, when looking at their regional and local z-scores, both sites fall within 1 standard deviation from the mean for both transport and storage vessels.\(^{590}\) On the contrary, site 15108 has no z-scores greater than 1 at all, while 15068 has a z-score greater than 1 only for table wares in comparison to the regional baseline. This firstly points to the wide range of the data, making comparisons solely based on proportional data unreliable for these functional categories with large standard deviations and secondly to the importance of combining different measurements for a more robust analysis. Both proportional data and z-scores will thus be taken into account to detect divergent household assemblages. Despite the difference in the percentages for each functional category in relation to standard deviations as reflected in the z-score, the means of the regional and local baselines do reflect the proportional distribution of the functional categories as described above.

Within the coastal dataset, all sites except 15005 and 15108 have z-scores greater than 1 for at least one functional category in comparison to either the regional or coastal baseline. In the case of six sites, this might be related to the small size of the assemblages, being less than 30 fragments\(^{591}\) (sites 11269 (N=20), 11291 (N=6), 11378 (N=16), 15005 (N=11), 15038 (N=18) and 15152 (N=22)). For the remaining sites in the coastal area, the divergence is within varying categories and thus potentially related to variance in domestic behaviour.

Focusing on those sites with larger assemblages, which groups stand out as divergent from the baselines is mostly related to table ware consumption.

\(^{589}\) The site 11318 is missing in this part of the analysis because it has no classification into functional categories.

\(^{590}\) Site 15068, transport 12%; -0.61/-0.73 and storage 0%; -0.74/-0.59. Site 15108 transport 11%; -0.67/-0.80 and storage 0%; -0.74/-0.59.

\(^{591}\) N=30 is used as the threshold minimum assemblage size to be able to perform statistical analysis assuming that with 30 samples or more the distribution will be statistically normal, Drennan 1996, 135
The high proportions of table ware largely overlap with higher z-scores. Based on the combination of the two, sites 11316, 15068, 15112 and 15153 stand out for their consumption of much higher amounts of table wares than expected, around 50% of the total assemblage.\(^{592}\) In the case of site 15112 this is combined with a very low amount of kitchen ware (10%). The coastal dataset also contains three sites with divergent z-scores for storage but not very strong divergences from the proportional data. These are site 15106 (transport and storage), 11345 and 11375.\(^{593}\)

The same problem with sample size does not come into play for the dataset from the plain, for which the assemblages are all larger than 30 fragments. Divergence from the baselines in the plain is mostly connected to transport vessels and to a lesser extent kitchen ware. In the plain 13 out of the 21 sites follow the order of the local baseline proportions.\(^{594}\) However, 13 out of the 21 sites also have a divergent z-score for at least one functional category from the regional or local baseline.\(^{595}\) with 5 sites, despite following the general proportional order, also having z-score larger than 1 for at least one category (marked with * in the footnotes). In the case of the sites in the plain, one pattern of divergence based on the z-scores clearly stands out: 8 sites have a z-score > 1 for transport vessels when compared both to the regional and the local baseline.\(^{596}\) Six of these sites also stand out based on proportions of transport vessels, with some site having much more and other very few transport vessels.\(^{597}\) Site 14057, with very low numbers of transport vessels, has a much higher amount of storage vessels (26%) combined with a very high z-score of 3.74/3.81, while three sites have negative z-scores for transport combined with positive high z-scores for kitchen ware (14007 (90%), 14019 (84%) and 14028 (82%)).\(^{598}\)

Divergence from the baseline in the functional categories in combination with z-scores indicating more than 1 standard deviation, can potentially be linked to two different causes: different site function and/or different socio-economic status. I would argue that the former would especially be reflected in divergent patterns in the consumption of transport and storage pottery, while the latter might be more related to divergent patterns of consumption of primarily table ware and to a lesser extent transport vessels assuming that these are linked to the importation of foodstuff.\(^{599}\) Potentially socio-economic status is also reflected in additional data, such as the occurrence of luxury architectural elements (mosaic stones) and size of the site.

Based on this assumption, the data tentatively suggests that the pottery assemblages of sites 14010 and 14034 point towards a more specific function than a simple farmstead. Both of these sites have higher numbers of transport vessels, but not combined with higher numbers of table ware. Furthermore, both of these sites lack indications for the production of transport vessels. The high amount of transport vessels might thus be related to the export of foodstuff from these two sites. Furthermore, especially site 14034 had a favourable location within the transport network, only a couple of hundreds of metres away from both the via Appia and Ad Medias. Additionally, this site also has a divergent pattern for special function ceramics. From the seventeen fragments in that group, eleven are loom weights. Although loom weights are a frequent find in the region, this site has one of the highest numbers of them. Potentially, this household was thus not only producing agricultural products but also processed products related to sheep.\(^{600}\)

Also site 14057 has a divergent assemblage, but with a very low number of transport vessels and by far the highest amount of storage vessels of all sites. This site is located within 100 metres of site 14058. The high amount of storage pottery on site 14057 might indicate that this site functioned as a storage facility related to site 14058 rather than being an individual farmstead itself. Also site 11375 has exceptionally

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\(^{592}\) Site 11316 (54%; 1.54/1.21), 15068 (44%; 1.06/0.60), 15112 (56%; 1.68/1.37) and 15153 (51%; 1.41/1.04).

\(^{593}\) Site 15106 (transport 46%; 1.66/1.46 and storage 11%; 1.16/1.23), 11345 (11%; 1.05/1.13) and 11375 (22%; 2.94/2.94).

\(^{594}\) Site 12306, 12307, 12308, 14002, 14003, 14017, 14026, 14029, 14035, 14040, 14053, 14058 and 14061.

\(^{595}\) Site 12308, 14007, 14010, 14016, 14017, 14019, 14026, 14028, 14034, 14035, 14037, 14057 and 14061.

\(^{596}\) Site 12307, 14007, 14010, 14016, 14017, 14019, 14026, 14028, 14034, 14035, 14037, 14057 and 14061.

\(^{597}\) Site 14007 (3%; -1.16/-1.09), 14010 (44%; 1.51/1.68), 14019 (2%; -1.22/-1.16), 14028 (2%; -1.25/-1.19), 14034 (49%; 1.88/1.99) and 14057 (3%; 1.15/1.10).

\(^{598}\) Kitchen ware: site 14007 (90%; 1.87/1.93), 14019 (84%; 1.59/1.54) and 14028 (82%; 1.48/1.37).

\(^{599}\) This is also hypothesised based on the scattered distribution of Republican amphorae within the Pontine region, see Verhaegen et al. in prep.

\(^{600}\) A similar interpretation about this site was made by Tol & De Haas 2022.
Figure 8.1. Overview of all the Republican sites in the Pontine region (top) and respectively Mid-republican sites (middle) and Late Republican sites (bottom) in the case study areas. Sites with a number are included in the assemblage analysis.
Figure 8.2. Overview of the pottery functional assemblages from the 36 selected sites. Number of fragments and percentages can be found in Table 8.2.
Table 8.2. Overview of the pottery functional assemblage data based on the 36 selected sites.

<table>
<thead>
<tr>
<th>Site_ID</th>
<th>Transport</th>
<th>Transport %</th>
<th>Storage</th>
<th>Storage %</th>
<th>Kitchen Ware</th>
<th>Kitchen Ware %</th>
<th>Table Ware</th>
<th>Table Ware %</th>
<th>Special Function</th>
<th>Special Function %</th>
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<td>12306</td>
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<td>23.08</td>
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<td>1.95</td>
<td>665</td>
<td>68.14</td>
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Table 8.2. Overview of the pottery functional assemblage data based on the 36 selected sites.
Daily life in the Roman Republican countryside

High numbers of storage vessels, however, this is based on a very small assemblage (N=37) and thus possibly related to data quality rather than to the site function.

Coastal sites 11316, 15068, 15112 and 15153 all have very high amounts of table wares (around 50% of the total assemblage) combined with higher z-scores.\(^{601}\) This is more than double the average of the local baseline (25%) and close to triple as much as the regional baseline (17%), but as a group of sites they all have very similar amounts of table ware. It should be noted that in general table ware consumption appears to have been higher in the coastal area (25%) than in the plain (12%). Furthermore, only one site in the plain (14037, 36%) stands out because of its higher consumption of table wares in comparison to the local baseline, with also only a higher z-score in comparison to the same baseline.\(^{602}\) The higher than expected consumption rate of table wares in the coastal area might tentatively point towards dining practices being more important than in the plain, leading to households buying more serving vessels at the costs of other types of vessels. In this respect, site 14037 in the plain also stands out especially in the local context, with much higher consumption of table wares.

The pottery assemblages from the coastal area in general appear to be much more varied than the more standardised assemblages from the plain. This comes forward from both the proportional and the z-score data, with a wider variety of groups standing out. Although this could partly be explained by the earlier mentioned dataset issues, there is also a lot of variation between the sites with larger sized assemblages. Interestingly, site 15106, which is assumed to have been involved in the production of table wares does not have an outstanding high amount of them. The reason for the pattern of more variation in the coastal area in comparison to the plain might be sought in possibly a more heterogeneous population, both culturally (Volscian, Latins and Romans) and possibly also socio-economically. The argument for possible socio-economic diversification might be related to longer site histories, with many of the coastal sites continuing into the Imperial period. Sites with longer chronologies have also more time to develop and thus diverge from other sites in the area. On the other hand, the highly standardised assemblages of the Pontine plain might suggest a more homogenous population, both culturally (Roman colonists?) and socio-economically. The divergent pattern in mostly transport vessel consumption in the plain indicates the involvement of the area in agricultural production but also as a market for import products. The exception to this socio-economic homogeneity in the plain is site 14037. This site is interpreted as a medium sized, Mid-Republican farm (date: 350–200). Its size does not stand out in comparison to other sites dated to the same period. The consumption of more table ware might thus be a tentative indicator for a different socio-economic status.

The pottery assemblages thus point towards generally shared domestic behaviour across the region but also minor variations in the consumption practices of the different functional groups of ceramics. Variations occur mostly in practices connected to the production and consumption of foodstuff (amphorae) and how food was served (table ware).

**8.2 Form and cooking ware type assemblages**

Based on the general pottery assemblages classified according to functional categories, it was noted that the plain appeared to have highly standardised assemblages while the coastal area has more assemblage variation. We will now take a closer look at the assemblages based on the diagnostic fragments on two different levels: forms and the Olcese cooking ware types. The form assemblages will provide general information on functions of the vessels (Figure 8.3 and Table 8.3–8.4). These forms are related to specific food preparation methods and thus relate directly to behaviour around cooking. Focus will be on divergence from the local baselines and the amount of variation between sites based on proportional variation and z-scores. However, when the form group only contains a small number in total, combined with low means and relatively large standard deviations, the z-scores tend to be larger than 1 even with only minor variations (Appendix V). For example, the occurrence of any number of diagnostic storage vessel fragments on any of the sites in the plain immediately leads to z-scores >1 because of the low number of total fragments for the entire plain (N=6). The same occurs with non-cooking jars. This needs to be kept in mind, since it is more of a reflection of the data quantity than possibly actual variations in the assemblages. Nevertheless, their

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\(^{601}\) 11316 (54%; 1.54/1.21), 15068 (44%; 1.06/0.60), 15112 (56%; 1.68/1.37) and 15153 (51%; 1.41/1.04).

\(^{602}\) Site 14037: 36%; 0.66/1.26.
Figure 8.3. Overview of the form assemblages for the 37 selected sites. Numbers and percentages can be found in Table 8.3 and Table 8.4.
occurrence indicates specific types of behaviour. The Olcese cooking ware type assemblages provide more detailed information on possible variation between the Mid- and Late Republican period (Table 8.5). The co-occurrence of specific types can be indicators for ‘sets of things,’ specifically cooking sets. Because of the quantitative restrictions of the type dataset (being small), a more descriptive approach is taken there.

As with the pottery assemblages, the size of the assemblages becomes more problematic for the form and type specific data. Since this dataset is based on the diagnostic fragments only, those sites that already yielded very limited amounts of pottery overall have even smaller numbers for this step. Again, this is mostly a problem for the coastal dataset but also some of the sites in the plain have very small diagnostic assemblages. Therefore, the 16 sites with fewer than 30 diagnostic fragments will not be discussed in more detail in this section, although they are included in the graph and tables.

The baselines indicate that four form groups are most common and the remaining assemblage comprises very small amounts of a wide variety of

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Table 8.3. Overview of the quantitative data of the form assemblages.
forms. The average regional form assemblage for the Republican period (Figure 7.2) was dominated by jars (37%), followed by lids (22%), amphorae (16%), supplemented with bowls (12%), pans, basins/mortars, plates/dishes, jugs and non-cooking jars (all 2%), baking covers, cups and dolia (all 1%) and finally. The jars, lids, amphorae and bowls were the largest form groups in both the coastal area and the plain. However, in the coastal area amphorae were the dominant group (35%) instead of jars (21%), while in the plain jars were dominant (43%), followed by amphorae and bowls occurring in more or less similar amounts (respectively 10% and 11%). Based on the comparison between the local baselines and the site form assemblages (Figure 8.3, Table 8.3–8.4, Appendix V), the following stands out:

Only two sites yielded diagnostic fragments of all forms, site 14016 (N=237) and 15106 (N=417). These are also the two sites with the largest form assemblages. In general, the form repertoires from the sites in the plain appear to have more form variety. On the other hand, there is more variety in the occurrence of forms between sites in the coastal area, but generally fewer forms occur on each individual site. This difference might be related to
variation in sample size, with the coastal assemblages being generally smaller than the assemblages from the plain.

For the coastal area, only two sites follow the proportional coastal form baseline (sites 15106 and 15153). However, both of these sites have divergent z-scores for a variety of forms. Especially 15106 stands out, with more pans, basins, cups and jugs than expected based on the z-scores. Although this could be connected to household preferences, in the case of this site it is more likely caused by a more intensive sampling strategy. This has led to a much larger quantity of data, resulting in the recording of forms which are often less common on other sites. This is the case for basins, which in the pottery classification are often missed due to them being mistaken for tiles (which are made from similar fabrics), and more fragile forms like cups and jugs.

Pans also have a higher z-score at site 15106, but this appears to be a more general coastal pattern. Out of the 6 remaining sites, 4 have positive z-scores higher than 1 for pans, while only 3 out of 21 sites have the same pattern in the plain. This points towards pans being a more important part of food preparation methods in the coastal area, although this could also partly be related to more sites continuing into the Late Republican period.

One other site in the coastal area has a divergent assemblage based on percentages and z-scores: 11316. For this site, the combination of which forms show divergence is interesting. Pans, baking covers and plates/dishes all have much higher positive z-scores, indicating the use of higher amounts of these three forms. The combined use of pans with baking covers has been hypothesised before, with pans being able to function both as pan and as baking tray. Combined with the occurrence of plates/dishes, this suggests the preparation of drier types of food on this site specifically.

On the local level in the plain, jars are dominant in the form assemblages; however, five sites do have divergent z-scores for jars. Two sites in the plain, 14003 and 14026, stand out because they lack z-scores above 1. All other sites have divergent z-scores, with a couple of sites standing out. Firstly, for site 14037, the pattern of higher consumption of table wares (see above) is also mirrored in the form assemblage. Both bowls and plates/dishes have higher positive z-scores. This is combined with negative z-scores for amphorae and jars. A similar pattern is detected for site 12307, with higher than expected consumption of bowls and jugs, and fewer jars. Lastly, site 14058 used more pans and jugs than expected.

In general, it thus appears that variations between sites in the form assemblages are minor based on proportional data. However, taking into account z-scores as well, almost all sites show divergence. Nonetheless, in both case-study areas the same forms occurred most frequently (jars, lids, amphorae and bowls), supplemented with smaller amounts of other forms. Despite the divergent z-scores, which might partly be explained by the size of the dataset, in general the household assemblages looked quite similar in both the coastal area and the plain. The general homogeneity of the form repertoire within the Pontine region points towards a similar function for most of these sites as farmsteads and broadly shared consumption practices related to foodways. The former provides an additional argument for all these sites being interpreted as farmsteads. The latter points towards similarities in how food was prepared and served on a general level within the Pontine region. However, some tentative indications for local preferences can be detected, with the coastal area having a stronger preference for drier foods based on the consumption of pans and plates/dishes combined with jugs and cups and the plain showing a stronger preference for the consumption of (semi)liquid food prepared in jars and served in bowls.

A more detailed qualitative analysis of the occurrence of specific Olcese cooking ware types on each site is carried out to identify the co-occurrence of specific cooking ware types (Table 8.5). Because of the small size of the cooking ware type dataset (N=1138), with all type groups being smaller than 15 fragments in total
Table 8.5. Overview of the Olcese cooking ware type assemblages.

| Site id | olla 1 | olla 2 | olla 3a | olla 3b | local olla | tegame 1 | tegame 2 | tegame 3 | clibanus 1 | clibanus 2 | coperchio 1 | coperchio 2 | coperchio 3 | TOTAL |
|---------|--------|--------|---------|---------|-----------|----------|----------|----------|------------|------------|-----------|------------|-----------|----------|-------|
| 12306   | 1      | 2      | 1       |         | 1         |          |          |          |            |            |           |            |          |       | 4     |
| 12307   | 6      | 6      |         | 1       |           |          |          |          |            |            |           |            |          |       | 13    |
| 12308   | 3      | 3      |         | 1       |           |          |          |          |            |            |           |            |          |       | 7     |
| *14002  | 2      | 36     | 2       | 1       | 2         | 1         | 1        | 1        | 14         | 4          | 11        | 11         | 131      |       | 131   |
| 14003   | 91     | 26     | 1       | 3       | 1         | 3         | 3        | 23       | 2          | 153        |           |            |          |       |       |
| 14007   | 10     |        |         | 2       | 12        |           |          |          |            |            |           |            |          |       |       |
| 14010   | 6      | 1      | 1       | 1       | 12        |           |          |          |            |            |           |            |          |       |       |
| 14016   | 100    | 2      | 2       | 1        | 25        | 1         | 1        | 131      |            |            |           |            |          |       |       |
| 14017   | 42     |        |         |         |           | 4         |          |          |            |            |           |            |          |       | 46    |
| *14019  | 68     | 2      | 1       | 8       |           | 79        |          |          |            |            |           |            |          |       |       |
| 14026   | 36     | 21     | 12      | 1       | 70        |           |          |          |            |            |           |            |          |       |       |
| 14028   | 11     |        |         | 1       |           | 12        |          |          |            |            |           |            |          |       |       |
| *14029  | 38     |        |         | 6       |           | 44        |          |          |            |            |           |            |          |       |       |
| *14034  | 18     | 53     | 2       | 1        | 5         | 79        |          |          |            |            |           |            |          |       |       |
| *14035  | 1      | 5      | 1       | 4       |           | 12        |          |          |            |            |           |            |          |       |       |
| 14037   | 26     |        | 1       | 0       |           | 2         | 29       |          |            |            |           |            |          |       |       |
| 14040   | 41     | 6      | 1       | 0       |           | 3         | 4        | 55       |            |            |           |            |          |       |       |
| *14053  | 2      | 54     | 7       | 5       | 14        | 13        | 14       | 75       |            |            |           |            |          |       |       |
| *14057  | 7      |        |         |         | 7         |            |          |          |            |            |           |            |          |       |       |
| *14058  | 45     | 13     | 3       |         | 14        | 75        |          |          |            |            |           |            |          |       |       |
| 14061   | 18     | 1      | 1       | 1       |           | 1         |          |          |            |            |           |            |          |       | 21    |
| 11269   |        |        |         |         |           |           |          |          |            |            |           |            |          |       | 0     |
| 11291   |        |        |         |         |           |           |          |          |            |            |           |            |          |       | 0     |
| *11316  | 2      | 4      | 1       | 1       | 1         | 2         | 12       |          |            |            |           |            |          |       |       |
| *11318  | 5      | 5      |         | 1       | 2         | 13        |          |          |            |            |           |            |          |       |       |
| *11345  |        |        |         |         |           |           |          |          |            |            |           |            |          |       | 0     |
| *11375  | 1      |        |         | 1       | 2         | 2         |          |          |            |            |           |            |          |       |       |
| 11378   |        |        |         |         |           |           |          |          |            |            |           |            |          |       | 0     |
| 15005   |        |        |         |         |           |           |          |          |            |            |           |            |          |       | 0     |
| *15034  | 8      | 6      |         |         |           |           |          |          |            |            |           |            | 14       |       |       |
| 15038   |        |        |         |         |           |           |          |          |            |            |           |            |          |       | 0     |
| *15068  | 14     | 7      |         |         | 1         | 2         | 26       |          |            |            |           |            |          |       |       |
| *15106  | 2      | 28     | 12      | 1       | 4         | 206       | 1         | 6         | 6          | 62         |           |            |          |       |       |
| *15108  | 3      | 3      |         |         |           |           |          |          |            |            |           |            | 6         |       |       |
| 15112   |        |        |         |         |           |           |          |          |            |            |           |            |          |       | 4     |
| 15152   |        |        |         |         |           |           |          |          |            |            |           |            |          |       | 1     |
| 15153   | 7      | 2      |         |         |           | 1         | 1        | 11       |            |            |           |            |          |       |       |
| TOTAL   | 8      | 730    | 185     | 3       | 5         | 12        | 15       | 5         | 2           | 13         | 3         | 135       | 14       | 8     |

with the exception of Olcese olla 2 (N=730), Olcese olla 3A (N=185) and Olcese coperchio 1 (N=135), both proportional analysis and the calculation of z-scores are problematic. It should also be noted that on six sites, none of the Olcese cooking ware types occur\textsuperscript{611} and three sites have only one Olcese type.\textsuperscript{612} The paucity of type data, however, should not be seen as evidence that these cooking ware types were not used on these sites. As shown in the pottery assemblage and form assemblage analysis, it is very likely that the households that inhabited all these sites used relatively similar sets of material culture. The absence of evidence for specific types should thus not been taken as evidence for absence.

Based on the type data, no specific associations between types stand out. However, there are some other elements that invite further discussion.

The high frequency of jars is in line with the form assemblages. All Mid-Republican sites but one yielded Olcese olla 2 jars. The site without this type (11375) has only two types present so this might be due to sample size. All sites dated to the Late Republican period yielded Olcese olla 3A jars, with the exception of 14002 and 14035. Site 14035 has an end date around 150 which might explain the lack of Olcese olla 3A fragments. The assemblage for this site is also small (N=12). On the other hand, site 14002 continued to the mid-1\textsuperscript{st} century. This site only has two cooking ware types dated to the Late Republican period: one Olcese clibanus 3 and one Olcese coperchio 2. I would therefore suggest that this site might have been abandoned closer to 200.

Olcese coperchio 1 occurred on most sites, except...
for four sites in the plain\(^6\) and seven in the coastal area. Out of these eleven sites, only one recorded another type of lid (11375 – Olcese coperchio 2), while all the others yielded no Olcese type lids at all. However, all of these sites do have lids occurring in the more general form assemblages.

Considering ollae and coperchi together, three of the Mid-Republican sites only contained Olcese olla 2 plus Olcese coperchio 1 and no other types.\(^6\) Furthermore, all sites with more than two Olcese cooking ware types present contain types out of at least three form groups, with the exception of sites 14026 and 12308 which yielded ollae plus coperchi types, and sites 12307 and 15108 on which ollae and clibani types were recorded.

12 out of the 37 sites studied yielded Olcese tegami types. That also other types of pans were probably used comes forward from the form assemblage data, with 18 out of 37 sites yielding pans. Only two sites in the coastal area had Olcese tegami types.\(^6\) However, the form data indicates the consumption of pans in general, but these were not Olcese type tegami. Furthermore, the occurrence of tegami appears to be more frequent on Late Republican sites (7 out of 15) in the plain than Mid-Republican sites (2 out of 6) in the same area. Portable ovens (clibani, baking covers and baking trays) are associated with 12 out of the 32 sites (8 out 21 in plain, 5 out of 11 in coastal area).

Sites that stand out because they yielded multiple tegami or portable oven fragments are 14003, 14016 and 15106. Site 14003 has the largest type assemblage in the dataset (N=153). It also has the highest amount of tegami (N=7), but no clibani. The lack of baking equipment on this site might be significant, considering the large form assemblage and the long date range (350–50).

Site 14016 also has a large type assemblage (N=133), it recorded fewer tegami (N=2) but the second highest amount of portable oven fragments (N=3 and 2 non-Olcese types). However, the form assemblage of this site only has one z-score larger than 1, which is for lids. This site is also interesting because of its short life span (350–250). Site 15106 (N=66) yielded the most portable oven fragments (N=2 and 4 non-
Chapter 8. Household consumption practices

Olcese types), but also has a very large assemblage. Lids are not used by themselves but are always combined with another form. In the kitchen, this would have been the jar or pan. Comparing the diameters of the different lid types with the diameter of the ollae and tegami could reveal the combined use of those forms. Additionally, changes over time in diameter can tentatively point towards the cooking of larger or smaller portions of food, relating to potential change in food sharing practices or household size (Figure 8.3).

The diameter of the different forms increased over time, as indicated by the different types. For jars there is an increase from 14.7 to 19.5 centimetre between the Mid- and Late Republican period, for pans average diameter increased from 19.7 to 24.4 centimetre and for lids from 18.2 to 21.4 centimetre. Additionally, the wide variety of sizes for the Olcese olla 2 stands out. This general pattern for the Pontine region is mirrored in both the study areas. The diameters of the lids show much size variation, which is logical when considering that they could be used both with jars and pans. Specifically, the diameters of the Olcese coperchio 3 matches well with the increased sizes of both the Olcese olla 3 and the Olcese tegame 3.

Besides the lids, baking bells could also have been combined with pans. The average diameter for a clibanus is consistently 28–29 centimetre. This is not an uncommon size for pans, but reaches the upper diameter limits of this form. Potentially, the larger sized pans were thus used in combination with the baking bells for baking rather than for cooking.

Although the type data thus did not provide much information on consumption practices due to the limited size of the dataset, the diameter data tentatively points towards three patterns related to foodways. Firstly, the wide variety of diameters for the Olcese olla 2 potentially hints at a wide variety of different types of food being prepared in them, or at least variety in the amount of food being prepared. Banducci suggests based on diameter data combined with use-wear larger ollae can be associated with the preparation of porridge which requires frequent stirring, while the smaller ollae might have been used to prepare ´side dishes´ such as vegetables and meat stews. Alternatively, it could also indicate a wider general use of Olcese olla 2 jars, not only for cooking but for example also for storage. This multi-functionality of jars might be further suggested by their frequency within site assemblages. Secondly, the use of lids with both jars and pans comes forward based on the diameter data. Thirdly, the increase in diameter size for both jars and pans between the Mid- and Late Republican period suggests a change in prepared quantities of foods. The increased size could point at either a change in household compositions, an increased importance of boiled food (although the use of pans becomes more common during this period), or an increased importance of social gatherings for which larger sized meals needed to be prepared.

8.3 Fabric assemblages

The last level to be considered is the fabric level. It discusses the occurrence of the different fabrics on the sixteen sites from which samples were taken for thin-section analysis (Table 8.6). As stated earlier (Section 6.4.2), the targeted sampling strategy does not make it possible to reconstruct distribution patterns based on the occurrence of fabrics on the sites. However, the frequency of the fabrics can tentatively inform us on possible preferences for specific fabrics and thus objects on sites with multiple samples (sites 14035 and 14057 only have one sample). The focus will be on site 14019, 14029, 14034, 14053, 14058 and 15106 because those have the most samples.

The following elements stand out:

Most sites have a variety of volcanic and quartz-feldspar fabrics. Site 14034, however, only has one volcanic sample and eight quartz-feldspar samples. Otherwise, none of the sites appears to have only consumed cooking wares belonging to just one of the two main fabric families. The consumption of mainly volcanic cooking wares is thus not a specific Mid-Republican characteristic, since also the sites that only date to that period used both volcanic and quartz-feldspar fabrics.

Site 14019 only yielded samples with a bright orange slip layer. The strong preference for slipped cooking wares on this site already came forward during the macroscopic analysis. Whereas it was

\[\text{olla is attested in Lavinium, see Ebanista 2020.}\]

\[\text{618 See also Ebanista 2020 for relationship in diameter sizes of jars and lids at Lavinium.}\]

\[\text{619 See Banducci 2021, 117–118 for similar arguments.}\]
noted earlier (Chapter 4) that slip layers were mostly applied to pans, all the ollae samples with orange slip layers within the dataset are collected from this site. Although this household appears to have had a specific preference for slipped cooking wares, they do not all belong to the same fabric groups. Interestingly, this site also has higher than 1 z-scores in both the pottery assemblage and form assemblage for respectively kitchen ware and jars.

QF.4 (N=3) and QF.5 (N=3) are the only two fabric groups that are restricted to one (and the same) site: 15106. This site however also yielded the largest assemblage of any site in the coastal area due to a very intensive survey strategy. QF.3 and QF.4 overlap with M-fabrics 7, 10 and 15 as well as partially with the large M-fabric 9. The first three of these M-fabrics are almost exclusively connected to site 15106, with the exception of one sample. The occurrence of two different fabric groups at only one site might suggest a specific preference or a single act of buying a set of pots.

8.4 Pontine foodways in the Republican period

The reconstructed local baselines for the plain and coastal area tentatively pointed towards some variation in the way that pottery categories and forms were most commonly consumed. Data issues related to small sample sizes aside, the vast majority of sites follow regional and/or local baselines in their consumption practices. Based on the pottery assemblages, site 14057 and possibly also 11375, might not be farmsteads because of their high amounts of storage vessels and their lower amounts of domestic pottery. Instead, they are likely to be outbuildings or storage locations for other nearby farms.

Republican foodways in the Pontine region were focused on (semi)liquid foods, such as porridge, soups and stews, prepared in jars (with or without a lid) and served in black-gloss bowls at least during the Mid-Republican period. The occurrence of a variety of other pottery categories and forms indicates that also other types of food played a role. The (less) frequent occurrence of pans and baking covers, as well as serving vessels such as plates/dishes and drinking equipment (wine amphora, cups and jugs) shows that foodways were also varied early onwards. Bread must have formed an important additional component, with the occurrence of baking equipment on most sites. This might have been a specific Pontine food tradition, since similar forms are also well attested at Satricum.\textsuperscript{620} Furthermore, textual sources and botanical data attest to the production of grain in the Pontine region during the 5\textsuperscript{th} and 4\textsuperscript{th} centuries.\textsuperscript{621}

\begin{table}
<table>
<thead>
<tr>
<th>Fabric Group</th>
<th>Plain</th>
<th>Coastal</th>
</tr>
</thead>
<tbody>
<tr>
<td>QF.1</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>QF.2</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>QF.3</td>
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<td>1</td>
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<td>3</td>
</tr>
<tr>
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<td>3</td>
</tr>
<tr>
<td>QF.6</td>
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</tr>
<tr>
<td>QFLA</td>
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</tr>
<tr>
<td>QFLB</td>
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<td>1</td>
</tr>
<tr>
<td>QFLC</td>
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<td>1</td>
</tr>
<tr>
<td>V.1</td>
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</tr>
<tr>
<td>V.2</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>V.3</td>
<td>1</td>
<td>1</td>
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<tr>
<td>V.4</td>
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<tr>
<td>VLA</td>
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</tr>
<tr>
<td>VLB</td>
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<tr>
<td>VLC</td>
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<td>VLD</td>
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<tr>
<td>VLG</td>
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</tr>
<tr>
<td>VLI</td>
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<td>1</td>
</tr>
<tr>
<td>TOTAL</td>
<td>3</td>
<td>2</td>
</tr>
</tbody>
</table>

\textsuperscript{620} E.g. Bouma 1996 teglia type I and II.
\textsuperscript{621} See Section 7.2.
Comparing the coastal area to the plain provided a couple of observations in regard to possible local preferences. Jars were absolutely dominant in the plain and far less prominent in the coastal area, were amphorae were the largest consumed form group. Bowls and amphorae occurred in almost similar proportions in the plain. The assemblages from the plain were in general more homogeneous in their composition than the assemblages from sites in the coastal area. In the coastal area, many sites diverge from the local baseline. Despite possible data issues with the coastal dataset, I would suggest that this difference between the coast and the plain is related to a difference in homogeneity of the local populations. Considering local historical trajectories (Chapter 2), the plain was not inhabited before the Roman conquest. Most sites are associated with the establishment of the centuriation and thus the process of colonisation in the plain. Based on the homogeneity of the pottery assemblages, I would suggest that the plain was settled by a homogenous group of people both culturally and socio-economically. All appear to have been using similar amounts of the same functional groups of pottery, as well as similar forms and similar types. The more heterogeneous assemblage composition of the pottery assemblages in the coastal area might tentatively point towards a culturally and possibly also socio-economically mixed population. Considering that this area was already settled before the Roman conquest by both Latins and Volscians, the assemblages might reflect this variation in cultural background as well as socio-economic divergence (reflected in table ware consumption) due to longer site histories. Also, the use of pans and drinking equipment appears to be more common in the coastal area. Although very little is known about Latin and Volscian foodways, grave gifts suggest the importance of drinking rituals within Volscian society. The more frequent use of pans could be connected to the dataset being more skewed to the Late Republican period, when pans in general become more common, but could also indicate a local preference for drier types of food.

On the site level, a couple of sites stand out. Firstly, a small group of sites in the plain witnessed a higher than expected consumption of amphorae. This suggests that these sites either imported more foodstuffs, which might be related to socio-economic status, or were involved in the production and export of foodstuffs. Based on the petrographic analysis of Dressel 1 amphorae from site 14034, it appeared that 80% of the sampled amphorae were made locally. This is interpreted as a strong indication for the export of produce from there. Also site 14037 stands out for its unusually high consumption of table wares. This is not only reflected in the pottery assemblage, but also in the form assemblage with higher than expected consumption of bowls and jugs. This specific site has a relatively short life span (350–200) and did not stand out in terms of size. The consumption of table wares could thus potentially be an indicator for either household preferences in what to spend income on, or point towards a better socio-economic position of this household. If the latter is the case, the abandonment of the site at the end of the Mid-Republican period might suggest misfortune since some of the other sites in the area develop into larger farmsteads during the Late Republican period. Also site 14019 stands out, not because of the forms used but because all cooking wares on this site were slipped. To only obtain slipped cooking wares must have been a very conscious choice of this household, since the majority of cooking wares on sites in the Pontine region were not slipped.

In the small coastal dataset, the household of site 11316 had a specific preference for the preparation of drier foods, reflected in the combined consumption of pans, baking equipment and plates/dishes. A group of four sites in the coastal area also stands out because of their very high consumption of table wares in general (around 50% of the pottery assemblages). The generally higher consumption rates of table wares and the wide variety of table ware forms indicates the importance of dining practices in the coastal area, with specifically a more prominent role for drinking in comparison to the plain.

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623 Verhagen et al. in prep.
Chapter 9

A ceramic perspective on daily life in the Roman Republican countryside

At the heart of this study lie the farmers of the Pontine region and the material culture they used on a daily basis. Although the focus is on people who lived in the countryside, they were definitely not isolated. Over time, the region became integrated into the Roman Republic and the local rural population was affected by wider socio-economic and historical developments, such as the integration of the area into the Roman state through colonisation, expanding networks and warfare. The aim of this study was to better understand how these developments during the Republican period impacted daily life in the Pontine countryside.

The previous chapters discussed, from a bottom-up ceramic perspective, how the life cycle of cooking pots, from their production to their distribution and consumption, showed aspects of both change and continuity. The focus was primarily on small-scale data, ranging from individual sherds to fabrics and households. Local variations and similarities between the Pontine plain and the coastal area were identified and discussed. In this chapter, we scale up once more, to connect the patterns from the ceramic data to the wider socio-economic and political processes of the Roman Republic, in order to answer the main research question of this study: how daily life in the countryside changed under the influence of socio-economic developments between the 4th and 1st centuries. But before we can do that, we need to briefly return to the other two research questions: firstly, how bottom-up ceramic data relates to top-down theories and large-scale processes and, secondly, in which way change and continuity in the production, distribution and consumption of cooking wares can inform us about daily life and wider historical processes.

9.1 Bottom-up histories: from minerals to historical processes

Bottom-up ceramic data from rural, non-elite consumption sites was used in this study to understand the influence of large-scale, top-down political decisions on daily life in the countryside. The data is characterised as bottom-up in different meanings of the term. Firstly, it is bottom-up in a sociological meaning of the term.624 This study is concerned with the processes that took place at the non-elite levels of the population and how those people were influenced by the implementation of top-down political decisions. It considered detailed data about individual objects and households as small windows into wider society to answer question about how people lived their daily lives in the countryside. The argumentation thus started from the small and worked up to the general level of society. It should be emphasised that these rural households were not passive agents in this process. They responded in different ways to the new (political) situation, shaping the outcomes of the process of integration into the Roman state in different ways as is reflected in the ceramic data on the regional, local and household levels. Furthermore, Roman culture was characterised by its openness to other cultural influences, making it possible that the Pontine region was not only changed by becoming part of

624 Bottom-up sociological approaches stem from interpretative sociology, focusing on how people are influenced by top-down processes. This was first pioneered by Max Weber and George Simmel in the late 19th century.
the Roman state but Rome itself was changed in the process too.

Secondly, the data itself is bottom-up from a science-based perspective. On the smallest scale the data consisted of detailed scientific information about clays and minerals. It required generalisation through up-scaling for this data to be connected to bigger narratives through the process of interpretation. This required a dialogue between the ceramic data derived partially from methods borrowed from the natural sciences and insights gained from historical and archaeological sources within the humanities. This made it necessary to build an interdisciplinary bridge between the scientific data on the one hand and social interpretations on the other hand.

As stressed in Chapter 2, it is important to be able to connect different datasets to different types of processes on different scales to be able to build bridges between them. This principle guided the argumentation process from small and specific information to societal generalisation. The connection between the scales was maintained through careful consideration of how patterns on one (smaller) scale related to processes taking place at a larger scale through inductive reasoning. The connection between the different scales was formed by behaviour. It is the place where the action takes place – the action of making a cooking pot, transporting and selling it and using it for food preparation – that tied together not only people and pots but eventually through repetition of acts led to behavioural patterns. In turn, those patterns are understood in relation to archaeological and historical information about wider society, embedding the behavioural patterns of domestic behaviour in the Pontine region into the societal context of the Roman Republic.

Action, or more generally behaviour, mostly takes place within domestic contexts. Household form the middle ground, with the activities taking place there being shaped by smaller scales – e.g. the objects used and the raw materials they are made of providing restraints and opportunities – as well as larger scales – e.g., societal norms and values influencing foodways. Most of the time, we are not aware of all these connections in the moment of action. They are part of the habits of daily life, always working in the background but also continuously influencing our behaviour.

The rather abstract process of up-scaling can be exemplified by having a closer look at sherd Net’07 T2S3.F5.5. On the smallest scale, this sherd is characterised by the occurrence of equantly-shaped, sub-rounded to well-rounded volcanic inclusions in two size ranges, specifically clinopyroxene, quartz, biotite, chert, feldspar, rock fragments, olivine and leucite. These mineral inclusions are set in an iron-rich non-calcareous clay with feldspar and biotite particles. This specific ‘scientific’ information is supplemented by the occurrence of macro planar voids with a strong alignment to the margins, formed during the making of the pot and the addition of a slip layer. Together, the elements of inclusions, clay and voids form a fabric, recognised as fabric group Volcanic 3. The sherd came from a baking tray, found on site 15106 in the coastal area. The combination of fabric, form and function provides information on how the pot was used for the preparation of food. Baking trays were commonly used together with a baking cover (clibanus), of which several were also found at this site, but trays could also be used as a pan. This household thus used a portable oven in addition to jars for the preparation of their meals.

On the local level, the fabric group that this particular sherd belongs to only occurred in the coastal area, suggesting not only a local production (based on similarities to a local clay) but possibly also a local preference for slipped cooking wares in a variety of forms during the Mid-Republican period in the coastal area. The household assemblage (at site 15106) followed the local baseline consumption pattern of pottery, albeit with a slightly higher amount of transport wares (amphorae) being recorded. Interestingly, this site is assumed to have been involved in the production of black-gloss table ware, but this did not result in a significantly higher share of the overall assemblages of this ware group.

Lastly, on the largest scale we can tentatively reconstruct how the production of this specific vessel was influenced by general changes in the production landscape. The form repertoire of this fabric group suggests it is a Mid-Republican production, whose chronology did not extend into the Late Republican period. This is a general pattern, influenced by socio-economic changes that took place at the end of the 3rd and beginning of the 2nd centuries (see below). When comparing the origin of the pots in the household assemblage, there is a change from local to regional fabrics from the Mid-Republican to
the Late Republican period in the coastal area. On the consumption level, the use of baking trays and portable ovens had a strong local tradition pre-dating the Roman colonisation of the area, as is illustrated, for example, by the frequent occurrence of the same forms amongst the Satricum material.

The way cooking pots were made, distributed and used is related to different scales of society, as shown above. It also places human behaviour at the heart of this study – the choices made by people during different parts of the life cycle of pottery are reflected in the cooking pots themselves. Because these choices do not occur in isolation but are influenced by historical and socio-economic processes, cooking wares are used to provide a bottom-up perspective on large scale processes. Consequently, using careful argumentation to maintain the scalar links, the interpretation of micro-scale data added to our knowledge about macro-scale developments. The level of production, distribution and consumption compose the middle ground, connecting pots to processes and is therefore crucial. By separating those elements in the life cycle of pots, the opportunity arose to examine how clearly defined actions of human behaviour (the activity of production, distribution and use) were intricately embedded in society. This embeddedness was not static nor uniform through time and space. The relationship between general developments and the production, distribution and consumption of cooking wares is reflected in change and continuity in behaviour and the material culture involved in it.

9.2 The middle ground: production, distribution and consumption of cooking wares in the Republican period

The production, distribution and consumption of cooking wares are considered to have a reciprocal relationship to each other (Figure 9.1). Without a demand for specific ceramics, reflected in its consumption pattern, there was no incentive to produce and distribute these pots either. However, at the same time, increased production and distribution of pottery also influenced consumption because more of it would have been available at the marketplace.

This reciprocal relationship cannot be seen separately from wider socio-economic processes. What a household was able to spend depended on its income. In the case of the farming families in the Pontine region, possibilities and constrains were connected to the agricultural market where they sold their surplus. What these households could buy depended also on what was available at the market and is thus connected to larger trade networks. In turn, what was produced at the pottery workshops depended on the consumer demands for different forms of cooking wares. These demands were contingent upon foodways through different methods of food preparation.

The influence of social and economic processes on the consumption of cooking wares is reflected in the composition of household assemblages. What was used by a household was influenced by their socio-economic status. Socially, what was eaten and how food was prepared is strongly connected to
identities, while economic means of the household would determine what and how much was affordable – both in terms of objects and foodstuffs that could be bought.

The studied Pontine households represent farming families who generated income through agriculture. The region itself is a fertile area with good opportunities for the growing of a wide variety of crops. Although little is known about what these farmers actually produced, the assemblages indicated that agriculture provided a decent income based on the frequent occurrence of table wares and imported amphorae alongside the cooking wares on these farmsteads. This does not only suggest that they produced more than needed for their own families, but also that the farmers were able to sell of their produce, indicating some degree of market integration. Because of the location of the Pontine region, agricultural production for Rome’s food market is not unlikely. This might also have been one of the main economic reasons to reclaim the Pontine marshes during the Mid-Republican period. Additionally, there are indications for the farming of higher priced crops and animals in relation to regional variation in agricultural potential: the occurrence of cheese strainers in the plain; the famous Setian wines and olive presses in the Lepine foothills; the villae maritimae with industrial sized fishponds along the coast and lastly also the production of amphorae for the export of agricultural products throughout the region. Most of these indicators come from Late Republican period sites that show clear signs of upscaling in size during this period.

This process towards agricultural specialisation and intensification is more widely hypothesised to be connected to the rise of the so-called villa economy. Traditionally the rise of villas was argued to be connected to an increased elite investments in land at the cost of the free rural population, making increased use of slave labour. Although previously already criticised, the recent overview study by Launaro based on survey data from Italy showed that the increase of villa estates went hand in hand with an increase in the number of farmsteads and villages in most parts of Italy. Nevertheless, the Late Republican period saw the establishment of the first more specialised larger scale farms and villas, producing agricultural products that required more financial investments (vineyards, olive groves, fish ponds and equipment) or involved higher economic risks (the growing of cash crops). The platform villas in the Lepine foothills and the coastal fish ponds are indicators that this process also took place in the Pontine region. The increased diameter size of the Late Republican jars might also be related to this process, hinting at larger households living on the farmsteads.

Besides these economic reasons, there might also be social reasons behind the composition of the household assemblages. The different cooking ware forms were tied to different methods to prepare your food, which were in turn culturally specific. What was socially acceptable to eat is therefore reflected in cooking ware consumption patterns. The Republican batterie de cuisine was characterised by a rather conservative and limited set of cooking equipment: portable ovens, pans, jars and their associated lids can be found on almost every Republican period site in the Pontine region. The use of jars and portable ovens for the preparation of food was already part of a pre-Roman regional tradition. Archaic household assemblages from for example Satricum often contained very similar looking types of cooking wares. Although the use of jars for the preparation of porridge is often seen as something typically Roman, it might actually have constituted a deeper Latin cultural tradition. Aside from the general uniformity, local variation between the plain and the coastal area in consumption patterns do point towards possible variations in food preferences in relation to local histories and identities (Chapter 7 and below).

Although the general composition of the form repertoire remained stable throughout the Republican period, minor changes occurred not only in the morphology of the pots (see below) but also in the ratios of specific forms within the cooking ware assemblages. Whereas jars dominated the cooking

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625 The limited botanical data indicates the production of olives, cereals and some types of legumes. See also Section 7.2.
626 The frequent occurrence of coins on these rural sites might be another indicator for the households being part of the market economy.
627 The latifundia model as developed by Carandini (1981) was highly influential but also heavily criticised. For critique, see e.g. Rathbone 2008; Marzano 2007, 125–153; Launaro 2011.
628 Launaro 2011; Launaro 2017.
629 See Hollander 2019 for overview of required investments and market dependency for different types of farms.
630 Of course, Rome was once part of the Latin culture and developed out of Latin material culture. A clear break between Latin and Roman can thus not be traced.
assemblages in the Mid-Republican period, pans appeared more frequently in the Late Republican period, leading to a more frequent side-by-side use of these two forms. This shift was probably related to the exposure to new foodways and new ways of cooking through trade networks, and was thus one of the consequences of the expansion of the Roman state. These forms and the cooking methods associated with them became integrated into the existing regional foodways over time. Specifically, the use of pans was associated with the preparation of drier types of (fried) food and sauces. Whereas literary references to Roman cuisine frequently mention liquid types of boiled food, such as porridge and stews, the increased use of pans potentially suggests increasing importance of other types of drier food and sauces. Interestingly, the increased use of pans is accompanied by the increased use of plates and dishes used for serving drier food instead of bowls. This shift towards drier food could be an influence from the Hellenistic world. Greek foodways differ mostly from Roman foodways in the consumption of bread-like staples combined with vegetables and fried pieces of meat or fish. With bread already being a component of Pontine foodways before the Roman period, new methods for the preparation of meat and fish could easily be fitted into the existing framework. The long line of continuity in the use of cooking forms with slowly changing form frequencies thus points towards more varied foodways but within already existing form repertoires. Only in the Imperial period can we see the introduction of new forms into the batterie de cuisine of the Pontine region, such as the pentola and the caccabus (casserole).

Although foodways in the Pontine countryside were certainly not static, change was very gradual between the 4th and 1st centuries. Foodways thus remained traditional and were grounded in regional pre-Roman traditions. Although by the end of the 1st century, households might still have acquired very similar foodstuffs, the way they would prepare them was potentially much more varied than in the early 4th century. The time it took for new foods to trickle down to rural populations and become an accepted part of daily life was slow but over time did have an effect. Exposure to these new types of food and foodways would have occurred through social networks and the importation of both food and new types of pottery that were available at the local market where these households would go to sell their surplus.

The influence of social and economic processes on the distribution of cooking wares is reflected mostly in the configuration of various networks. Social influences on distribution are almost impossible to reconstruct beyond the general observation that the distribution of cooking wares was driven by demand based on foodways. On the other hand, economic influences were visible in the number of circulating fabrics and their provenance. These two factors combined indicated a possible change from a fragmented distribution mechanism in the Mid-Republican period, especially in the coastal area, towards a more centralised distribution mechanism with fewer workshops dominating the Pontine cooking ware market in the Late Republican period.

This diachronic change is probably related to a change in both production organisation (see below) and expanding networks through the conquest of new territories. Tentative indications for an increased scale of production might be related to more far-reaching transport networks in general of these workshops. These networks profited from the integration of new territories into the Roman state. By 263, peninsular Italy was unified in its entirety. Trade benefited from a shared monetary system, longer periods of peace (especially after the Second Punic War) and investments in infrastructure by the Roman state. The latter also resulted in a difference in trade patterns between the coastal area and the plain.

The plain became connected directly with both Rome and the south through the establishment of the via Appia in the late 4th century. This consular road was created by Rome to ease military transports but was of course also used for economic purposes. Combined with the construction of the road was the digging of the Decennovium canal, providing a faster and cheaper way to transport goods directly between the town of Forum Appii and the sea harbour at Terracina. The combined effect of these investments on trade networks was visible in the

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631 A similar pattern is attested in Musarna – see Banducci 2021, 231–245.
632 Amouretti 1999.
633 See Donnelly 2016, 246–255 for discussion on the use of these forms. These forms are like a hybrid between pans and jars, specifically associated with the making of sauces.
increased number of imports from initially Rome but later on also Campania, Sicily and northern Africa into the plain. Moreover, the connections appeared to be direct because only a limited number of fabrics circulated alongside local products.

The distribution pattern of cooking wares was different for especially the Mid-Republican period in the coastal area. The more dispersed pattern in this area could be connected to various cooking wares reaching the Pontine coast through its different harbours before the vessels were transported further inland via secondary roads. Most of these roads that connected the coastal area with the interior have unknown construction dates, but are likely to be of Republican origin. These roads were probably built through local initiatives, creating connections between the different colonial towns and the via Appia. At the same time, the coastal area was probably connected towards Rome by land and via sea through Ostia and southwards over sea to Puteoli.

The influence of large-scale economic processes on pottery production can be examined through change and continuity in production organisation. Production organisation changed between the Mid- and Late Republican period under the influence of economic changes. This was not an abrupt change, although the Second Punic War is often seen as the catalyst.635 The defeat of Carthage and the following conquest of the eastern Mediterranean led to an influx both in cash and in the form of slaves and migrants. Consequently, the consumption market for pottery expanded as well as the demand for foodstuffs combined with the availability of more labourers. Investments, primarily by wealthy elite, were made to increase outputs, leading not only to the rise of villa estates in the countryside636 but also to larger pottery production centres producing larger volumes of pottery. The rise of larger scale production centres is attested in the archaeological record especially for the production of black-gloss ware and amphora.637 A similar process for the production of cooking wares could tentatively be inferred from the fabric data. Between the Mid- and Late Republican period, the number of circulating fabric groups within the Pontine region decreased drastically, from thirteen to seven (with four groups occurring in both periods). Additionally, the number of loners also decreased. Whereas the Mid-Republican fabric assemblage was thus characterised by many small groups, the Late Republican period saw the dominance of fewer, larger groups but with more typological variation. Assuming a connection between distribution mechanisms and production organisation, this would point to a change from a fragmented production landscape in the Mid-Republican period with many smaller producers to a centralised production landscape in the Late Republican period with fewer and potentially larger scale producers manufacturing a wider form repertoire and supplying more extensive market areas. Changes in the local production landscape support this idea of a decrease in the number of producers. However, a change in the scale of production and associated change in production organisation remains difficult to confirm because of the lack of (published) excavated coarse ware production sites. Nevertheless, the first more specialised cooking ware production centres (i.e. Vasanello) are established in the Late Republican period.638

It is not possible to reconstruct the socio-economic status of potters during the Republican period based on the examined dataset, but production technology provided information about communities of potters. The uniformity in the overall appearance of cooking pots suggests the existing of a shared idea around the physical and visual properties of especially cooking jars (ollae). Although this homogeneity could be achieved in different ways, the Olcese olla 2 jars from the Mid-Republican period showed a high level of uniformity between the different fabric groups. All were made from iron-rich clays that were fired in an oxidising environment, leading to red and orange colours in the finished vessels. Additionally, the majority was made of clays with black coloured, volcanic inclusions that were either naturally occurring or added as temper. Morphological variation between the fabric groups was also relatively low. Combined, this led to a very recognisable product. This demonstrates that the knowledge on how to make such a pot (and what it should look like) was shared between different workshops. The provenance data indicated that most of these workshops were located within

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635 Toynbee 1965; Wallace-Hadrill 2008; Lomas 2018.
636 Launaro 2011 for general Italian data; De Haas 2011 for the Pontine region.
637 For black-gloss see Di Giuseppe 2012; Roth 2007. For amphorae see for example the production at Albinium and Minturno discussed in Chapter 5.
638 Vasanello – Poggio del Capitano is dated to the 1st century BC–3rd century AD (Olcese 2011, 250–251, site ID L154).
Central Tyrrenian Italy, pointing towards knowledge transmission within the community of potters within this area.

The Late Republican cooking pots were more varied in their appearance. This variation is mostly caused by two factors: a change towards clays being tempered with quartz-feldspar instead of volcanic, black inclusions and more variation in firing environments. Together, these two factors led to a less homogeneous physical appearance of the cooking wares. Cooking pots in colours varying from grey to brown and orange, either speckled with black or white and shimmering inclusions and sometimes slipped were used alongside each other. Furthermore, there were tentative indications for a minor change in forming method. Many of the Olcese olla 3A pots showed a stronger alignment of inclusions and voids towards the margins than the Olcese olla 2 pots (see for example fabric group QF.1). This suggested forming with higher centrifugal forces, i.e. faster turning wheels. This could be connected to the assumed increase in the scale of production, since it decreased the production time of individual pots. At the same time, it required a higher investment in both equipment and practice to be able to make a pot on a fast wheel.

The simultaneous changes in vessel morphology might be connected to this too. On the jars, not only the rim shape changed (from a small almond shaped rim to a much thicker one), but also the overall form of the body changed. Whereas the Olcese olla 2 has a rounded globular body, the Olcese olla 3A has a more oval body shape with the widest point closer to the rim. Considering that wheel turning requires the potter to pull up the clay, the shape of the Olcese olla 3A is easier to make on a fast wheel than the globular, more closed body of the Olcese olla 2 – which requires a narrowing of the body that is more complicated to achieve at faster speeds.

9.3 The bigger picture: change and continuity in daily life in the Republican countryside

To answer the overarching research question about how daily life changed during the Republican period, we will return to the household assemblages as our main data source. These assemblages are viewed as remnants of habitual behaviour in codified form, frozen in the consumption patterns from these households. They provided information about what those people ate and how this was influenced (or not) by general socio-economic processes. As theorised earlier, people ‘subscribed’ to socio-economic groups through the consumption of goods (Section 3.3). Variation in consumption patterns – both locational and diachronic – could thus indicate variation and similarities in socio-economic identities. These variations and similarities were in turn connected to local historical trajectories and how they were influenced by top-down socio-economic processes. This study considered three top-down political decisions that potentially impacted the rural population of the Pontine region the most because they affected landownership: colonisation, agrarian reforms and warfare (Section 2.4).

The ceramics used for the hot preparation of food (jars, pans, portable ovens and lids) were consistently used throughout the Republican period. Although the shape of the rim of each form changed over time, the continued use of these vessel types actually indicated a strong line of continuity between the Archaic period and the Late Republican period in methods used for the preparation of food. That being said, foodways were never fully static. Minor variations in consumption practices between the Mid- and Late Republican period indicated gradual changes, for example a shift from the consumption of (semi)liquid to drier types of food, as well as local variations. Both local areas follow the same broad temporal trends described previously (above and Chapter 7, 8), but with local differences between them. These differences could be reflections of varying population preferences in foodways in relation to local historical trajectories, foremost their response to the process of colonisation, and local agricultural potential.

The incorporation of the Pontine region into the Roman state led to major changes in the area. The consequences of and responses to this process of unification and integration varied between the coastal area and the plain, but in the long term had a very similar outcome. The existing pre-Roman population in the coastal area had to deal with the decisions made in Rome to legally integrate the region through the creation of colonies, tribes and the connected land distributions. This process lead to several wars and rebellions during the 4th century, with Satricum even rebelling after the Latin War as late as 320. Although the settlement data showed that very few farmsteads pre-date Roman colonisation of the region, land was probably owned
by local elites or communities. Whether they lost their land or not, is impossible to say, nor is known which parts of the coastal area were re-assigned as part of land distributions.

The coastal population is likely to have had different types of legal statuses connected to the legal status of the colony. The size of the allotments would have varied accordingly. Just the fact that Satricum was a Latin colony and Antium in the end a Roman citizen colony already illustrates to co-occurrence of at least population groups with different legal status. This difference in legal status was likely to have been (at least partially) based on ethnic differences too. The mixed population in the coastal area, consisting of people of Volscian, Latin and Roman descent, was also reflected in the household assemblages in three ways. Firstly, the variation between the household form assemblages appeared to be relatively large already in the Mid-Republican period. This was taken as a reflection of household preferences related to different backgrounds as well as possibly reflecting economic variation related to land ownership. Secondly, the prominence of table wares, specifically cups, jugs, plates and dishes, suggested the importance of drinking and dining practices in the area. Lastly, the coastal assemblages pointed towards a specific preference for drier types of food in comparison to the plain, as attested by the more frequent use of pans, portable ovens, plates and dishes.

Sites in the Pontine plain, on the other hand had highly standardised household assemblages, with relatively little variation between them and consistency in the forms used during the Mid-Republican period. Taking into account that the plain was a marsh land before the Roman conquest, with very limited permanent habitation, the homogeneity of the plain dataset points towards a much more homogenous population inhabiting the area. This population was likely to have arrived as colonists with the foundation of the colonies in the Lepine foothills and connected land distributions. Considering the location of the plain, the area was either distributed as part of the colonial lands of Setia or as viritane land distributions. Either way, both options would mean that Roman citizens were the colonists in the area because land distribution through those means was only toward Romans. Those two factors combined, the lack of variation between the household assemblages from the Mid-Republican period would thus be related to the arrival of a culturally homogenous Roman population with similar socio-economic status based on land ownership. They collectively had a strong preference for (semi)liquid foods prepared in jars and served in small black-gloss bowls, combined with flat breads made in portable ovens. Only over time, variation related to socio-economic changes of individual households led to more variation in household assemblages by the Late Republican period.

After colonisation and the allotment of land to the Pontine population, agrarian reforms were one way in which the arrangement of land ownership potentially changed. The effect of the agrarian reforms was in political speech portrayed as playing a key role in solving problems that had led to social unrest due to economic inequality. The reforms were mostly aimed at land distribution towards landless plebs or people of non-Roman legal status. The first agrarian reform, the Licinio-Sextian law from 367 had the specific goal of allotting land to the plebs to solve social struggles within Rome. Written sources mention the distribution of viritane land within the Pontine region during this period, but the exact location of these land distributions is unknown. Regardless, the notion of land being assigned to members of the plebs is interesting in connection to the household assemblages. The land distributions were supposed to go to the landless poor, however, the assemblages do not necessarily point towards poor farmers. Although wealth could of course be accumulated over time, the consumption of black-gloss serving vessels dated to the late 4th century suggests that most household had enough financial means to invest in nice serving vessels right from the moment of settling down.

The Gracchan reforms are likely to have surpassed the Pontine region, since it only concerned the allotment of *ager occupatoris*, which was probably not located within the area under study. Lastly, the *lex agraria* from 111 potentially made the biggest difference for the Pontine population. The Latin status holders, of which probably many were left in at least the coastal area, received now equal rights to their Roman counterparts. This new status offered more protection than beforehand but should have had limited influence on household assemblages since it foremost concerns a legal change.

Despite the importance of Republican-period agrarian
reforms in Roman social history, their effect on the daily lives of the households in the Pontine region might thus have been limited beyond the colonial allotments and virtus distributions of the late 4th century. What would potentially have mattered more was the difference between landowners and tenants. The foundation of the colonies and tribes suggests that most land within the region was distributed to colonists or classified as ager publicus. This would have made most farmers in the early Mid-Republican period landowners. The situation is likely to have changed over time leading to a more complex situation with landowners and dependent tenants. Although it is complex to archaeologically discern between a tenant-run farm and a farm inhabited by its landowners, there are a couple of possible indicators. For example, it is unlikely that tenants would invest in the farm building and equipment itself, since these were usually provided by the landowners as part of the tenant contract. The occurrence of luxury architectural elements, such as mosaic stones, could thus be an indicator for land ownership rather than occupation by tenants, with the landowner investing money in his own house. On the other hand, successful tenants might have invested their flexible income in more luxurious objects, including more table wares, imported foodstuffs and metal ornaments.

Ten sites in the coastal area and at least eight sites in the plain yielded tesserae, which are here taken as an indicator for non-essential architecture. Not all of these sites date to the Republican period or were farms, but the majority were classified as medium to large farmsteads during the Late Republican period. These sites are thus more likely to have been inhabited by landowners, although their assemblages do not necessarily stand out based on other objects. On the other hand, the assemblages with high amounts of table wares, especially 14037 and the group of sites in the coastal area, might have belonged to wealthy tenants who spent their money on portable (luxury) items. Moreover, the wider inter-household variation in the assemblages of the coastal area might also point towards a more complex system of landowners and tenants with different socio-economic statuses. Because of an existing population, including elite families, when the area was colonised, not everybody in the coastal part of the region had the same starting position. Over time, elite families and successful colonists could have profited from this situation. The uniformity of the Mid-Republican household assemblages in the plain and the decrease in the number of sites in the Late Republican period might point to land being added to existing farms, with the farms that were previously built on the land being abandoned rather than rented out. If you were a landowner or a tenant could thus have influenced what you invested your income in, but the general wealth of the assemblages implied that neither of these groups were poor or living near subsistence level.

Whether a household owned land or tenured land matters also within the military system of the Roman state. Although major changes in how the Roman army was organised occurred between the 4th and 1st centuries, a fundamental part for enrolment in the army remained wealth connected to land ownership through the dilectus-tributum system. The question of land ownership (and individual legal status) would thus also have had a significant effect on the daily lives of these households, with men potentially being away for increasingly longer periods of time. However, there is no clear indication for a decrease in population in the Pontine region in relation to any of the major wars.

In contrast, the aftermath of battles taking place in the Pontine region itself could potentially be visible in the abandonment of sites. Since the pre-Roman countryside in both the coastal area and the plain was mostly empty, consequences of warfare connected to colonisation are only visible in the excavation data from urban settlements. On the other hand, the conflict between Sulla and Marius during the 80s might not only have led to destructions in Norba, Setia and Antium but also in their respective hinterlands. The populations of Norba and Setia, possibly including the rural population, used the older defensible sites in the area probably for shelter. However, there is no indication for a decline in rural settlement after the abandonment of Norba. On the other hand, successful tenants might have invested their flexible income in more luxurious objects, including more table wares, imported foodstuffs and metal ornaments.

639 See also Jones 1963 and his hypothesis on the Monte Forco farms (Ager Capenas) being tenant farms. 640 Coast: see Tol 2012, 55. Sites: 11208, 11312, 11318, 11387, 15002, 15004, 15014, 15036, 15085-04 and 15152. In the plain, see Tol et al. in prep. and De Haas et al. in prep. Sites: 12305, 14022, 14025, 14027, 14034, 14047, 14049 and 14062 and some of the platform villas in the plain. De Haas 2011, 226, 256, also notes that some of the Mid-Republican sites located along the via Appia and the Lepine foothills developed into larger sites (class 3 in his classification). 641 See Foxhall 1990 on heterogeneity of the group of tenants. 642 De Haas 2011, 256.
the other hand, there is a decline in site numbers in the plain, but this is more likely to be related to problems with drainage.

Indirectly, the aftermath of warfare in general between the 4th and 1st centuries had major consequences for the Pontine region since it led to the integration of the region into an expanding territory. Due to its proximity to Rome, the Pontine region became part of this expanding territory early on. Because of its location within the network, the local infrastructural connections and the agricultural potential of the region, the population profited from the opportunities that came with this integration into the Roman state. This is for example reflected in the early imports of overseas amphorae, the overseas export of foodstuffs from the region as attested by amphorae in shipwrecks, investments being made in the local production of pottery, imports of table wares and cooking wares from outside of the region and the frequent occurrence of coins – all signs that households in the region were integrated into the Roman market economy already in the Mid-Republican period. Many of these households gained economically from the expanding Roman world and the associated increased demand for food. This is also attested by the longevity of many of the studied sites, with foundation dates in the 4th century and continuation into the Imperial period.

Nonetheless, not all households remained successful in the long run. Especially the Pontine plain suffered from a lack of investments in the drainage system, leading to uninhabitable conditions in large parts of the low lying plain. Meanwhile, infrastructural investments continued to be made in the coastal area, which blossomed economically in the Early Imperial period.

The expanding economic networks did not only affect the local economies but also had social consequences. People were introduced to new foodways through the same networks. The household assemblages that are part of this study were interpreted as clear signs of this process of local traditions and new introductions being combined into new ways of preparing and serving food. These changes were slow and gradual and might thus not have been very noticeable for the rural households themselves, considering that habitual behaviour and especially something so normal as cooking and eating food, happens largely unnoticed. However, by the end of the 1st century, what inhabitants of the region would serve for dinner would have been quite different but also still somewhat recognisable to their Mid-Republican ancestors.
Daily life in the Roman Republican countryside changed under the lasting effects of unification and integration into the Roman state. The outcomes of this process varied based on local trajectories in different areas, leading to regional variation in daily practices of rural communities. This study aimed at shedding a new light on the rural communities of the Pontine region and how they were impacted by larger socio-economic processes. Through a detailed study of the production, distribution and consumption of cooking wares retrieved during surveys from farmsteads in the Pontine region, elements of change and continuity between the 4th and 1st centuries have been explored.

Top-down political decisions affecting land ownership and the expansion of the Roman state influenced the everyday life of the households in the Pontine region. Sometimes quite directly, for example through the settling of the Pontine plain with colonists, but more often indirectly through slowly changing legal, social and economic structures. These offered new possibilities and limitations, depending on the legal status of the inhabitants, their socio-economic position and their involvement in the expanding Roman market economy. Combined, this led to new avenues for the expression of household identities through the consumption of objects associated with different foodways or economic wealth. Yet, changes in consumption only became apparent over extended periods of time, indicating that change in domestic household practices took generations and many food traditions persisted.

An opposition in the pace of change between different ceramic classes can be noted, tentatively underpinning an assumption about varied uses among them and their relationship to expressions of identity. The changing consumption patterns are at first mostly reflected in the use of amphorae and table ware. Amphorae were imported, but also exported, from the region early onwards. Interestingly, already from the beginning imports from western Sicily and northern Africa reached the area. Variation in amphora types increased over time, where eventually amphorae from all over the Empire reached the Pontine region during the Early Imperial period. The consumption of table wares, specifically black-gloss, was a standard practice for the Pontine rural households. Besides indicating that these farming households had enough income to buy non-essential goods, the form repertoires of the individual households suggest specific preferences. Whereas households in the plain almost exclusively used highly standardised bowls, coastal households used additional forms such as jugs and cups to a much higher extent, indicative of the local importance of drinking.

Simultaneously, the longevity of traditions can be witnessed in the consumption of cooking wares. Jars, used for the preparation of hot food that required long boiling times, remained the dominant choice throughout the Republican period. Apparently, most food consumed was (semi)liquid, probably consisting of various types of stews, soups and porridges. Differences in the use of jars over time are relatively minor, but include change in the combined use with lids, a change from a globular to a more
oval form, and a general increase in size. However, the dominance of the jar dwindled during the Late Republican period, when other types of cooking vessels became more frequent. Whereas the use of portable ovens for the preparation of food had a long standing local tradition, the increased use of pans indicated that foodways became more varied, adding a new cooking method and new types of dishes to everyday meals. A more varied practice for the preparation of hot food emerged over time which, in turn, lead to also more diverse ways of serving foods on bowls, plates and dishes.

Tradition and change in foodways is thus reflected in the household assemblages of the Pontine region. The way food was served changed more rapidly while food preparation methods remained more traditional with new elements being added. These behavioural changes were influenced by exposure to new foodways through the expanding networks of the Roman state, the integration of the Pontine region into this network and the adoption of these new elements into the lives of the rural households, with subtle variations between areas and households reflecting different choices being made in this process.

The use of cooking wares was however not solely connected to foodways. What was produced and locally available at the market place also had a profound effect on consumption patterns. Based on the indirect indicators retrieved from the cooking wares collected from consumption contexts, another image of change and continuity in the production and distribution of cooking ware became apparent.

There are tentative indirect indications for changes in the production and distribution of cooking ware during in the first half of the 2nd century. While the Mid-Republican production landscape was fragmented with many smaller-scale workshops and overlapping distribution networks, the Late Republican period saw a process of centralisation, with the rise of large-scale production centres and more extensive distribution networks. Within the Pontine region, the local supply of cooking wares was accompanied by the import of supra-regional products during the Republican period. Cooking wares are often perceived by modern scholars as mundane objects not worth transporting over long distances, but this was clearly not a matter of concern in the Pontine region. The import of cooking wares instead suggests a high degree of market integration of the area.

The import of cooking wares was facilitated by investments made in local infrastructure. The coastal area received products with a more varied origin, probably unloaded at the harbour of Antium before being distributed inlands through the local road network. On the other hand, the Pontine plain benefitted from a fast connection through the via Appia and the Decennovium canal both north- and southwards. This direct line of trade is reflected in the occurrence of a more homogenous provenance of the cooking wares, initially coming in from the north and later possibly also from the south. Moreover, new pottery workshops were established along the via Appia during the Late Republican period.

Although the data does not allow for an assessment of changes over time in the scale and output of the specific producers, the fabric analysis provided information about technological change and standardisation. Already during the Mid-Republican period, pottery technology appeared to be widely shared across Central Tyrrhenian Italy, leading to the production of very similarly looking cooking pots at different locations. This process of visual standardisation was grounded in Archaic ceramic traditions. A shared concept of what a cooking jar should look like is apparent, particularly for the jars. Also, the choice of iron-rich clays for the production of cooking wares remained stable throughout the Republican period. While the forms of the cooking wares (and how they were used) and the choice for clay sources show continuity, less visible technological changes occurred during the 2nd century. These included a change from volcanic to quartz-feldspar as the dominant inclusion type, the use of a faster wheel for the production of the Olcese olla 3A and the more limited use of slip layers for only pans instead of a wider variety of forms. Simultaneously, firing conditions became more varied during the Late Republican period, resulting in a wider colour palette for the cooking pots from grey to brown to orange.

A change in distribution networks, the pottery production landscape and pottery technology can thus be identified in the first half of the 2nd century. This was arguably the result of several minor changes that had already started earlier. However, this period also saw large societal changes related to the outcome and effects of the Second Punic War. The integration
of large overseas territories and the influx of wealth and people affected initially not only the economic networks and production of goods, but over time also accumulated into new everyday practices of local rural households and their foodways.

By the end of the Late Republican period, life in the Pontine countryside looked different but in some regards still familiar to conditions four centuries earlier. Although the Pontine plain had been largely abandoned again due to wettening conditions, the coastal area became more densely populated and wealthier, but most household still used cooking jars, pans, lids and portable ovens that looked very much alike the ones used by their ancestors. What was cooked in them, however, might have been quite different due to the availability of a wider range of foodstuffs through the expanded network of the Roman territory.

This study has only scratched the surface of the possibilities for future research offered by the wealth of data from the Pontine Region Project. The limitations of this study, being restricted to mostly one type of ceramics, from one type of sites from the Republican period within one single region also leaves open many questions, especially concerning various consumption practices.

Now that local variations in the assemblages of the coastal area and the inner plain have been analysed, it would be rewarding to expand the inquiry to other areas such as the Lepine foothills or extent the timeframe to include also the Imperial period. Did methods to prepare and serve food became even more diverse in the Imperial period? Did local preferences persist? To better ground the results of this regional study, a similar assessment of data from other regions or other time periods would be beneficial. It could provide a better understanding of how different rural communities responded to the process of integration in relation to their own unique trajectories. Of special interest are household assemblages from the suburbium of Rome, possibly providing a better understanding of what early Roman foodways looked like, and regions with different pre-Roman (material) traditions such as the Samnium and Magna Graecia, which could be placed in opposition to new ‘Roman’ foodways.

Besides providing a broader context for this study through comparison, questions related to consumer decision-making processes also remain open.

A reciprocal relationship between production, distribution and consumption is assumed but arguably not well understood in scholarship. By diving deeper into how people made the choice to buy a specific pot, we could potentially also better understand how production and distribution were steered by consumption practices and thus indirectly related to identity and foodways. So, how did consumers examine (functional) quality differences between standardised products such as cooking jars and black-gloss bowls? How was knowledge about the use, quality and origin of ceramics communicated between potters, traders and consumers? And what role did standardisation of visual appearance play in production, distribution and consumption? Focusing on these kinds of questions would not only inform us about consumption choices but also situate mundane ceramics, such as cooking wares, at the centre of debates about the Roman economy. This study has shown that farming households were not only contributing agricultural products to the market economy but also took the opportunity to buy objects that circulated within the local, regional and supra-regional economic networks. It has demonstrated that even such mundane objects as cooking pots were not merely low cost, locally produced objects made for local use but that they were traded on a larger scale than previously assumed.
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Sampling strategy is an essential part of all archaeological research. Not only can the archaeological record itself be seen as a sample of what once was,643 further downsizing of a collection is often also much needed because of the time (and money) consuming nature of comprehensive analysis. There is no such thing as a universal best sampling strategy. It is driven by the research objectives (Chapter 1) and depends on which methods are most suitable to answer particular questions. As stressed by Binford, we need to be explicit about the ‘facts’ we want to recover from our data before we start sampling and studying our material.644 Therefore, we should ask ourselves what kind of sample (both in size and in material) is needed to answer our research questions. The answer to this question leads to a research design and provides structure to the analysis.

By sampling the target population with a strategy designed in connection to methodology and research aims, it became possible to answer the research questions of this study. Each step in the sampling strategy did not only intend to reduce the sample size, but also connected to the method applied to the remaining dataset and the research questions on production, distribution and consumption and the broader questions on the effect of socio-economic processes on daily life in the Republican countryside.

This appendix discusses the research design for this study, including a description of the sampling strategy in connection to the applied methods. The research design goes down from the largest scale sample, represented by all the materials collected during three decades of research in the Pontine region by the PRP (see top of the funnel in Figure I.1) to the smallest scale of the thin-sectioning of 100 individual cooking pots (the bottom of the funnel in Figure I.1). Each step in the selection process leads to further deselection of data (Figure I.1). Furthermore, by connecting different steps in the sampling process with different physical scales, a link between large scale data and smaller detailed ceramic data is maintained. The target population consists of the Republican cooking wares collected on the rural sites (‘farmsteads’) in the Pontine region during field surveys. Rural sites denote a group of sites which are interpreted as farmsteads because of their size, location and functional interpretation based on material culture.645 This group thus excludes urban sites, villages, hamlets, road stations and villas. Cooking wares are defined as all ceramics that are suitable to use above a fire (Chapter 1).

The first part of this appendix deals with the existing dataset of the Pontine Region Project, the second part explains the creation of ‘new’ ceramic data by analysing earlier collected materials. For each separate step in the sampling strategy, the applied methods leading to the selected sample will be discussed first, followed by a description of criteria leading to the next step in the sampling strategy. In this way, it becomes possible to follow the strategy for the reduction of the dataset from thousands of

643 Orton 2000, 40–41.
644 Binford 1964.
645 This is the internally used site classification within PRP, see forthcoming Minor Centres publication (Tol et al. in prep.; De Haas et al. in prep.) for discussion.
Appendix I. Methodology and sampling strategy

1. All sites PRP: 585
   Republican: NE: 56 PP: 111
2. All finds PRP: 286.078
3. Assemblages
   NE: 34.101 PP: 27.290
4. Cooking ware
   NE: 1.848 PP: 2.836
5. Types
   NE: 141 PP: 323
6. TS
   NE: 50 PP: 50

Figure I.1. Sampling steps and sample selection funnel. NE = coastal area Nettuno; PP = Pontine Plain; TS = thin-section. Each individual step and related selection criteria and methods are described below.

Figure I.2. Location of PRP surveys.
sherds to one-hundred thin-sections. But first we briefly need to consider the importance of having a clear sample selection procedure and how sampling is generally executed within Roman pottery studies.

**Sampling in survey archaeology and Roman ceramic studies**

Each archaeological project involves sampling. Whereas in the past sampling was often done based on rather loose ideas on what should be collected to obtain a representative sample, with the arrival of New Archaeology in the 1960s and the start of regional survey projects in the 1970s this started to change. Especially within the field of survey archaeology, it is quite clear from the material evidence – mainly pieces of pots – that one is dealing with an incomplete record. This incompleteness results from several reasons: site formation processes, the effect of post-depositional conditions and the fact that we only see (and collect) what is visible on the surface. The effect of post-depositional processes and field conditions during surveys was long underestimated. Even though recognition of possible biases came as early as the late 1970s, the effect of these were long ignored. As suggested by Terrenato, this might be caused by the fact that these biases consist of ‘variables about which, apparently, one could not do much’. This statement is true for all scales of surface survey archaeology since it is just as impossible to obtain a complete site recovery rate during regional surveys, as it is to collect a complete ceramic assemblage from the surface.

Ceramic studies in Roman archaeology have a strong tradition of focussing on presumably high-valued wares, such as black-gloss, terra sigillata and amphorae, which can be studied with long-established typological methods. This has led to extensive publications on table wares and amphorae from excavations, providing information on (inter)regional trading networks and detailed typologies which are important tools for site dating. Yet, for an outsider, these site catalogues might suggest that Romans solely ate from nice little black bowls and plates and that they transported all their foodstuffs in amphorae. This is of course not a reflection of reality. Both during excavations and surveys, most of the ceramic evidence consists of what is generally called coarse wares. Only in the past decades, these coarse wares have received due attention, including their standard collection and study instead of them being discarded immediately. Collection and study of all ceramic groups is the first step in grasping a completer and more balanced picture of past pottery consumption. The present study can be placed within this wider trend of increasing interest in more mundane ceramics.

**Legacy data Pontine Region Project: outcome of previous research as starting point for new research**

Decades of field surveys, excavations and environmental studies in the Pontine region have led to extensive knowledge on past occupation and its relation to the landscape. Because of the availability of extensive background information on the research area and the applied survey sampling strategies, it is less necessary to select a formal sample for thin-sectioning. Instead, it is possible to take an informal and informed sample based on previous knowledge. To do so, clear archaeological criteria need to be formulated as the basis for selection. These criteria need to be based not only on archaeological consideration but must also consider data compatibility between the collected assemblages from the different sites recorded. Therefore, the methodological developments in field survey methods and ceramic classification systems as employed by the Pontine Region Project need to be discussed first.

Field surveys in the Pontine region by the University of Groningen started as early as the 1980s, initially to be able to contextualise the excavation of Satricum into its wider surroundings. Over thirty years of archaeological research by the Pontine Region

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647 The article *A consideration of archaeological research design* by Binford (1964) played an important role in the move towards both regional studies and a more critical attitude towards sampling strategies.

648 See Ammerman 1985 for ploughing experiments on the recovery rates of ceramics. Shennan et al. 1985 discusses collection and analysis experiments in Britain. See also Francovich & Patterson 2000 and Alcock & Cherry 2004 for a more recent discussion of survey methodology and problems related to visibility, collection strategies and quantification.

649 Terrenato 2004, 37.

650 Villing & Spataro 2015, 1–4. A recent example of such a study focussed solely on fine wares is the study of Roth (2007), which reconstructs processes of Romanisation in Central Italy through the analysis of black-gloss alone.

651 A formal sample is based on a well-defined sampling population and with statistical procedure. For an informal sample, deliberate but informed choices are made based on available knowledge and research questions (Orton 2000, 2, refers to Redman et al. 1979).
Appendix I. Methodology and sampling strategy

Project (PRP) has led to extensive knowledge on site distribution patterns based on (mostly) ceramics found on the surface of predominantly ploughed fields.652 The general development in survey archaeology from covering large areas with a low coverage towards more intensive (and thus more spatially restricted) surveys is also traceable in the research history of the PRP (Figure I.2).653

The earliest surveys in the 1980s–1990s, in the Lepine foothills, had an extensive character with unsystematic collection of materials.654 The method became more systematic with the introduction of block surveys in the late 1990s in the coastal area of Fogliano.655 Over the past twenty years, the survey unit blocks were reduced further in size from the initial 100 by 100 metres to 50 by 50 metres while simultaneously increasing the sample coverage and with it the precision of the data.656 The collection of accurate spatial data was further enhanced with the use of GPS tracking.657

Although these methodological developments increased knowledge on consumption patterns and larger material samples provided more precise dating of sites, it came at a price. Less ground was covered by more recent surveys, while at the same time more material was collected that needed to be studied. Various PhD projects led to methodological refinement and more in-depth knowledge on specific periods and specific geographical areas within the wider Pontine region as well as possible biases caused by post-depositional processes.658

The latest phase of the Pontine Region Project, the Minor Centres project, focussed on the Pontine plain, the area of the former Pontine marshes. Based on decades of experience in the region, the adopted method was once more adjusted. To address the need for obtaining high quality data as well as the desire to cover more land, a more site-based approach was employed. Rural sites were gridded with 10 by 10 metre blocks and surveyed with a coverage of 40–100%. Off-site material was recorded as individual finds.659

**Step 1: criteria for deselection of sites**

Decades of field surveys in the Pontine region660 have led to the discovery of circa 600 sites dated between the Palaeolithic and the modern period. This substantial dataset is too extensive to consider in its entirety within this study. Therefore, sites have been deselected based on the following considerations:

1. All sites which are not dated between the 4th and 1st century BC.

2. All sites from surveys that applied a non-systematic field methodology.661

3. All sites from surveys for which the ceramic data is incomplete or find densities are unreliable.

4. All sites from surveys for which the spatial data is incomplete or imprecise.

Criterion 1 excludes all sites without a Republican phase. Criteria 2–4 relate to field sampling strategies and recording. To avoid possible differences in site assemblages caused by biases not related to behaviour, it is of importance to select sites which are mapped with the same or with a similar method.

652 Within the PRP, preference has always been given to surveying ploughed or fallow fields because of better visibility conditions. This of course has led to a spatial bias connected to modern day land use. To enter a field, usually permission is requested from the landowner, something that was not always granted. Therefore, some areas have a rather ‘patchy’ dataset. Furthermore, the coastal area between Nettuno and Torre Astura is largely part of a military base.

653 See De Haas & Tol 2023 for methodological overview of PRP. In turn, the PRP is also building on the earlier Agro Pontino Surveys from the University of Amsterdam – Voorrips et al. 1991.

654 See thesis Attema 1993, for earliest surveys in the region. Post-doctoral research by Attema concentrated around Cori, Norma, Sezze in the Lepine foothills, Lanuvium in the Alban Hills and Signia in the Sacco Valley. The results are published in several articles, see below.

655 Attema, de Haas & La Rosa 2004.

656 The surveys around Nettuno and Astura used blocks of 50 by 50 or 30 by 30 metres when visibility conditions were good, with diagnostic sampling with 50 or 100 percent coverage in case of a site. If this was not the case, an unsystematic grab sample was collected (Attema et al. 2008; Attema, de Haas & Tol 2010; Attema, de Haas & Tol, 2011). Protohistoric sites were surveyed at 100 percent coverage (total sample) because of their low find density. Within the scope of making the Carta Archeologica di Nettuno (Attema, de Haas & Tol, 2011) and the PhD project of Tol (2012), many sites in the Nettuno – Astura area were revisited and mapped in more detail.

657 The first time GPS was used during PRP surveys was in 2004 during the Nettuno survey (De Haas 2011b, 19).

658 Period studies: see Tol 2012 for Roman (Imperial) period in coastal region, De Haas 2011 for (early) Roman period in the Pontine region, Satijn 2020 for Late Antique period, Alessandri 2009 for Bronze Age in coastal region. For geo-archaeological studies, see van Jooken 2003 and Feikens 2014.

659 De Haas & Tol 2023; for Minor Centres Project (2011–2016) see Tol et al. in prep. and De Haas et al. in prep.

660 The Pontine Region Project also carried out surveys in the area of Segni, which is according to the definition used in this study for the Pontine region, outside of the research area because it is situated east of the Lepine Mountains.

661 Unsystematic collection strategies are grab samples, which are taken without a clear coverage or collection strategy and samples which are taken without a consistent strategy, for example string samples in the earliest surveys.
This prevents biases in relation to sampling strategy. It also implicitly assumes that the selected sites have equal sampling fractions.662

The dataset can be narrowed down considerably based on these four considerations. Due to unsystematic field methods and incompleteness of data (criteria 2–4), data from twelve surveys are excluded.663 In general, all data from the period before the first systematic block surveys is excluded either due to issues with reliability of the adopted survey method664 or because of the incompleteness of (digital) datasets. This leaves us with a detailed and reliable dataset consisting of 111 sites in the Pontine plain and 56 sites in the coastal area between Nettuno and Astura with a certain Republican phase.665

Step 2: site selection for assemblage analysis

By now, the dataset has been narrowed down considerably based on survey methodology and chronology. The next step is to select sites based on location and ceramic assemblages. Whereas location is of importance to answer questions mainly related to distribution networks (Chapter 6), the assemblages provide information on consumption patterns (Chapter 7 and 8). These two considerations lead to the formulation of new selection criteria.

Assemblage analysis

The analysis of site assemblages is both part of the sampling strategy and the study of consumption patterns (Chapter 7 and 8). It provides information on the availability of the different types of cooking wares and the other functional groups of ceramics used by the inhabitants of the individual sites. Consequently, it gives a more complete picture of what people used daily, not only for food preparation but also of how food was transported, stored and served. The data used for this analysis stems from the PRP database. Therefore, the PRP find classification system needs to be considered first.

Because of the methodological development of the Pontine Region Project, not all the available data is comparable to each other. This is not only due to changes in field survey method (see above), but also because of variation in how the ceramics have been classified and an improved understanding of regional ceramic chronologies used for these classifications over time. The classification system itself shows a lot of continuity, but new groups can be added at any time, made possible by the "open" typological structure of the system.666 The selected survey datasets are all broadly classified according to the same system, which is of importance to be able to make reliable comparisons between sites.667

From the very beginning, the excavations at Satricum played an important role in how the classification system was organised. Especially for the earliest surveys, it also formed an important point of reference for the dating of ceramics. Since the majority of the collected material consists of building material and coarse pottery, with less chrono-diagnostic precision than table wares, there was a need to be able to date ceramics based on fabrics.668 This has led to a classification system whereby ceramic assemblages are sorted into seven broad groups related to chronology and/or function.669 Each of the groups is divided into smaller subclasses based on the relation between date-related wares, fabrics and function (Table I.1). This makes it possible to both assign diagnostic and non-diagnostic fragments to a functional group. As comes forward from the

662 It should be noted however that also other factors could cause biases in relation to recovery rates. Most notably variation in post-depositional processes, such as geological variation and land use (Orton 2000, 44, 47, 49–51).
663 Unreliable find densities are noted for the following surveys: Cori transect 1987, Norba transect 1987, Sezze transect 1987, Caracupo/Valvisciolo survey 1988, Cisterna regional survey 1990 (Attema 1993) and the Doganella di Ninfa survey 1998 (Van Leusen et al. 2004). Incomplete digital datasets (either spatial or ceramic) are noted for Contrada Casali survey 1986 (Attema 1993), Sezze survey 1994, Lanuvium – Albano survey 1995 (only fabrics are published, see Attema & Van Oortmerssen 2001) and Norba – Cori survey 1995 (Van Leusen et al. 2004). The surveys around Lago di Foggiano were also carried out with variability in coverage (Attema, de Haas & la Rosa 2004).
664 Mainly caused by inconsistency in coverage or vagueness about the method. For example, for the on-site surveys at Valvisciolo and Contrada Casali (Attema 1993), it is unclear what the spatial selection strategy was for the taken sample and how much of the sites is actually covered by the survey.
665 The remaining datasets are for the Pontine plain the Pontinia 2007 and Norba 2008 surveys (De Haas 2011) and the Minor Centres data (Tol et al. in prep.; de Haas et al. in prep.). For the Nettuno – Astura region the datasets consist of the Astura 2003 survey, the Nettuno 2004 survey (Attema, de Haas & Tol 2011) and the data collected and published in Tol 2012 and de Haas 2011. Only the sites with a certain Republican phase based on diagnostic ceramics are counted. The coastal dataset contains a further 47 sites with a possible Republican phase (see overview table Tol 2012, 81–83; table 3.5).
666 Attema et al. 2003, 322.
667 Millett 2000, 54.
669 The seven groups are: 1. lithics, 2. impasto pottery, 3. building materials, 4. other pottery, 5. metal/bone/glass/stone, 6. unidentifiable ceramics and 7. production debris.
### Table I.1. Overview of the main functional types in the PRP classification system and their respective sub-codes. The underlined groups mark those groups that needed further alteration.

<table>
<thead>
<tr>
<th>PRP old classification code_orig (NE + AS)</th>
<th>PRP old description</th>
<th>Equivalent in PRP (MC) functional classification system</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Lithics</td>
<td>Lithics</td>
</tr>
<tr>
<td>2</td>
<td>Impasto/hand made – plain impasto</td>
<td>Indet</td>
</tr>
<tr>
<td>2a</td>
<td>Plain impasto</td>
<td>Kitchen ware</td>
</tr>
<tr>
<td>2a1</td>
<td>Plain impasto</td>
<td>Kitchen ware</td>
</tr>
<tr>
<td>2a2</td>
<td>Red augite impasto</td>
<td>Kitchen ware</td>
</tr>
<tr>
<td>2a3</td>
<td>Thick red augite impasto, (Archaic) dolium</td>
<td>Storage</td>
</tr>
<tr>
<td>2b</td>
<td>Burnished impasto</td>
<td>Table ware</td>
</tr>
<tr>
<td>2c</td>
<td>Impasto rosso</td>
<td>Table ware</td>
</tr>
<tr>
<td>3</td>
<td>Architectonic material</td>
<td>Architecture</td>
</tr>
<tr>
<td>4</td>
<td>Other pottery</td>
<td>Indet</td>
</tr>
<tr>
<td>4a</td>
<td>Impasto chiaro sabbioso</td>
<td>Table ware</td>
</tr>
<tr>
<td>4a1</td>
<td>‘Thin’ chiaro sabbioso</td>
<td>Table ware</td>
</tr>
<tr>
<td>4a2</td>
<td>‘Thick’ chiaro sabbioso</td>
<td>Storage</td>
</tr>
<tr>
<td>4b</td>
<td>Coarse ware</td>
<td>Mix Table (60%) / Kitchen (23%) / Indet (16%)</td>
</tr>
<tr>
<td>4b1</td>
<td>Thin coarse ware (&lt;5 mm)</td>
<td>Mix Table (26%) / Kitchen (72%)</td>
</tr>
<tr>
<td>4b2</td>
<td>Medium coarse ware (&gt;5&lt;10 mm)</td>
<td>Mix Table (26%) / Kitchen (72%)</td>
</tr>
<tr>
<td>4b3</td>
<td>Thick coarse ware (&gt;10 mm)</td>
<td>Special function</td>
</tr>
<tr>
<td>4b4</td>
<td>Loomweight</td>
<td>Kitchen ware</td>
</tr>
<tr>
<td>4b5</td>
<td>Pompeian red ware</td>
<td>Transport</td>
</tr>
<tr>
<td>4c</td>
<td>Amphorae</td>
<td>Table ware</td>
</tr>
<tr>
<td>4d</td>
<td>Depurated ware</td>
<td>Table ware</td>
</tr>
<tr>
<td>4d1-2</td>
<td>Depurated ware thin to medium</td>
<td>Storage</td>
</tr>
<tr>
<td>4d3</td>
<td>Thick depurated ware (&gt;10 mm, not amphora)</td>
<td>Special function</td>
</tr>
<tr>
<td></td>
<td>Depurated loomweight</td>
<td>Special function</td>
</tr>
<tr>
<td>4d4</td>
<td>Black gloss ware</td>
<td>Table ware</td>
</tr>
<tr>
<td>4e</td>
<td>Terra sigillata</td>
<td>Table ware</td>
</tr>
<tr>
<td>4f</td>
<td>African red slip ware</td>
<td>Table ware</td>
</tr>
<tr>
<td>4g</td>
<td>Other fine wares</td>
<td>Table ware</td>
</tr>
<tr>
<td>4h</td>
<td>Oil lamps</td>
<td>Special function</td>
</tr>
<tr>
<td>4m</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Indet</td>
<td>Indet</td>
</tr>
<tr>
<td>7</td>
<td>Production debris</td>
<td>Special function</td>
</tr>
</tbody>
</table>
table below, the function `food preparation` consists of ceramics from chronological group 2 (impasto pottery – Archaic) and group 4 (other pottery – Roman and later). Throughout the various phases of the PRP, each subclass is counted and weighted per sample and entered in the database.

Both the initial classification and the more detailed study of individual diagnostic sherds are of importance for this study. The initial classification records finds according to functional categories, which are the basic groups for the assemblage study. After initial sorting, a selection is made of diagnostic fragments. Diagnostic pieces are generally rims, handles, bases and decorated fragments (painted, stamped, relief-decorated). The selections are numbered and described in more detail. For each individual diagnostic fragment, the following information is recorded: sherd number (relates to each individual diagnostic fragment, the following

For this study, the coastal data needed to be reclassified to be compatible with the data from the plain. This was done through the link between the coded labels from the old PRP data (Table I.1 column 1 and 2) in relation to their functional categories, which matches with the categories used for the classification of the data from the plain (Table I.1, column 3). Three groups could not directly be reclassified: 4b; 4b1 and 4b2. These contained a mix of table ware, kitchen ware and indet fragments.

Based on how the diagnostic fragments of these groups were assigned to different types, the sum of these groups has been divided across the different functional categories. The reclassification is carried out in R to improve reproducibility.

To avoid further biases, only sites with a comparable sampling strategy were considered. This means that sites for which only a grab sample is available, or which, for whatever reason, were only partly mapped, are excluded from the analysis. In addition, preference has been given to sites with only Republican phases. This is because the functional classification does not differentiate between Republican and Imperial period materials. However, due to the nature of the coastal dataset, the selected coastal sites include some sites that extend into the 1st century AD. The site chronology is important to take into account since most of the ceramics do not provide chronological information but are merely ascribed to a functional group based on ware.

Assemblage analysis: method

The assemblages are examined on different levels. Firstly, for each individual site it is determined which cooking ware forms were retrieved and in which quantities. This is part of the sample selection strategy (step 2) and combined with the locational data (step 1) it has led to the selection of sites that will be examined in more detail (see below for the selection criteria) in this study. Secondly, the assemblage of the selected sites will be analysed based on the functional ceramic categories used within PRP (Table I.1). These functional categories are defined based on the combination of ware/fabric and form data. They overlap with the `coded` system of the older surveys.

672 Bouma 1996 (Satricum); Di Mario 2005 (Ardea); Dyson 1976 (Cosa); Lambrechts 1989 (Artena); Bertoldi 2011 (Rome). These publications are all related to excavations.
The assemblage analysis is carried out based on the counts of fragments for each functional and form group. It will provide information on the individual sites but is also aimed at comparison between sites to detect differences in overall consumption patterns. To detect divergent consumption patterns on the local level (Chapter 7) and on the level of individual sites (Chapter 8), the assemblages are compared to the background pattern of the region or the local area. To do so, a regional and local baseline is created based on the classification of functional categories and diagnostic fragments. The assumption is that these baselines represent the average Republican ceramic assemblage (Chapter 7). The data is based on counts but converted to percentages to be able to also compare assemblages of varying sizes. The data will thus be compared based on relative presence of each functional group rather than absolute numbers.

The proportional comparison of assemblages is only robust when the assemblages are of a similar size. This is not the case for the site assemblages in this study. Therefore, an additional statistical step is required to examine the significance of detected deviations. This method is based on the method developed by the ager Tarraconensis survey. It is aimed at detecting site level variations in comparison to the baselines by subtracting the proportions of each group on the site level to the proportions of the baseline assemblage. It therefore provides a range of deviations from the baseline for each site.

However, the Tarraconensis method does not provide any guidelines on when a deviation is considered to be significant. To be able to decide when a site level deviation from the baseline is significant, I added an extra step to the method by calculating z-scores. The z-score is a measurement of how many standard deviations above or below the mean each percentage on the site level is in comparison to the mean of the baseline. The z-score is calculated with the following formula:

\[
\text{Z-score} = \frac{\% \text{ functional group site} - \text{mean of } \% \text{ functional group baseline}}{\text{standard deviation of the functional group baseline}}
\]

Z-score values can be positive, indicating a higher number than expected, or negative, indicating a lower number. Z-scores surpassing 1 represent a standard deviation of the data of more than 1. These are considered to be significant within the data analysis, especially when they are combined with outstanding proportional deviations from the baselines.

**Site location**

The second factor considered in the selection of sites is location. Distribution and consumption patterns are influenced by location. Variation in accessibility of the landscape, either natural or in relation to infrastructure, affect how easy it was to obtain products. Central places played an important role in the distribution of goods in rural areas. A central place can vary considerably in size, from minor road stations such as Forum Appii, to urban centres like Antium. However, they share that they are places where different functions (administrative, economic etc.) are available to the surrounding rural population.

The selected sites need to cover a range of distances to infrastructure and central places, which is assessed by applying spatial analysis. This is of importance because for sites located near central places or with easy access to infrastructure and therefore a fast route towards central places, it was presumably easier (more economical) to obtain products than for sites located further away or in less accessible parts of the landscape. Site location in relation to distance to central places, infrastructural networks and natural boundaries thus influences ease of access to products.

**Sampling criteria step 2**

On the basis of site location and the ceramic assemblages, it becomes possible to narrow the dataset down further. To select the sites which will be studied in more detail, three criteria have been formulated.

1. The selected group of sites must encompass both sites dated to the entire Republican period as well as sites dated to the Early/Mid-Republican and Late Republican period only to detect possible temporal changes in consumption patterns.

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675 The assemblages also have weight data. There was not a significant difference in the proportions within each assemblage based on weight in comparison to count.

676 Bishop 2016, 60–62.


679 De Haas 2017.
Figure I.2. Location of Republican sites in the Pontine plain and coastal area with different buffer zones around the central places. All the Republican sites are part of the assemblage analysis. Sampled sites are marked with their site identification number.
2. The selected sites must show variation in assemblage composition on the inter-site level based on relative values of the functional categories.

3. The selected sites must cover variation in distance to infrastructure and central places.

The first criterion relates to the collected assemblages from the Republican sites. To ensure that differences in ceramic assemblages and fabrics are not caused by sampling biases but relate to actual diachronic change (or continuity) in pottery consumption, it is of importance to sample sites with only a Mid- or Late Republican phase as well as sites which span the whole Republican period. This also ties in with the next sampling phase, when specific types in relation to chronology are selected for sampling.

The second criterion of inter-site assemblage variation relates to the aim of detecting possible differences in consumption patterns. Although most sites resemble small farmsteads, minor variations in function (and size) probably did exist between them.

The last criterion relates to site location and can be examined based on the spatial distribution of the Republican sites. By creating maps with boundaries around central places and infrastructure as buffer zones, it becomes possible to group sites based on distance to these features. The thresholds for the boundaries are based on walking speed in a flat landscape. The Pontine region has little relief, and the assumption of a flat landscape is therefore valid. From each buffer group a couple of sites are selected for further analysis.

What immediately becomes apparent from the buffer map is the difference in site location between Ad Medias and Forum Appii (Figure I.3). This probably reflects a real difference in settlement pattern in the surroundings of these two minor centres. Around Ad Medias, there is a clustering of rural sites within an area of 3 kilometres and a distinct fall-off pattern beyond this point. For Forum Appii, the settlement pattern is reversed, with very few sites in its direct vicinity and an increase in site density beyond 3 kilometres.

Based on these criteria, the dataset was narrowed down to 21 sites for the Pontine plain and 16 sites for the coastal region. The next step was to select the sites which will be studied in more detail during the petrographic analysis, for which the presence of specific ceramic types needs to be considered.

**Step 3: selection of types**

The selection of specific types for sampling implicitly assumes a relation between morphological form and function or use (see Chapter 7.3 for more extensive discussion on fabric, form and function). This study focuses on cooking wares and therefore also assumes a higher-level relation between fabric and function. The form itself is believed to relate to different ways of preparing food involving the use of fire, either by boiling, frying or baking and thus a relation to a specific cooking method while the fabrics are presumably fitting for use above or in a fire.

The final selection step based on the legacy data from the PRP was the selection of specific cooking ware types. Important considerations were:

1. The selected samples must cover different chronological periods.

2. The selected samples must cover different cooking ware forms, representing different methods of cooking.

These two criteria are of importance because of the aim to trace change and continuity in consumption patterns in relation to foodways over time as well as between sites. The typology for cooking wares as formulated by Olcese is the general starting point both for types and for chronology. Table I.2 gives an overview of the different selected cooking ware types, their dates and proposed use for the Republican period and their presence at the sites selected for macroscopic analysis.

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680 Average walking speed is generally thought to be 5 kilometre an hour (Bintliff 2008).
681 This observed pattern is statistically reliable, especially for Forum Appii and not caused by methodological biases although the sample size is small. See Verhagen 2016b (unpublished) for statistical analysis and possible reasons for the observed patterning of the Minor Centres data. However, it cannot be excluded that sites are covered by colluvial deposits in the area directly south-west of Forum Appii.
682 Olcese 2003.
683 See also Chapter 2.
Daily life in the Roman Republican countryside

By sampling consecutive types of the same general form, possible changes in production choices and distribution can be detected. The ollae (jars), tegami (frying pans) and clibani (portable bread ovens) all represent a different method for food preparation involving heat. This study focussed on these three groups of forms. The fourth type group comprises lids (coperchi), which are mainly associated with jars in general.

Based on the availability of different types on different sites in relation to site location and site chronology, the dataset has been narrowed down further. Eight sites have been selected in both the Pontine plain and the coastal area based on the aforementioned criteria (see Figure I.3). The selected sites in the plain yielded a total of 2,836 kitchen ware fragments, of which 323 are ascribed to one of the selected types. The selected sites in the coastal region yielded a total of 1,848 kitchen ware fragments (based on the
reclassification), of which 141 are ascribed to one of the selected types. These 464 fragments form the basis for the macroscopic analysis.

Creation of new data

Whereas the previous part of this chapter dealt with existing data, we now move beyond the legacy data into the acquisition of new data through petrographic analysis. In contrast to the first part, which made use of data collected during previous phases of the PRP and with their own research questions, the petrographic analysis is motivated by the aims and questions of the current study.

The petrographic study consists of two steps. Firstly, the macroscopic examination of the selected types from the selected sites in respectively the Pontine plain and the coastal area. Secondly, the thin-section analysis of a sample taken from the different fabric groups recognised on the macroscopic level.

Step 4: macroscopic analysis of selected types: selection of variables

There is a wide variety of variables which can be studied under the microscope. To avoid losing too much time on describing features which may not be relevant for the study of pottery production, distribution and consumption, some focus was needed. Which variables were studied was guided by the research questions. To safeguard uniformity in what and how characteristics were recorded, a database with two forms was created (Figure I.3).684 The first form (ARTEFACT) records general information on location, sherd_ID, macroscopic fabric, thin-section fabric and if drawings and photos are available. The second form (FRACTURE) focusses on the breaks and notes fabric characteristics. Both forms are linked to the general PRP database through the Sherd_ID. Two more forms are created that contain the metadata on the macroscopic fabrics (lookup_MFABRIC) and thin-section fabrics (lookup_FABRIC). These contain the summaries of the recognised fabric groups with photos.

There is currently no standard for describing Roman (Italian) macroscopic fabrics, leading to variation in descriptions complicating comparison between archaeological projects.

The choice is made to use the PRP method to be able to compare to regional known fabrics (see below).

The use of forms with standardised terminology streamlines the macroscopic analysis and facilitates comparison between the studied fragments. On the forms, a variety of features is listed relating to the examined characteristics as well as more general information.685 The form intends to solely record traces of production and use and therefore does not contain interpretations such as how these traces are created. For example, a sherd entry mentions that the surface has a bright orange colour, a gritty texture and regular groves. These descriptions are later interpreted as signs of an oxidising firing atmosphere, the use of a coarse clay paste and forming on a fast wheel. For the examination, a Dino-Lite AM4815ZT microscope is used.

Broadly speaking, the examined characteristics of the ceramic fragments are divided into two hierarchical categories that are used for sample selection for thin-sectioning: a) variation in inclusions and clay and b) typological variation. This leads to the division of the selected sample in fabric groups, which are subdivided into type groups. Both fabric and morphological type are determined during the production process and therefore relate to behavioural chain and the technological choices made by the potter (Chapter 4),686 but they also provide information on distribution networks (Chapter 6) and consumption practices (Chapter 7 and 8). Because some characteristics are more time consuming to record than others, choices needed to be made. Below is indicated per category if characteristics are recorded for each sample or for a part of the sample. Partial recording is done based on petrographic fabric groups. A separate category of characteristics is formed by use-wear traces, specifically blackening of the surface.

A) Macroscopic fabrics

Macroscopic fabric analysis of ceramics has from the outset been part of the PRP, although it has not continuously been executed. Previous macroscopic analysis was carried out for the excavated material from Satricum and on material collected during the surveys around Sezze, Segni687 and Lanuvium.688 This

684 The form is created using Access and is linked to the PRP Access database ARTEFACT table based on sherd number. The database with the macroscopic and thin-section classification can be found on: https://github.com/FVerhagen/Thesis-Roman-Daily-Life.
685 See also Moody et al. 2003 for importance of using standardised forms.
686 See Chapter 3 for explanation of behavioural chains and technological choices.
687 Attema et al. 2003.
has led to a regional fabric database and the creation of a fabric reference collection. Although the focus of the PRP fabric analysis has been on the pre-Roman period, the employed method is also suitable for Roman ceramics. Furthermore, it makes it easier to compare the fabrics resulting from this study to documented regional fabrics when described in a similar way. The PRP fabric method has a hierarchical structure, with colour families at the top, further subdivided into fabric groups based on variations in the type of inclusions, sorting, size and quantity of inclusions and hardness, porosity and fracture of the sherds. The method is largely in line with the macroscopic method of Peacock and Williams (1986) used for the study of Roman amphorae and the method of Tomber and Dore (1998) used for the National Roman Fabric Reference Collection (NRFRC) in Britain.

There are two main points of adjustment made to the pre-existing PRP method for this study.

Firstly, the previous PRP fabric research used code names as names for the fabrics. The advantage of code names is that all the important characteristics of each fabric are captured within the name. It is however very complicated to understand these names precisely because they are completely coded. Therefore, the choice is made to use descriptive names within this study instead of the coded names of earlier PRP fabric research.

Secondly, the importance given to colour. The PRP fabric research method emphasises colour differences as the most distinctive feature between fabrics. There are three main groups, red, orange and pale firing, which form the top of the fabric hierarchy. These groups are based on refiring experiments and the connection between refired colours and the colour of sherds in hand specimen. Although there is a good scientific argument to be made for this division in the case of the pre-Roman fabrics from the Pontine region, it is not tested for the Roman period material. Furthermore, colour is not only influenced by the clay properties and firing atmosphere, but also post-depositional processes and use can alter colour. Colour changes as a result of use especially affect cooking pots in a variety of ways. The exterior can change colour through contact with the fire and repeated heating, while the interior can be discoloured due to what was prepared in the vessel. These so-called use-wear traces provide important information on consumption and use and will be studied separately within this study (see below).

Macroscopic analysis: grouping into fabrics

Making detailed descriptions of fabric groups is time consuming. A considerable amount of material will was studied during the macroscopic analysis, but because of time constraints not each individual sherd fracture has been described. Instead, each fragment was assigned to a macroscopic fabric group in the artefact table. The full macroscopic fabric descriptions can be found in Appendix III. Summarised fabric descriptions are entered into the database in the lookup_fabric form.

The grouping of the samples into macroscopic fabric groups is based upon the observed characteristics of the clay paste. Variation in typology is only considered at the next sampling step. Minor colour differences between samples are considered to be technological or use related and are thus not used as a discriminant factor for the fabric grouping. Grouping of materials based on visual characteristics is heavily embedded in the human brain. We have the natural ability to quickly and intuitively detect differences and similarities. This is often referred to as ‘feel’, and plays a key role in petrographic grouping. Despite the fact that this is influenced by experience and difficult to describe, standardisation to how differences are described and clarity on which features are used as discriminating factors provide a more ‘scientific’ base. Inclusions are in this study used as the first discriminator.

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689 The reference collection is stored at the Laboratory for Conservation and Material studies at the University of Groningen. Descriptions and photographs of the coarse ware and impasto fabrics are also available online at www.lcm.rug.nl.
690 An example of one of the most common fabrics in the region is SAT I(II).AD*.ms-vps(1-4).a, a variety of characteristics(slightly) gritty. This code translates as following: Satricum red firing, with some orange firing, predominantly quartz/feldspar inclusions (can only be determined under microscope), moderately to very poorly sorted (particle size big to absent), more than 20% inclusions, with a variety of characteristics and gritty texture. For the key to the code, see Attema et al. 2003.
692 This deviates from the PRP fabric analysis method, see above.
693 Quinn 2013, 73.
694 Shepard 1971, 97–102.
695 In most macroscopic fabric studies, fabrics are initially recognised based on inclusions, see for example Moody et al. 2003 for the Sphakia Survey, Peacock 1977 for Carthage and Haggis & Mook 1993 for the Kavousi coarse wares. To determine these characteristics, the same comparison charts as for the thin-section analysis were used. When an inclusion could not be
only are inclusions geologically bounded, but their composition, size, sorting and frequency can also be altered during clay paste preparation. Inclusions also, but not exclusively, affect the surface texture (when not coated), feel and fracture mode.

The focus on inclusions differs from the PRP method previously used for fabric studies, whereby colour was the first discriminant, followed by inclusions. A pilot study carried out previously showed that the inclusions in Olcese olla 2 and 3A fabrics are varied enough to function as a basis for fabric classification.696

B) Typological variation

Even though Roman cooking ware production at first sight comes across as having a highly standardised form repertoire, minor differences do occur.697 These can relate to them being produced by different potters and/or production centres and therefore provide additional information on variation in production location and complexity. To map variation in rim shapes, most ceramics selected for thin-section analysis were drawn because of the destructive nature of making thin-sections (Appendix II).

Production technology

Traces of production technology examined for the macroscopic analysis are limited to recording slip layers (finishing) and firing atmosphere. The colour on the in- and exterior is recorded as well as colour variation within the walls based on the classification of Rye to reconstruct firing conditions (see Chapter 4).698 The thin-section analysis encompasses a complete examination of all the steps in the production process. This is described in detail for each fabric in Appendix III.

Use-wear traces: blackening

Alteration caused by use explicitly relates to cooking practices and foodways, but the examination is restricted to discolouration in this study. This choice is made mainly because of the nature of the material; being highly fragmented and weathered due to post-depositional processes, especially ploughing, abrasive use-wear traces are lost or difficult to distinguish from post-depositional alteration.699 Abrasion in relation to use is for that reason difficult to examine in survey assemblages.

Use which caused discolouration might attentively be observed since colour is less affected by weathering. Yet, differentiating between if the observed colour relates to firing during production or firing during use can be complicated. Furthermore, mainly the bases and walls of cooking pots were probably in direct contact with fire. Since only rims were examined for this analysis, traces of blackening are therefore rather limited. On the other hand, discolouration related to what was cooked inside the vessels might have left traces on the interiors of vessels. Interior carbonisation is caused by the charring of food and different kinds of cooking methods (wet vs dry) cause different patterns. Parts of the prepared food either stick to or are absorbed by the walls. 700 Other factors which can cause blackening are the relation between the pot and the fire (hearth design, how the vessel was placed and fuel type), vessel size and thermal conductivity of the fabric.701 The occurrence of blackening and the location of blackening will be recorded on the same form as other surface features.

Step 4: selection criteria for thin-section analysis

It is surprising how little has been written on how to select a representative sample for thin-sectioning. Most studies do not elaborate, or only briefly, on the sampling strategy behind sample selection. This makes it look as if most samples are selected rather ad hoc without a clear reasoning behind it. Although whether this is really the case is impossible to judge. Commonly, it is only stated that a representative sample is taken based on macroscopic fabric grouping. What is deemed representative and how to judge this is usually not elaborated upon.

For the Pontine plain and the coastal area, fifty sherds were selected for thin-sectioning from each area, leading to a total of one-hundred thin-sections. The thin-section sample was selected based on the following criteria:

1. Selection of different vessel types within the same macroscopic fabric group.

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697 There are, for example, local cooking ware varieties known in the Pontine plain (Tol & Borgers 2016).
698 Rye 1981, 116; fig. 104.
699 For examples of use-wear studies on Roman ceramics, see Banducci 2021 for the sites of Musarna, Cetamura del Chianti and Populonia and the ongoing Pompeii Artifact Life History Project of the University of California (Berkeley) directed by prof. Peña.
700 Banducci 2013, 89–91; Skibo 2013.
701 Skibo 2013, 98–99.
2. Preferably at least three samples of each macroscopic fabric group need to be selected.\(^{702}\) This selection must represent both the ‘average’ and possible outliers from the same group.

Because Olcese olla 2 and 3A fragments have been sampled already during a previous phase of the PRP, other type groups will be given preference even though ollae form the largest type group within the sample.\(^{703}\) This means that the sampling of types will not be done according to percentile presence of the types or ‘stratified’ sampling.\(^{704}\) Instead, the sampling strategy for thin-section analysis can be characterised as an informed formal sample based on previous knowledge consisting of the macroscopic analysis and available thin-sections for the region.

The requirements of a sherd for thin-sectioning also needs to be considered. Sherds should preferable have a length of at least 3 centimetres. Walls and rims are preferred because bases and handles are sometimes made with a different forming method.\(^{705}\) Both these aspects are generally met for the survey material.

**Step 5: thin-section analysis**

The aim of the thin-section analysis is twofold. Firstly, to gain more in-depth information on ceramic technology (Chapter 4) and provenance (Chapter 6). Secondly, to check the correctness of the macroscopic fabric grouping and to gain more insight in the degree of standardisation within each fabric group, which in turn can be related to production organisation (Chapter 5).

The method of thin-section analysis for archaeological ceramics is ‘borrowed’ from sedimentology and geology. Whereas earlier ceramic petrography studies were mainly aimed at reconstructing provenance based on a match between ceramic fabrics and geology, studies from the late 1980s onwards also started to consider production technology. This led to the awareness of how potters manipulate their raw material sources to obtain the desired vessels. Because of this realisation, new methods for ceramic petrography were developed that also consider human agency.\(^{706}\) This crystallised into the method developed by Whitbread (1995) and refined by Quinn (2013), which is also the method used for this study.

The outcomes of thin-section analysis depends on the coarseness of the examined fabrics and the mineral and technological homogeneity of the sample. Mineral variation is partly connected to geological variation. In regions with a wide variety of mineralogical inclusions, it will be easier to pinpoint the provenance of a fabric than for areas with a very monotone geology. In the case of Central Italy, large areas are characterised by volcanic inclusions, making provenancing complicated but not impossible.\(^{707}\) Concerning coarseness, only cooking wares were analysed, which is a group of ceramics which is, at least in the Republican period, characterised by its coarse nature.

**Thin-section preparation and equipment**

The preparation of thin-sections is a destructive exercise. However, in comparison to chemical analysis thin-sections have the advantage that they can be re-studied. Thin-sections are pottery slices with a thickness of 30 µm placed in between two transparent glass slides. The standard thickness makes it possible to recognise minerals based on their known optical characteristics when light passes through.\(^{708}\) The samples are handmade by cutting the sherds and grinding them down to the required thickness. The thin-sections for this study are made by the commercial company Servizi per la geologia Massimo Sbrana in Piombino (Italy). For the examination, a Dino-Lite AM4815ZT microscope is used in combination with the Dino-Lite MSBL-ZW1 polarising back-light. The magnification range of this microscope is 20x–200x. Both plane polarised light (PPL) and crossed polarised light (XP) are used. Photographs of the fabrics are made with the camera integrated in the microscope.

The thin-sections were analysed according to the qualitative descriptive method of Quinn (2013). This starts with the grouping of the samples, followed by visual characterisation of the groups.

\(^{702}\) Quinn 2013, 129–130.
\(^{703}\) Olla 2: 16 samples (of which 5 are taken from sites selected for this study in the plain) 3 fabric groups. Olla 3A: 28 samples (of which 9 are taken from sites selected for this study in the plain), 4 fabric groups. These samples are not added to the data from this study because they are not yet published.
\(^{704}\) Orton 2000, 30, 182–183. In the case of stratified sampling for the plain sample it would lead to the selection of 41 ollae fragments, 7 lids, 1 baking cover and 1 tegame. This would not be very informative for the study of shared fabrics between types and variation in technology within type groups.
\(^{705}\) Quinn 2013, 22.
\(^{706}\) Reedy 1994, 121.
\(^{707}\) For discussion on local geology, see Section 2.3.1.
\(^{708}\) Freestone 1995; Quinn 2013, 23–33.
Appendix I. Methodology and sampling strategy

This is the same hierarchy as is used for the macroscopic fabric analysis.

Grouping of the thin-sections in fabric groups is the first step of the thin-section analysis and was done according to the same principle as the one adopted for macroscopic fabric grouping. Initial grouping is executed on a low magnification. Thin-sections are compared to each other and grouped based on similarity in inclusions, amount of inclusions and other prominent features. How easy it is to detect groups depends on the degree of difference between the samples. If the differences are less obvious, higher magnification is needed to check reliability of the grouping. In the case of larger datasets, it is advisable to check consistency within the groups by cross-checking.

Whereas fabric groups are differentiated from each other based mainly on differences in clay types (matrix) and inclusions, sub-groups are defined based on minor variations in for example the amount of inclusions and voids. These sub-groups indicate a shared geological area based on the inclusions they share with the larger fabric group and might relate to variation in technology. This variation can be related to either changes over time or variation in technology and production organisation between different potters or production centres in the same region.

The thin-sections were described according to the qualitative descriptive system as developed by Quinn. The descriptions describe the three components of a fabric – inclusions, matrix (clay) and voids – in a systematic way. The advantage of using a descriptive method is that all elements visible in a fabric can be described, even if they are not immediately recognised. To aid comparison between fabrics, description are standardised by using a set of comparison charts and restricted terms. For this study, so-called ‘full’ descriptions are made, noting detailed information on inclusions, matrix and voids. The used format and thin-section fabric description can be found in Appendix IV.

**Selected sample**

In the end, the sampling strategy led to the targeted selection of 100 thin-sections out of the initial 286,078 ceramic fragments that are reported in the PRP database. An overview of the sampled cooking ware types and the number of fragments selected for macroscopic and thin-section analysis can be seen in Table I.3.

A more extensive overview of the 100 selected samples, with information about their exact sherd_ID; the site it was found on; type, macroscopic and thin-section fabric; firing conditions and drawings is presented in Appendix II. Appendix III presents the format used for the macroscopic fabric descriptions as well as the descriptions, including pictures, of the macroscopic fabric groups (M-fabrics). Appendix IV in turn presents the fabric groups based on the thin-section analysis. Finally, Appendix V is focussed on the presentation of the assemblages from the 16 selected sites.

<table>
<thead>
<tr>
<th>Olcese type</th>
<th>N macroscopy</th>
<th>N thin-section</th>
<th>Olcese type</th>
<th>N macroscopy</th>
<th>N thin section</th>
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<tbody>
<tr>
<td>Olla 1</td>
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<td>Tegame 1</td>
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<td>Tegame 2</td>
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<td>6</td>
<td>Clibanus 2</td>
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<td>Clibanus 3</td>
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<td>1</td>
<td>Clibanus general</td>
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<td>Casserole</td>
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<td>1</td>
<td>Baking tray</td>
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Table I.3. Overview of the selected types, macroscopic samples and thin-section selection.

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709 Quinn 2013.

710 Quinn 2013, 79.
Appendix II
Sample overview

<table>
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<tr>
<th>Sherd_ID</th>
<th>Fabric_code</th>
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<th>Type</th>
<th>Diameter</th>
<th>Firing</th>
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<td>V.1</td>
<td>A</td>
<td>14059</td>
<td>olla 2</td>
<td>12</td>
<td>OR diffuse</td>
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<tr>
<td>102368/02/01</td>
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<td>A, 1/D</td>
<td>14019</td>
<td>olla 2</td>
<td>20</td>
<td>ORO diffuse</td>
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<tr>
<td>102819/02/03</td>
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<td>B</td>
<td>14057</td>
<td>olla 2</td>
<td>-</td>
<td>ORO</td>
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</table>

VOLCANIC 2

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<th>Type</th>
<th>Diameter</th>
<th>Firing</th>
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<td>14002</td>
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<td>O</td>
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<td>G</td>
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<td>QF.5</td>
<td>9</td>
<td>15106</td>
<td>tegame 1</td>
<td>18</td>
<td>O</td>
</tr>
<tr>
<td>Net.06 P118/G.B./65</td>
<td>QF.LA</td>
<td>9</td>
<td>11318</td>
<td>olla 2</td>
<td>13</td>
<td>O</td>
</tr>
<tr>
<td>Net.07 T253/G.B./32</td>
<td>QFLB</td>
<td>14</td>
<td>15106</td>
<td>dibane 2</td>
<td>27</td>
<td>O</td>
</tr>
<tr>
<td>104035/04/08</td>
<td>QFLC</td>
<td>E</td>
<td>14053</td>
<td>tegame 2</td>
<td>28</td>
<td>O</td>
</tr>
</tbody>
</table>

Appendix II. Sample overview
Daily life in the Roman Republican countryside

Volcanic 1

Volcanic 2

Volcanic 3

Scale 1:2
Appendix II. Sample overview

Volcanic 4
Daily life in the Roman Republican countryside

Volcanic Loners
Quartz-feldspar 1

Net'08 T2S3/I4/4
MC 102197/02/04
Net'08 T2S3/E2/4
MC 101889/02/01
Net'08 T2S3/4/4
MC 104036/02/01
Net'07 P116/GS/9
MC 101557/01/01
Net'07 P116/GS/13
MC 104035/04/05
MC 104035/04/06
MC 104035/04/06
MC 104036/02/01
MC 104036/01/01
Net'07 P116/GS/13

Scale 1:2
Quartz-feldspar 2

Net'06 T255/GS/26
MC 101701/01/09

Net'07 GT2007_01/GS/55

Net'07 T253/GS/50
Net'08 T253/I4/5

Net'07 N.S.1/GS/8
Net'08 T253/B2/1

Net'05 4277/1/3
Net'08 T253/P6/2

Net'07 P145/GS/35
Net'07 P116/GS/35

Net'07 N.S.1/GS/9

Scale 1:2
Quartz-feldspar 2 bimodal

Appendix II. Sample overview

Quartz-feldspar 3

Appendix II. Sample overview

Scale 1:2
Quartz-feldspar 4

Quartz-feldspar 5

Quartz-feldspar 6

Scale 1:2
Quartz-feldspar Loners

Net’06 P118/GS/65

Net’07 T2S3/GS/32

MC 104035/04/08

Scale 1:2
Macroscopic fabric description format

In total, 111 fragments from the coastal area between Antium, Astura and Satricum and 317 fragments from the Pontine plain have been examined. These are divided into 27 different fabric groups based on variation in inclusion types, clay colours and abundance of inclusions. The fabric groups from the coastal zone are numbered, while the fabric groups from the plain have a letter. The numeric or alphabetic codes are supplemented with a more descriptive name. The complete classification of all the sherds and additional information on firing atmosphere can be found in the online database.

The macroscopic fabric descriptions follow a format loosely based on the FACEM method,711 descriptions for chaîne opératoires712 and the method used by the Laboratory for Material Culture Studies (Groningen Institute for Archaeology) for the description of the Satricum fabrics.713 An important element in all these methods is the verbal characterisation of the different elements of a fabric. Because language use can be very personal, I have tried to use standardised, descriptive terminology for the descriptions as much as possible.

The described components for each fabric are:

1. **Macroscopic fabric name**: based on most distinctive features.
2. **Group size**: number of samples assigned to the fabric.
3. **Colour description**: Munsell colour codes and a description.
4. **Firing method**: notes on dominant firing atmosphere (oxidising/reducing) and indication of variation within each group. The database contains information on firing method for each individual sherd.
5. **Hardness**: based on if the surface could be scratched with a fingernail.
6. **Fracture texture and direction**: fracture texture is described with the terminology of Roux for the mode of fracture. Direction can be horizontal, vertical or diagonal.
7. **Surface texture**: based on sensory feel of the texture of the surface, described using terms from Roux for (micro)topography and relief of surfaces supplemented with notes on soapiness or powderyness of the sherds. Also, any kind of surface treatment (slip) is noted.
8. **Voids (shape, size, abundance)**: voids are described using the terminology of Quinn.714 It should be noted that it is difficult to examine voids with the naked eye.
9. **Inclusions general (abundance, sorting, size range)**: for abundance, the Abundance Estimation Chart of Terry and Chilingar is used.715 Sorting is based on the chart from Pettijohn, Potter and Siever.716 Size range is measured using the Dino-Lite microscope program.
10. **Inclusion descriptions (frequency, type, colour, shape/rounding, size)**: the semi-quantitative frequency labels discussed in Quinn are used to describe frequency.717 If possible to type is noted, otherwise...

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711 http://facem.at/project/about.php#method (30 September 2020).
713 Attema et al. 2003.
714 Quinn 2013, 97–100.
715 Terry & Chilingar 1955.
716 Pettijohn, Potter & Siever 1972.
717 Quinn 2013, 89–90.
Appendix III. Macroscopic fabric descriptions

Colours are described as the indicative feature of the inclusion. Colours are described, often in combination with notes on shimmering or opaqueness. Shape is elongated, equant or rectangular. Rounding of the inclusions is based on comparison with the chart from Quinn.\textsuperscript{718} Size is measured using the Dino-Lite microscope program.

11. **Comments:** brief characterisation of the main features of the fabric and indication of any possible relationships to other macroscopic fabric groups.

12. **Photos:** photo of fresh fracture and surface of each fabric at 20x magnification taken with the Dino-Lite microscope.

Macroscopic fabric groups Pontine plain

*M-fabric A Augite and green inclusions*

Group size: 90 / 13 selected for thin-sectioning.

Colour: reddish brown to brown (2.5YR 4/4-3/4 to 5YR 3/6). Less coarse variant also in orange (5YR 5/6).

Firing: mostly oxidised, but with occasionally diffuse boundaries to the core due to either reduced phase or incomplete oxidisation. Some examples show darker (grey to black) colours, mainly on the interior.

Hardness: hard to very hard.

Fracture texture and direction: texture is gritty. Majority of fractures has a vertical direction. Longer fractures can have a diagonal orientation.

Surface texture: in the coarse variant you can clearly feel the inclusions that stick out of the surface, leading to a gritty and sandy texture. This is less pronounced for the finer variant, probably due to fewer inclusions and fewer coarse ones.


Inclusions general: inclusion abundance ranges between 10–20% for the coarse variant and 3–5% for the fine variant, but there is a gliding scale visible with a relation between abundance of inclusions and inclusion size. The finer the fabric, the better sorted the inclusions are. The most coarse variants are poorly to moderately sorted, the fine versions moderately sorted. Inclusions appear in two sizes (bimodal): 1–2 mm and 0.25–0.5 mm. The coarse group is far less abundant or even absent in the fine variant of this group.

Inclusion descriptions:

**Dominant–frequent:** augite. Black, angular to sub-rounded inclusions, angular specimen are often larger than rounded specimens. Size: 0.3–1.9 mm. Frequency depends on the frequency of green inclusions (olivine/aegerine augites) in individual fragments.

**Dominant–frequent:** olivine or aegerine augite. Dark green, tree colours, sub-rounded inclusions. Size: mostly 0.3–0.4 mm, but occasionally 0.7 mm.

**Common–few:** Rounded greyish inclusions, looks like composite of several inclusions/ rock type with quartz (granite? Microcrystalline quartz?). Size: 0.45–1.35 mm.

**Few:** mica. Black elongated, angular inclusions. Size: 0.35–0.5 mm.

**Few–very few:** clay pellets in bright to dark orange. Well-rounded. Size: 0.35–0.65 mm, occasionally 0.8 mm.

**Very few:** iron nodules. Rounded brown inclusions. Size: 1.5–2.8 mm. Only occurs in coarse variant.

\textsuperscript{718} Quinn 2013, 84; fig. 4.11.
Comments: main characteristics of this M-fabric is the very clear dominance of black, angular augites in an orange, oxidised fired clay combined with a varying amount of rounded greyish inclusions. Under the microscope they abundance of green inclusions also becomes clearly apparent. Within this group there is some variety in inclusions sizes, with a gliding scale from coarse to fine.

*M-fabric A1 Technological difference – slip layer*


The surface is thinly slipped with what looks like the same clay type but finer. It is not always as fine as a slip layer. Variation in how well the coating is preserved. On most fragments it is flaky, but there are also examples where it looks brand new and just applied. Texture fresh breaks is gritty and the sherds break into multiple pieces when cut (this did not happen with any of the other fabric groups). This group only occurs on site 14019.

*M-fabric B Dimply surface*

Group size: 30 / 7 selected for thin-sectioning.

Colour: M-fabric B has two colour groups. The orange coloured group (5YR5/8–2.5YR 5/8-5/6) and a brownish group (5YR4/3–7.5YR4/3).

Firing: oxidising, but sometimes with diffuse, incompletely oxidised core. Use seems to have left traces mainly on the inside (darker colours). Unclear if the brown colour group is brown because of different firing method (reduced) or due to use.

Hardness: hard to very hard.

Fracture texture and direction: texture is relatively fine due to the lack of larger inclusions (such as in M-fabric A). Most fractures are diagonal with steep angle, approaching vertical. Fracture structure follows the direction of the rims shape.

Surface texture: texture is smooth with slight feeling of inclusions. Dimply.

Voids: elongated voids (vughs and channels), following the rim. Size: 0.5–0.7 mm.

Inclusions general: abundance of inclusions is 3–5%. Moderately sorted. Small inclusions are predominant in sizes up to 0.4 mm. Augites also occur in a larger size but are less frequent (same for iron nodules and clay pellets but they are rare).

Inclusion descriptions:

Dominant–frequent: feldspar. Small white milk to light grey rounded inclusions. Sub-rounded to rounded. Size: 0.18–0.40 mm.

Few: augite. Black, angular. Size: 0.4–0.6 mm.

Few: olivine. Green inclusions. Sub-angular. Size: 0.4–0.7 mm.

Very few: biotite. Golden, shimmering, elongated, angular inclusions. Size: 0.2–0.4 mm.

Comments: this fabric is characterised by the relatively few inclusions in comparison to the other fabric groups. The surface is dimply and has often very few visible inclusions in hand specimen. Main characteristics of this fabric group is its more buff colour and the appearance of many small milky white to light grey inclusions (not well visible without microscope).
Appendix III. Macroscopic fabric descriptions

**M-fabric C Sandy fabric with rock fragments**
Group size: 18 / 4 selected for thin-sectioning.
Colour: yellowish light brown (7.5YR 6/4–5/4 to 5YR 5/6).
Firing: oxidised, sometimes incomplete oxidation (MC104036/3/4).
Hardness: hard to very hard.
Fracture texture and direction: texture is gritty and seems to follow the direction of the rim. Fractures are predominantly vertical, sometimes slightly diagonal orientation.
Surface texture: texture is smooth with slight feeling of inclusions. Dimply.
Voids: elongated vughs and channels, but in general very few (dense and compact fabric). Size varies between 0.5–1.3 mm.
Inclusions general: bimodal fabric with large fraction of 0.6–1.2 mm and small fraction of 0.2–0.4 mm (visible under microscope). Large fraction around 3%, small fraction (white) makes up 10–20%.
Inclusion descriptions:
Dominant: feldspar. White, shimmering, opaque inclusions. Sub-angular to angular shape. Size: 0.2–0.4 mm.
Common: iron nodules. Brown, rounded to well-rounded. Size: 1.2–1.6 mm.
Common–few: grey rock fragments, lightly shimmering and similar to the once in M-fabric A. Rounded–well-rounded. Size: 0.6–1.2 mm.
Very few: augite. Black, sub-rounded. Size: 0.7 mm.
Comments: possible relation to M-fabric A, but different on the abundance of augite and in general less coarse/fewer inclusions. Also occurs in finer variety (MC101705/1/1 and MC101700/2/1).

**M-fabric D White angular inclusions and rock fragments**
Group size: 39 / 8 selected for thin-sectioning.
Colour: bright orange to black (2.5YR 4/4–3/4–2.5Y 3/1)
Firing: varied, often oxidised but with either dark interior or exterior (use related?), however, some fragments are also fired reducing.
Hardness: hard to very hard.
Fracture texture and direction: texture is gritty (especially in the coarse fragments) and bumpy. Most fractures are vertical.
Surface texture: coarse fragments have a sandy feel due to the sticking out of larger inclusions. In general sand paper feel.
Voids: the voids consist of elongated vughs with a length of 0.4–0.7 mm. The direction of the vughs follows the margins.
Inclusions general: bimodal fabric. Small fraction is most abundant, at 10–20%. Coarse fraction varies between finer and coarser fragments, between 3–10%. Size range small fraction is 0.3–0.6 mm, coarse fraction is 0.8–1.4 mm.
Inclusion descriptions:

**Dominant–frequent:** quartz or feldspar. Small white inclusions, sub-angular to sub rounded. Size: 0.1–0.3 mm.

**Few–very few:** sanidine. Large white, shimmering, angular inclusions. Size: 0.85–1.35 mm. Only present in coarser fragments, well visible on surface.

**Few–very few:** large white-yellowish, milky and opaque inclusions (calcereous?). Shape is varied from sub-angular to rounded. Size: 0.7–1.5 mm. Only well visible in coarser fragments on the surface.

**Rare:** olivine. Green angular inclusions. Size: 0.6 mm.

**Few:** bright orange, well-rounded inclusions (clay pellets or iron stained chert?). Size: 0.4 mm.

**Few:** iron nodules. Well-rounded. Size: 0.5–1.4 mm. Frequency: few.

Comments: defining feature is the (almost) absence of black augite, however, green inclusions (olivine) do appear occasionally. Furthermore, characterised by abundance of quartz/feldspar in combination with bright orange clay pellets and iron nodules in the coarse fragments. There is a rather large variation in the amount of inclusions within this group.

**M-fabric E Sand and mica**

Group size: 14 / 3 selected for thin-sectioning.

Colour: pinkish light brown (2.5YR 5/3–5YR 5/3).

Firing: oxidised, sometimes with either reducing phase or use-related darker coloured discolorations (for example lid MC102196/1/6, blackened inside).

Hardness: very hard.

Fracture texture and direction: fracture texture is laminated. Orientation of fractures occurs both in vertical and diagonal directions.

Surface texture: surface is relatively smooth, feels like very fine grained sand paper.

Voids: no voids visible.

Inclusions general: abundance is 5–10%. Fine fraction is dominated by rounded, white, shimmering inclusions and small black mica in size smaller than 0.4 mm. The slightly larger fraction in 0.6–1.3 mm, is far less abundant but more varied in its composition. The most noticeable inclusion type is well-rounded, light grey, opaque that looks calcereous.

Inclusion descriptions:

**Frequent:** very small white, shimmering inclusions (sanidine?). Sub-rounded. Size: < 0.25 mm.

**Common–few:** black elongated/rectangular inclusions with slightly rounded corners, sub-angular (mica?). Size: <0.35 mm.

**Very few:** aegerine augite or olivine. Green inclusions, sub-angular. Size: 0.3–0.6 mm.

**Few:** augite. Black inclusions, angular to sub-angular shapes. Size: 1.0–1.2 mm.

**Few:** opaque whitish inclusions (calcereous?). Well-rounded to sub-rounded. Size: 0.6–1.3 mm.

**Very few:** iron nodules. Well-rounded. Size: 1.3 mm.

Comments: defining feature of this fabric is the lack of a coarser fraction. The main inclusion types are black
mica and small, rounded white inclusions (sand). Other inclusions are olivine (green), black and green augite and greyish, opaque inclusions.

**M-fabric F Finer fabric with clay pellets and no black inclusions**

Group size: 6 / 2 selected for thin-sectioning.

Colour: light orange-pink to grey (2.5YR 5/3–5YR 5/3).

Firing: incompletely oxidised or last phase reduced firing, but also blackening on the inside of one lid (MC101926/1/1).

Hardness: very hard.

Fracture texture and direction: fracture texture is hackly and direction is vertical.

Surface texture: surface feels smooth, almost soapy.

Voids: no visible voids.

Inclusions general: inclusions are rounded in general and have earthen colours. There abundance is 10–20%, because of the larger size they take up a lot of space. Dominant size ranges between 0.5–1.2 mm.

Inclusion descriptions:

*Common:* well-rounded darker orange and bright orange inclusions (clay pellets or iron stained chert?). Size: 0.25–1.2 mm.

*Common:* larger, rounded milky white, spotted, opaque inclusions (calcareous? Sanidine?). Size: 0.5–0.8 mm.

*Common–few:* yellowish, opaque inclusions, rounded. Size: 0.4–0.6 mm.

*Very few:* olivine and/or aegerine augite. Green inclusions, sub-angular. Size: 0.3–0.5 mm.

*Very few:* augite or mica. Black shimmering inclusions, sub-angular. Size: 0.5–1.0 mm.

*Very few:* iron nodules. Well-rounded. Size: 1.2 mm.

Comments: this fabric is recognisable by the large amount of orange inclusions, lack of black inclusions and opaque inclusions in earthen colours. This group might be related to the slipped sub fabric A.

**M-fabric G Golden biotite and mica**

Group size: 8 / 3 selected for thin-sectioning.

Colour: dark orange (2.5YR 5/6-4/6).

Firing: oxidised.

Hardness: very hard.


Surface texture: smooth, slipped.

Voids: elongated voids that do not follow the rim as much as in other fabrics (indications different shaping technique). Size: 0.6–0.7 mm.

Inclusions general: abundance of inclusions is 5–10% in the fracture. On the surface, fewer inclusions are immediately visible due to (remnants of) slip layer. Size range predominantly around 0.6 mm.
Inclusion descriptions:

*Common–few:* biotite. Golden, flaky, sub-rounded to sub-angular. Size: 0.3–1.4 mm.

*Few:* mica. Black, elongated, sub-angular. Size: 0.8–1.4 mm.

*Very few:* olivine or aegerine augite. Green, angular to rounded. Size: 0.5–0.6 mm.

*Very few:* augite. Black, angular. Size: 0.5–0.75 mm.

*Few:* small, white, opaque speckles, looks calcareous (post-depositional?). Rounded with diffuse borders. Size: 0.5 mm. Only visible in fresh break.

Comments: this M-fabric looks in colour very similar to M-fabric A, but is defined by the occurrence of shimmering black, elongated mica and flaked, golden biotites. It is furthermore slipped with a fine layer of clay, but this is not always well preserved. Powdery when broken.

**M-fabric H Fine fabric with orange coating**

Group size: 2 – selected samples classified as A1/H.

Colour: light orange (7.5 YR 6/4).

Firing: oxidised or incomplete oxidisation (MC102378/1/1).

Hardness: very hard.


Surface texture: smooth, slipped.

Voids: not visible.

Inclusions general: finer coarse ware fabric with 3–5% inclusions in size up to 0.5 mm.

Inclusion descriptions: see M-fabric F except iron nodules.

Comments: very similar to M-fabric F but with the occurrence of small amounts of black inclusions and no iron nodules. This group is only recognisable based on what is visible in the fracture, the surface is almost without inclusions and slipped.

**M-fabric I White sand with small fraction black inclusions**

Group size: 17 / 2 selected for thin-sectioning.

Colour: bright orange to very dark grey (5YR5/6 to 10YR 3/1).

Firing: oxidised, with blackening patterns on the interior and exterior.

Fracture texture and direction: hackly texture, diagonal orientation of fractures.

Surface texture: feels like sand paper.

Voids: no visible voids, compact fabric.

Inclusions general: small inclusions are very abundant, up to 20%. The fabric is well-sorted and the dominant size range is 0.1–0.2 mm, with occasionally a larger inclusions of 0.6 mm.

Inclusion descriptions:
Appendix III. Macroscopic fabric descriptions

**Frequent:** shimmering, white inclusions (microcrystalline quartz?). Sub-rounded to sub-angular. Size: 0.1–0.2 mm, occasionally 0.6 mm.

**Frequent:** milky white inclusions (feldspar?), sub-rounded. Size: 0.1–0.2 mm.

Comments: fabric is characterised by the large amount of very small white, shimmering inclusions and the absence of larger inclusions in general. Both inclusion types occur in is similar frequency. Speckly appearance on the surface.

**M-fabric J** Clay pellets, iron nodules, quartz/feldspar

Group size: 24 / 3 selected for thin-sectioning.

Colour: more variation than in most other M-fabrics, ranging from orange to grey (2.5YR 5/6-4/6 to 10YR 3/1).

Firing: varied.

Fracture texture and direction: gritty for the coarser fragments, smoother for the finer examples. Fracture direction is vertical.

Surface texture: relatively smooth, sometimes almost powdery. Dimpled (inclusions have fallen out?).

Voids: no visible voids.

Inclusions general: abundance of inclusions 3–10%, mainly larger sized inclusions that are well visible on the surface. Bimodal fabric, size ranges from 1.0–1.5 mm for large fraction and around 0.3 mm for the small fraction.

Inclusion descriptions:

**Common:** iron nodules. Rounded. Size: 1.0–2.0 mm.

**Common:** bright orange to dark orange brown, well-rounded inclusions (chert?). Size: 0.25–0.5 mm.

**Common–few:** quartz and/or feldspar. Opaque, whitish colour, rounded. Size: 0.25–0.5 mm.

**Few:** greyish, opaque rock fragments, sub-angular. Size: 1.3–1.8 mm.

**Few:** rock fragments. Multi-faceted shimmering inclusions (rock fragments?). Angular. Size: 0.8–1.4 mm.

**Very few:** augite. Angular to sub-angular. Size: 0.7–1.0 mm.

Comments: main characteristics are the lack of (visible) black inclusions on the surface and the appearance of large iron nodules and clay pellets in bright to dark orange colours. This is combined with a variety of mineral inclusions, such as quartz/sanidine in a finer fraction, rock fragments (granite/microcrystalline quartz?) and some augite and mica.
Figure III.1. A = M-fabric A. B = M-fabric A with slip. C = M-fabric C. D = M-fabric D.
Figure III.2. A = M-fabric E. B = M-fabric F. C = M-fabric G. D = M-fabric H.
Figure III.3. A = M-fabric I. B = M-fabric J.
Appendix III. Macroscopic fabric descriptions

Macroscopic fabric groups Pontine coast Antium – Astura – Satricum

*M-fabric 1A ‘Red augite’ coarse variant*

Group size: 4 / 2 selected for thin-sectioning.

Colour: dark reddish brown (5YR 4/4 to 5YR 6/4).

Firing: oxidised.

Hardness: hard.

Fracture texture and direction: gritty fracture. Fracture direction is very uneven (wobbly) and varies from diagonal to horizontal (Net’07/NS1/GS/2).

Surface texture: prominent inclusions sticking out of the surface, gritty.

Voids: small vughs, 0.6–0.8 mm, very few and not visible in all samples.

Inclusions general: inclusion abundance ranges between 5–10% for the coarse specimen. Moderately sorted.

Size range of the inclusions in the coarse variant is possible bimodal with a large fraction in size range 1.3–2.1 mm and the small fraction between 0.3–0.6 mm. The large fraction consists mostly of both black and green augite and olivine as well as quartz/feldspar or rock fragments. The small fraction is characterised by rounded black inclusions and olivine.

Inclusion descriptions:

*Common–few*: aegerine augite or olivine. Green inclusions, larger examples dark green and angular to sub-angular, smaller fraction has lighter colour of green and is more rounded. Large fraction: 1.8–2.0 mm. Small fraction: 0.3–0.6 mm.

*Common–few*: augite. Black inclusions, larger fraction is angular while small fraction is more rounded (same as above). Large fraction: mostly around 1.0–1.1 mm but also up to 1.4 mm. Small fraction: 0.45–0.6 mm.

*Very few*: grey, opaque inclusions, well-rounded. Size: around 1.0 mm, occasionally smaller between 0.4–0.6 mm.

*Rare*: translucent, shimmering, angular inclusions (sanidine?). Size: 1.5 mm.

*Rare*: yellowish-white, opaque inclusions, rounded to well-rounded. Size: 0.8–1.3 mm.

*Rare*: light orange-pinkish rounded inclusions (clay pellets?) Size: varied, between 0.4–1.3 mm.

Comments: this fabric is often referred to in the PRP database as ‘red augite.’ Occurs in a coarse (N=4) and fine variant (N=10, M-fabric 1B). Recognisable by high amount of both black augites and aegerine augite/olivine and lack of clear sanidine/quartz inclusions. Furthermore, always combined with dark red to dark orange firing clays fired in an oxidising atmosphere. Fragment Net’08 T2S3/J3/08 contains a giant fragment (6.4 mm) of olivine on the exterior.

*M-fabric 1B ‘Red augite’ fine variant*

Group size: 10 / 4 selected for thin-sectioning.

Colour: red to reddish brown (2.5YR 5/6 to 5YR 5/4).

Firing: oxidised.

Hardness: hard.

Fracture texture and direction: texture is hackly. Direction of the fracture is varied with often, one side vertical and one side diagonal.
Surface texture: smooth, no prominent feeling of gritty inclusions. All fragments except Net’05 4288/01/09 are slipped.

Voids: not visible.

Inclusions general: abundance of inclusions in this fabric is 5–7%. The inclusions are poorly sorted. The majority of inclusions is around 0.3–0.4 mm, none of the inclusions exceeds 1.0 mm.

Inclusion descriptions:
Frequent: augite/mica. Black inclusions, sub-angular to sub-rounded. Size: mostly around 0.3–0.4 mm, occasionally up to 0.8 mm.
Common–few: grey, opaque inclusions (rock fragments?), well-rounded. Size: 0.8–0.9 mm.
Few: aegerine augite/olivine. Green inclusions, rounded ones very small, otherwise also more angular shapes. Size: 0.3–0.8 mm.
Very few–rare: translucent, shimmering, angular inclusions (sanidine?). Size: 0.6 mm.

Comments: this is the fine variant of the above described ‘Red augite’ coarse fabric (M-fabric 1A). The coarse fraction is largely missing as well as the yellowish inclusions. The content of very rounded grey opaque inclusions is relatively higher than in the coarse variant, around few to common. Furthermore, the black augite is more frequent in this fabric in relation to the green olivine inclusions than in the coarser version.

M-fabric 2 Shimmering mica
Group size: 4 / 1 selected for thin-sectioning.

Colour: yellowish brown to light orange-brown (5YR 5/6 to 7.5 YR 6/4). Reduced fractures have a black colour.

Firing: either completely oxidised (Net’06/T2S5/GS/19) or completely reduced. One fragment has blackening on the inside (Net’08/T2S3/F5/5).

Hardness: hard.

Fracture texture and direction: hackly and in vertical lines. Fractures are mostly oriented vertical.

Surface texture: smooth but not slipped. Inclusions do not stick out of the surface, might be inserted suggesting smoothening.

Voids: some small vesicles are visible with the naked eye in fresh fracture, but not possible to trace under microscope.

Inclusions general: inclusion abundance ranges between 10–20%. Inclusions have a wide size range from 0.25 to 1.4 mm and are poorly sorted. There is not a clear distinction in size groups, although the larger sized inclusions are always black. The elongated mica inclusions have a horizontal to slightly upward angle orientation but in general do not seem to align directly with direction of the turning wheel.

Inclusion descriptions:
Dominant: mica. Black, elongated, angular inclusions. Size: 0.4–1.4 mm, very varied in size.
Common: augite. Black inclusions, sub-angular to rounded. Distinguishable from the other black inclusions by its more quadrant-like shape. Size: 0.5–1.3 mm, smaller sizes often have a more rounded shape.
Few: olivine and/or aegerine augite. Green inclusions, rounded to sub-rounded. Size: 0.4–0.6 mm.
Very few: quartz/feldspar inclusions, rounded. Size: 0.2–0.5 mm, very clear cut-off point.
Rare–absent: dark orange clay pellets, well-rounded. Size: 0.25–0.5 mm. Most notable in Net’06/T2S5/GS/19.

Comments: this fabric is set apart from the general augite/mica dominant groups by the shape and dominance of the inclusions (elongated, angular, black) and visible black and white shimmering on the surface. Surface is smooth but not slipped, maybe wiped with wet cloth.

**M-fabric 3 Match with M-fabric G**

Group size: 3 / 2 selected for thin-sectioning.

Colour: light brown (5YR 5/3) on the surface, in fracture greyish brown (5YR 5/1).

Firing: oxidised.

Hardness: hard to very hard.

Fracture texture and direction: texture is hackly with lines in a slight angle to the body. Direction is vertical, almost 90 degrees to the rim.

Surface texture: smooth, probably slipped.

Voids: few vesicles and vughs, unable to measure under the microscope.

Inclusions general: abundance of inclusions is 5–10%, with Net’06/P118/GS/107 having slightly more inclusions around 15–20%. The inclusions are moderately sorted. Inclusions mostly range between 0.5–0.7 mm but are occasionally larger.

Inclusion descriptions: see M-fabric G. Green inclusions might be slightly more frequent, around few, in comparison to samples from the Pontine plain in M-fabric G.

Comments: This fabric is a macroscopic match with M-fabric G from the Pontine plain (see below).

**M-fabric 4 Buff colour version of M-fabric A**

Group size: 1 / 1 selected for thin-sectioning.

Colour: bright light pinkish orange (5YR 7/6) on the surface, fracture is pale greyish pink (2.5Y7/2).

Firing: oxidised (incomplete?).

Hardness: hard.

Fracture texture and direction: gritty texture, vertical direction of fracture.

Surface texture: gritty.

Voids: not visible, compact fabric.

Inclusions general: see M-fabric A.

Inclusion descriptions: see M-fabric A.

Comments: sub-fabric of M-fabric A because of the clay colour, which is more buff instead of the typical bright orange colour the example in M-fabric A.
**M-fabric 5 Buff clay with small black inclusions**

Group size: 3 / 3 selected for thin-sectioning.

Colour: light (pinkish) orange (2.5YR 6/6, 5YR 7/6).

Firing: oxidised.

Hardness: hard but powdery.

Fracture texture and direction: smooth texture and vertical to diagonal direction of fractures.

Surface texture: smooth, powdery.

Voids: few planar voids following the walls.

Inclusions general: abundance of inclusions is between 10–20%. The inclusions are well sorted. Size range is very consistent throughout, between 0.25–0.4 mm with only occasionally larger angular inclusions (mica?) of 0.8 mm.

Inclusion descriptions:

**Dominant:** augite/mica. Black inclusions, angular to sub-angular. Size: 0.25–0.4 mm.

**Few:** larger black inclusions, angular to sub-angular in rectangular shapes. Size: 0.5–0.8 mm.

**Few:** olivine/aegerine augite. Green inclusions, either well-rounded or angular and rectangular shaped. Size: 0.3–0.4 mm for round, 0.6 mm for angular shaped examples.

**Very few–rare:** light grey, opaque inclusions (rock fragments or microcrystalline quartz?). Sub-angular to rounded. Size: 0.5–0.9 mm.

**Rare:** dark orange-brown inclusions (chert), sub-rounded. Size: 0.3–0.4 mm.

**Rare:** iron nodules. Rounded to oblong. Size: 1.3–2.0 mm.

**Very few–absent:** light grey-pinkish inclusions, sub-rounded. Colour is quite close to the buff pinkish colour of the base clay (clay pellets?). Size: either around 0.3 mm or around 0.6 mm. Not present in Net’08 T2S3/M6/8.

Comments: there is some variation in this fabric when it comes to the auxiliary inclusions beside the two types of black inclusions and olivine. However, the group is pulled together in its shared buff clay colour (these are also the only examples with such a clay colour in the sample) and the dominance of black inclusions. Sample Net’08 T2S3/P7/01 exhibits the finest fraction and more green inclusions.

**M-fabric 6 Olivine with rock fragments**

Group size: 2 / 1 selected for thin-sectioning.

Colour: dark reddish brown (2.5YR 4/4 to 4/6).

Firing: oxidised (Net’08 T2S3/D6/01) and oxidised exterior with reduced (black) interior (Net’08 T2S3/E5/04).

Hardness: hard.

Fracture texture and direction: gritty texture, vertical direction of fractures.

Surface texture: very gritty, but also looks affected by post-depositional processes.

Voids: no visible voids.

Inclusions general: abundance of inclusions is around 10%. Poorly sorted. Size range might be bimodal. Large
Appendix III. Macroscopic fabric descriptions

fraction: 0.8–1.3 mm, includes a very varied group of inclusions. Small fraction, consisting mostly of rounded whitish inclusions (sand?) ranges between 0.3–0.4 mm.

Inclusion descriptions:

Few–rare: rounded whitish to very light grey inclusions not very clear if translucent/shimmering or opaque (sand?). Possibly similar to the greyish inclusions but more rounded and in smaller sizes (0.3–0.4 mm). Most prominent in Net’08 T2S3/E5/04 (few) to rare in the other sample.

Very few: olivine/aegerine augite. Green colours, angular to sub-rounded. Size: 0.85–1.0 mm.

Very few: greyish inclusions, speckled appearance, rounded. Possibly a quartz based rock or larger sized micro-crystalline quartz. Size: 0.8–0.9 mm is most common, but also couple of smaller examples of 0.4–0.5 mm.

Very few–rare: black, slightly shimmering inclusions with quadrant-ish shapes (weathered augites?). Size: 0.4–0.7 mm.

Very few–rare: rounded pinkish-light orange inclusions or clay pellets, most prominent in sample Net’08 T2S3/E5/04 (because of colour difficult to see!). Size: 0.4 mm, occasionally up to 0.6 mm.

Comments: this group is defined by its lower content of black inclusions in comparison to the other fabrics with black inclusions and the appearance of relatively many greyish rock inclusions and possibly also sand. However, overall there is not clearly one type of inclusions dominant.

M-fabric 7 Very fine black sand

Group size: 1 (Net’08 T2S3/N2/04) / 1 selected for thin-sectioning.

Colour: light orange yellow to greyish yellow (7.5YR7/4–10YR 7/4).

Firing: oxidised.

Hardness: scratchable with fingernail.

Fracture texture and direction: hackly fracture, especially when considering that there are no large inclusions. Fractures are vertical to diagonal on the sides and horizontally following the flange.

Surface texture: smooth and soapy.

Voids: none visible except for one gigantic planar void in the fresh fracture (10.3 mm).

Inclusions general: abundance of inclusions is around 5%. Moderately sorted. Size range is (in comparison to the other fabrics) very small, black inclusions between 0.25–0.35 mm, auxiliary inclusions that are rare occur also in larger sizes up to 0.8 mm.

Inclusion descriptions:

Frequent: elongated, rectangular shimmering black inclusions, sub-angular shapes (mica?). Size: 0.25–0.35 mm.

Very few: opaque white to light grey inclusions, sub-rounded to rounded. Most visible are the larger examples in size 0.65–0.95 mm, but possibly also occurs in smaller size of 0.3–0.5 mm (difficult to see because of clay colour).

Rare: olivine/aegerine augite. Green inclusions, sub-angular and elongated shapes. Size: 0.3–0.4 mm.

Rare: clay pellets in orange to pinkish colour (close to colour of clay), rounded. Size: 0.6–0.8 mm.

Comments: fabric is characterised by its light clay colour and the relative abundance of very fine black inclusions that are also visible on the surface.
**M-fabric 8 Pink inclusions and mica**

Group size: 1 (Net’04 2301/07/D.S./2) / 1 selected for thin-sectioning.

Colour: bright orange to orangish brown (5YR5/6 to 2.5YR 6/6) on the surface, in fracture dark chocolate brown (2.5YR 3/3 to 7.5YR 3/4).

Firing: incompletely oxidised.

Hardness: very hard.

Fracture texture and direction: fracture texture is very hackly and gritty. Direction of the fracture is vertical and horizontally following the direction of the flange.

Surface texture: smooth, which is unexpected considering the texture of the fracture. Might indicate smoothing of the surface but no visible slip layer.

Voids: very few voids. Planar voids (not traceable under microscope) and some very large vughs (circa 5.0 mm), aligned with the direction of the flange.

Inclusions general: inclusions are more abundant in this fabric than in any other of the black inclusion fabrics, around 20–25%. Sorting is poor and the size of the inclusions is highly varied (but does not appear to be bimodal) between 0.5 and 3.45 mm.

Inclusion descriptions:

*Frequent:* pink, opaque inclusions, angular to sub-angular shapes (rock fragments, granite). Wide size range, 0.3–1.0 mm.

*Common:* black, elongated, angular, rectangular, shimmering inclusions (mica?). Size: mostly around 0.3 mm but occasionally larger up to 0.7 mm or even 1.3 mm.

*Few:* greyish opaque inclusions with colour variation within inclusion, rounded (rock fragments or microcrystalline quartz?). Size: 0.7–2.5 mm.

*Few:* (microcrystalline) quartz. Angular to sub-angular shapes. Different from greyish inclusions due to slight shimmering and shape. Size: 0.6–1.0 mm.

*Few:* black, sub-angular to sub-rounded inclusions, more quadrant shape than the ones described above (augite?). Size: 0.85–0.95 mm.

*Few:* olivine or aegerine augite. Green inclusions, sub-rounded. Size: 0.4–0.5 mm but also up to 1.2 mm. Only visible in (fresh) fracture.

*Very few:* dark rust coloured inclusions (chert?), sub-angular to sub-rounded shapes. Size: 0.3–0.8 mm.

*Rare:* iron nodules with concentric circle structure, rounded. Size: 1.5–3.5 mm.

Comments: when seen by naked eye this fabric is very similar to the red augite group, but under the microscope it is clearly very different. Only fabric with clearly pink rock fragments accompanied by long micas, large iron nodules, clay pellets, greyish milky rock fragments and green inclusions. This mixture of inclusions does not occur in any of the other fabrics.

**M-fabric 9 Sand fabric**

Group size: 29 / 10 selected for thin-sectioning.

Colour: light brown (7.5YR 5/4, 7.5YR 6/4) for oxidised examples, reduced examples are very dark grey (10YR 3/1).
Firing: the firing atmosphere in this fabric group is mixed, both oxidised and reduced appear although only a couple of Olcese olla 2 fragments are completely fired reducing (Net’04 2301/13/10; Net’08 T2S3/H4/07).

Hardness: hard.

Fracture texture and direction: texture of the fractures is generally quite smooth and a bit bobbly. Fracture direction is predominantly vertical, sometimes with slight diagonal angle.

Surface texture: slightly gritty.

Voids: no visible voids, compact fabric.

Inclusions general: abundance of inclusions is between 10–15%. The fabric is well sorted. Inclusion size is 0.2–0.6 mm for the rounded sand inclusions, the other types of inclusions are generally slightly bigger, 0.6–1.4 mm.

Inclusion descriptions:

**Dominant:** slightly translucent, whitish to light grey inclusions (quartz sand?). Sub-rounded to well round. Size: 0.2–0.6 mm.

**Few:** black inclusions, not elongated, angular to sub-angular shapes. Size: mostly around 0.5-0.6 mm but occasionally larger up to 1.4 mm. The amount of black inclusions varies within this fabric group but does not exceed 15%.

**Very few–absent:** shimmering, bright white inclusions, sub-angular shape (sanidine?). Size: 0.7–1.9 mm.

**Very few:** clay pellets in bright orange. Well-rounded. Size: 0.45–0.85 mm. Only visible in fractures.

Comments: this fabric is characterised by its abundance of (quartz?) sand inclusions that are well-rounded in combination with a low proportion of black angular inclusions and shimmering, bright white angular inclusions. There is some variation in the abundance of auxiliary inclusions and their size range.

**M-fabric 10 Powdery orange fabric**

Group size: 10 / 3 selected for thin-sectioning.

Colour: pinkish orange to orange (2.5YR 5/8 to SYR 6/8), when fired reduced greyish light brown (10YR 5/2).

Firing: completely oxidised except Net’05 4276/01/05 (reduced).

Hardness: hard but powdery.

Fracture texture and direction: fractures are smooth and mostly oriented vertical.

Surface texture: smooth and powdery.

Voids: compact fabric. Few planar voids, few vesicles (0.4 mm).

Inclusions general: abundance 10–20%, well sorted. Size range 0.3–0.5 mm for rounded (sand) inclusions, the occasionally occurring other inclusion types are generally slightly larger, 0.7–1.0 mm.

Inclusion descriptions:

**Predominant–dominant:** slightly opaque (milky) white to light grey, well-rounded inclusions (feldspar?). Size: 0.3–0.5 mm. Possibly this group includes two types of inclusions, one (micro)crystalline quartz and the other one similar in occurrence to quartz but less translucent/ more milky (feldspar?).

**Few–very few:** black, angular to sub-angular inclusions (augite?). Size: 0.7–1.0 mm.

Comments: this fabric is characterised by the small size of the inclusions and the limited inclusion types com-
bined with powdery, bright orange clay (except Net’05 4276/01/05 – fired reducing).


M-fabric 11 Angular rock inclusions and sand
Group size: 8 / 3 selected for thin-sectioning.

Colour: dark grey brown to dark grey (10YR 4/2 to 10YR 2/1).

Firing: reduced.

Hardness: very hard.


Surface texture: smooth, surface treatment with slip.

Voids: no visible voids, very compact fabric.

Inclusions general: abundance of inclusions is around 5–10%. Inclusions are moderately sorted, possibly bi-modal. Large fraction consists of angular (rock) inclusions of 1.0–1.3 mm. Small fraction consists of rounded inclusions, size 0.2–0.3 mm.

Inclusion descriptions:

Frequent: angular, small, shimmering inclusions in white colours (sandine?). Size: 0.2–0.3 mm.

Few: opaque white inclusions, slightly yellowish. Angular to sub-angular shapes. Size: 0.6–0.8 mm. More prominent in Net’08 T2S3/P7/03.

Few: shimmering, speckled inclusions with white and light grey colours (microcrystalline quartz or rock fragments?). Angular to sub-angular shapes. Size: 1.0–1.5 mm. Variation in frequency between samples.

Comments: this M-fabric is characterised by its larger angular rock inclusions combined with sand. Set apart from fabric 10 by inclusions size and angularity of the inclusions as well as the dominance of reduced fired fragments. This group only contains Olcese olla 3A fragments.

M-fabric 12 Match with M-fabric C
Group size: 10 / 3 selected for thin-sectioning.

Colour: (pinkish) orange (5YR 6/6 to 6/8), darker coloured examples are chocolate brown (7.5YR 4/3).

Firing: mostly completely oxidised.

Hardness: hard to very hard.


Surface texture: gritty, sandy.

Voids: very few visible voids. Some vesicles are visible under magnifying glass, but not traceable under the microscope.

Inclusions general: see M-fabric C.

Inclusion descriptions: see M-fabric C.
Appendix III. Macroscopic fabric descriptions

Comments: variation within this group in the amount of inclusions visible on the surface.

**M-fabric 13 Large quartz and iron nodules.**
Group size: 9 / 4 selected for thin-sectioning.

Colour: bright orange to yellowish orange (2.5YR 5/8 to 7.5YR6/6) for oxidised examples. Very dark grey to black (7.5YR 3/1) for reduced examples.

Firing: predominantly oxidised, but two fragments have a darker colour on the surface both on the interior and exterior.

Hardness: hard.

Fracture texture and direction: hackly and in some fractures you can clearly see that inclusions have fallen out.

Surface texture: gritty. Net'07 L34/GS/02 is also powdery.

Voids: very compact fabric, no visible voids.

Inclusions general: abundance of inclusions varies between the samples, generally not more than 10%. Inclusions are poorly sorted. Size ranges between 0.3–0.4 mm for smaller inclusions and clay pellets and between 0.9–2.0 mm for angular larger inclusions.

Inclusion descriptions:

*Common*: shimmering white-grey inclusions (quartz?). Angular. Size: 1.0–1.9 mm.

*Common–few*: small shimmering white and grey coloured inclusions, best visible in fresh fractures (quartz or sanidine?). Size: 0.2–0.3 mm. Frequency: few to common.

*Few*: small shimmering black inclusions, slightly elongated (mica?). Size: 0.2–0.4 mm.

*Few*: bright dark orange rounded clay pellets. Size: 0.6–1.2 mm.

*Few–rare*: iron nodules in dark brown to black colour, rounded. Size: 1.5–1.9 mm.

Comments: this fabric might be related to M-fabric 12 or M-fabric C but is lacking the smaller fraction of shimmering white inclusions. Most recognisable due to the visible large iron nodules and large grains of quartz combined with clay pellets. This group only contains Olcese olla 3A fragments.

**M-fabric 14 Buff clay with mica and sand**
Group size: 1 (Net'07 T2S3/GS/32) / 1 selected for thin-sectioning.

Colour: exterior is pink to yellowish orange (5YR 6/6 to 7.5YR 6/6). The fracture is dark grey (2.5Y 3/1).

Firing: reduced but last phase oxidising (ORO diffuse in database).

Hardness: hard.

Fracture texture and direction: fracture texture is hackly. Direction is vertical. The horizontal fractures are diagonal and do not completely follow the direction of the flange.


Voids: vesicle voids in the body, few, size 0.1 mm. In the flange, channels and vughs following the out-turned shape of the flange, very few, size around 2.0 mm.
Inclusions general: abundance of inclusions is around 15%. They are moderately sorted. There is a group of inclusions with sizes around 0.2 mm, one group around 0.5–0.6 mm and a small portion of inclusions are larger than 0.6 mm.

Inclusion descriptions:

**Common:** light to rusty bright orange sub-rounded inclusions (chert?). Size: varied, 0.35–1.5 mm.

**Common:** rounded whitish opaque inclusions (sand, quartz?). Size: 0.2–0.3 mm.

**Few:** mica. Shimmering, elongated, black inclusions, sub-rounded. Size: 0.2–0.3 mm but occasionally up to 0.8 mm.

**Few:** augite. Black, equant, sub-angular inclusions. Size: 0.5–0.6 mm.

**Few:** light grey to milky white, opaque, well-rounded inclusions (quartz/feldspar?). Size: 0.5–0.7 mm.

Comments: characterised by small black inclusions and bright orange inclusions (chert?).

**M-fabric 15 Clay mixing fabric**

Group size: 1 (Net’08/T2S3/F2/01) / 1 selected for thin-sectioning.

Colour: the dominant colour is bright orange (2.5 YR 6/6), but also light pinkish orange occurs (5YR 6/3).

Firing: oxidised.

Hardness: scratchable with fingernail.

Fracture texture and direction: fractures are smooth and oriented diagonal.

Surface texture: smooth, powdery.

Voids: very long planar voids visible in fresh break, up to 5.0 mm. The voids go in the opposite direction of the body, following the line of the fracture.

Inclusions general: in general this fabric has very few inclusions and it might be (two types?) of levigated clay that are used. Abundance of inclusions 3–5%. Sorting difficult to judge with such a low percentage of inclusions. Size is varied, with majority being small inclusions of 0.4–0.6 mm but also some much larger inclusions are visible on the surface of 1.2–3.8 mm.

Inclusion descriptions:

**Common:** yellowish, sub-angular inclusions that looks speckled (calcite?). Size: 0.4–0.8 mm.

**Common:** grey speckled, slightly shimmering, rounded inclusions (rock fragments?). Size: 0.5–0.8 mm.

**Common:** rounded white inclusions (only visible in fresh fracture). Size: 0.2–0.3 mm.

**Few:** mica. Black elongated shimmering inclusions. Size: around 0.5 mm.

**Very few:** bright orange clay pellets. Size: 0.25–0.5 mm.

**Very rare:** iron nodules, rounded, rusty dark orange. Size: 0.5–3.8 mm.

Comments: this fabric is recognisable by its very pure clay in two different colours. Possibly clay mixing of two clay types, one buff light coloured clay and one more brighter orange clay. Inclusions are not very abundant but on the surface some larger inclusions stick out.
Appendix III. Macroscopic fabric descriptions

**M-fabric 16 Extremely hard and fine fabric with grey coating**
Group size: 3 / 2 selected for thin-sectioning.

Colour: pinkish orange to light brown grey (5YR 6/6 to 5YR 5/2).
Firing: oxidised, but last phase reduced (grey slip layer).

Hardness: extremely hard.

Fracture texture and direction: hackly but not very pronounced fracture texture. Direction of the fractures is mostly diagonal.

Surface texture: smooth, possibly slipped or coated. Grey surface both on the interior and exterior which seems to be a very thin layer of slip. It does not look like as if it is related to firing method.

Voids: not visible, very compact fabric.

Inclusions general: inclusion abundance ranges between 10–15% and is moderately sorted. This fabric might be bimodal, with a small fraction (dominant) in 0.25–0.4 mm and a large fraction of around 0.7 mm.

Inclusion descriptions:

*Dominant:* small white to light grey inclusions (quartz/feldspar?). Sub-angular to sub-rounded. Size: 0.25–0.4 mm.

*Few:* yellowish inclusions, sub-rounded to rounded. Size: both in 0.25–0.4 mm and 0.7 mm size range. These inclusions are only visible in fresh fracture.

*Very few:* feldspar. Shimmering white inclusions, sub-angular. Size: 0.7 mm.

Comments: this fabric is recognisable because it is much harder and finer than any of the other fabrics. All of the samples in this group date to the very end of the Late Republican period/beginning of the Imperial period based on typology (Olcese tegame 3 and Olcese olla 3b).

**M-fabric 17 Match with fabric A**
Group size: 6 / 3 selected for thin-sectioning.

Colour: dark reddish brown (2.5YR 4/4-3/4 to 5YR 3/6).
Firing: oxidised.

Hardness: hard to very hard

Fracture texture and direction: texture is gritty. Majority of fractures has a vertical direction. Longer fractures can have a diagonal direction.

Surface texture: gritty and sandy texture.


Inclusions general: see M-fabric A.

Inclusion descriptions: see M-fabric A.

Comments: main characteristics of this fabric is the very clear dominance of black, angular augites in an orange, oxidised fired clay combined with a varying amount of rounded grey-ish inclusions. Under the microscope they abundance of green inclusions also becomes noticeable.
Appendix III. Macroscopic fabric descriptions

Daily life in the Roman Republican countryside

Appendix IV

Thin-section fabric descriptions

Fabric description format thin-section analysis.\textsuperscript{719}

1. Administrative elements: the name of the fabric or fabric group, based on the most distinct features of the fabric, and the sample numbers.\textsuperscript{720} Sub-fabrics are listed as separate but related fabrics, whereby the relationship with the main fabric will also come forward from the name. This is followed by the types that are present within the fabric. Finally, to ease database use, each fabric will be given a database code.

2. The descriptions start with the inclusions (non-plastic and plastic), including notes and the general features of the inclusions and a list of all inclusions larger than 0.01 mm. For the general features the relative abundance of inclusions as part of the total fabric is estimated, as well as notes on the dominant shape (equant or elongated), roundness, alignment to the margins, spacing, size distribution, sorting and if the fabric is uni- or bimodal and to what extent. To estimate these features comparative charts and figures were used.\textsuperscript{721} If a fabric is bimodal, the coarse (large) fraction is described in more detail than the fine (small) fraction. For the coarse fraction, or in the case of unimodal fabrics all the inclusions, the relative abundance of individual inclusion types were described as being predominant (> 70%) to rare (< 0.5%). The lists always starts with the most abundant inclusions. Then the size range is measured per inclusion type. Notes are taken on the shape and roundness and other distinctive features of the inclusion type. For bimodal fabrics, the fine fraction only consists of a list of inclusion types and the frequency in which these inclusions appear.\textsuperscript{722}

3. The matrix consists of the clay and inclusions smaller than 0.01 mm, referred to as particles. Firstly, the relative abundance as part of the whole fabric is estimated by subtracting the percentages of inclusions and voids. Followed by the examination of if the matrix is calcareous or non-calcareous and an assessment of the presence of iron-rich particles.\textsuperscript{723} The colour of the clay is determined in PPL and XP by using descriptive colour names based on Munsell, complemented with notes on the brightness of the colour. Furthermore, the optical activity in XP is examined.\textsuperscript{724} Finally, notes on the homo- or heterogeneity of the matrix are taken, including colour, the distribution of particles and textural features. Also notes on colour differences between and within the samples and the presence of secondary calcite are recorded.\textsuperscript{725}

4. The abundance of voids is estimated to assess porosity. The shape and size of the voids is described, using comparative figures,\textsuperscript{726} and the alignment to the margins of the sherd is recorded. If there are any other distinctive features, like blackened margins or calcite, these are noted as well.\textsuperscript{727}

\textsuperscript{719} Based on method as described by Quinn 2013.
\textsuperscript{720} Quinn 2013, 80.
\textsuperscript{722} Quinn 2013, 82–93.
\textsuperscript{723} Quinn 2013, 44, 93–94.
\textsuperscript{724} Quinn 2013, 93–97.
\textsuperscript{725} These are, strial, striated and speckled birefringe fabrics, Quinn 2013, 97.
\textsuperscript{726} For shape voids: Quinn 2013, 98; fig. 4.25, modified from Stoops 2003. For size voids: Quinn 2013, 97.
\textsuperscript{727} Quinn 2013, 97-100.
5. The relationship to the macroscopic fabric groups is discussed in the next section. Indicating firstly which macroscopic groups are represented with the microscopic group, followed by a discussion on the overlap between the two fabric classifications.

6. The comment section includes a general description of the fabric, followed by a discussion on indications for production technology and provenance. The used technology for clay preparation practice, forming, finishing and firing are described. The possible variation within one group, with reference to specific samples, and the relation to other fabric groups or geological samples is discussed.\textsuperscript{728}

Fabric families, groups and sub-groups

The thin-sections are classified into two fabric families: one characterised by volcanic inclusions, the other one dominated by quartz and/or feldspar inclusions. Each family is sub-divided into fabrics based on variation in inclusions (types, abundance and shape) and clays. Some fabrics have sub-groups, distinguishable from the main fabric based on variation in inclusion size and abundance or technological features (excluding firing method). Photos of the fabrics can be found in Figure IV.2.

Data overview

Twenty-one fabrics including ten groups and eleven loners have been identified in the thin-section analysis (Fig. IV.1). Eight of these loners come from the coastal area and only three come from the Pontine plain. The three largest fabric groups occur both in the plain and the coastal area, while three are exclusive to the coast and four to the plain. In general, samples belonging to the quartz-feldspar family are more common in the Pontine plain, while samples belonging to the volcanic family are more prevalent in the coastal area (Figure IV.1).

\begin{figure}[h]
\centering
\includegraphics[width=\textwidth]{Figure_IV.1.png}
\caption{Overview of the different fabrics and their occurrence in the case study areas.}
\end{figure}

\textsuperscript{728} Quinn 2013, 100-102.
Figure IV.3. A = VL. A. B = VL.B. C = VL.C. D = VL.D.
Figure IV.4. A = VL, E. B = VL F. C = VL G. D = VL H
Figure IV.5. A = QF.1. B = QF.2. C = QF.3. D = QF.4.
Figure IV.5. A = QF.5. B = QF.6. C = QFL.A. D = QFL.B
Figure IV.6. A = QFL.C.
Volcanic family – Fabric groups V.1–V.4

V.1 Quartz and olivine fabric

Samples (N=3): MC101921.2.1; MC102368.2.1; MC102819.1.3.

Type: Olcese olla 2.

Database code: Volcanic 1 / V.1.

Inclusions 10–15%

General features

Abundance of inclusions varies between the samples, from 10% (MC102819.1.3) to 15%. The variation is mostly caused by variation in the abundance of inclusions in the fine fraction, but MC101921.2.1 contains more coarse fraction inclusions than the other samples. This is a poorly sorted unimodal fabric with a large size range. Size range coarse fraction is 0.25–1.4 mm, with a modal size of 0.4–0.5 mm and 0.7–1.0 mm. Size range fine fraction is < 0.2 mm. The size range of the fine fraction blends into the size range of the particles of the matrix. Equant and elongated inclusions, sub-angular to rounded. Inclusions are close to open-spaced, with an uneven distribution across the matrix. Moderate to strong alignment to the margins.

Inclusion types

Dominant: quartz. Equant, sub-angular to rounded. Size range: 0.05–1.5 mm, modal size: < 0.2 mm. Large quartz inclusions with undulose extinction. The majority of quartz inclusions is < 0.2 mm. Larger quartz sub-angular.

Common: olivine. Equant and elongated, sub-angular to sub-rounded. Size range: 0.3–1.3 mm, modal size: 0.7–1.0 mm. MC101921.2.1 contains more olivine than the other samples.

Few: clinopyroxene. Equant and elongated, sub-angular for the large inclusions to rounded for the smaller inclusions. Size range: 0.2–1.2 mm, modal size: 0.25–0.35 mm. In general, the clinopyroxene inclusions are smaller than the olivine inclusions.

Few–very few: ARF – clay pellets in dark brown to blackish colours in both XP and PPL. Sharp boundaries, well-rounded equant and elongated. High optical density, discordant with the matrix. The clay pellets are surrounded by voids. Size range: 0.35–2.0 mm. MC101921.2.1 contains more smaller clay pellets than the other samples.

Very few–rare: sanidine (twinning). Equant, sub-rounded. Size range: 0.4–1.3 mm, modal size: 0.4–0.5 mm.

Very rare–absent: volcanic rock fragments, speckled appearance with black, grey and white grains. Equant, rounded. Size range: 0.5–2.3 mm. Large rock fragment in MC101921.2.1 contains also olivine and feldspar minerals.

Very rare: microcline (MC102368.2.1). Equant, sub-rounded. Size: 0.67 mm.

Very rare: chert, grey colours. Equant, well-rounded. Size range: 0.5–0.65 mm.

Matrix 63–80%

Iron-rich clay matrix. Variation in homogeneity of texture (speckled appearance) and distribution of inclusions, especially MC101921.2.1 is more heterogeneous than the other samples. Homogenous distribution of feldspar/quartz and biotite particles. Medium optical activity in all samples. Colour within samples is homogeneous but does vary between samples. Colour in XP varies from grey orange to dark orange, colour in PPL is dark orange to yellow orange and black. MC101921.2.1 and MC 102368.2.1 have discoloured internal margins.

Voids 5–7%

Strong alignment to the margins, especially in MC101921.2.1 outer margins. Macro and meso channels, mainly in the rim area. Macro vughs also occur, sometimes with random orientations.
Appendix IV. Thin-section fabric descriptions

Channel vughs around the clay pellets. MC102368.2.1 contains very few vughs.

**Relationship to macroscopic fabric:** the samples are classified as M-fabric A (N=1), A1 (N=1) and B (N=1). The attested inclusion types in thin-section overlap with M-fabric A, specifically the occurrence of quartz, olivine, clay pellets and grey rock fragments.

**Comments**

General: this fabric is characterised by the occurrence of large sized (up to 1.5 mm) olivine and quartz in sub-angular to sub-rounded shapes accompanied by clinopyroxene, feldspar, chert, rock fragments and clay pellets. The heterogeneous matrix is iron-rich with feldspar/quartz and biotite particles.

Production: an iron-rich, variegated clay is used for the production of this fabric group. Variegation is indicated by varying amounts of the quantity of quartz in the size range < 0.2 mm, which is due to its size unlikely to be added as temper, lamination in the clay and an uneven distribution of both finer and larger inclusions (MC101921.2.1). The latter also indicates that the clay was not properly kneaded before forming. Voids are strongly to moderately aligned, especially in the rim area, indicating wheel throwing. Form repertoire is limited to Olcese olla 2. Firing atmosphere is oxidising with varying degrees of incompleteness. Firing temperature was below 800°C based on optical activity of the matrix.

Provenance and circulation: there are no parallels found for this fabric group. Circulation is limited to the Pontine plain. Based on the set of inclusions, a relationship to V.2 is hypothesised, which would point towards a Central Italian origin.

Use: sample MC101921.2.1 has internal blackening.

**V.2 Sand and clinopyroxene**

**Samples (N=7):** MC102199.2.2; MC102375.2.1; MC102387.1.3; MC102387.2.1; MC102479.2.3; MC102487.1.2; MC102512.1.2.

**Type:** Olcese coperchio 1, Olcese olla 2 (N=4), Olcese olla 3A, Olcese clibane 3.

**Database code:** Volcanic 2 / V.2.

**Inclusions 10–15%**

**General features**

Abundance of inclusions varies slightly, between 10–15%. Both equant and elongated shapes occur, in sub-angular to rounded forms. Close to open spaced, with a moderate (MC102199.2.2) to strong (MC102387.2.1) alignment to the margins. Unimodal fabric, poorly sorted with a size range between 0.2–1.2 mm, modal size 0.2–0.25 mm. Quartz inclusions occur mostly in the modal size, while the other inclusion types have a wider size variety.

**Inclusion types**

**Dominant:** quartz. Equant, sub-angular to rounded. Size range: 0.2–1.2 mm, modal size: 0.2–0.25 mm. The majority of quartz inclusions falls within the narrow modal size range. Part of this group consists of microcrystalline quartz. Larger quartz inclusions with undulose extinction.

**Few:** clinopyroxene, some larger fragments are aegerine augite based on interference colours in green shades. Equant and elongated, sub-angular to sub-rounded. Size range: 0.2–2.1 mm, modal size: 0.6–0.7 mm. Most of the inclusions have very irregular shapes.

**Few:** feldspar (sanidine and plagioclase (clear examples of sanidine twinning in MC102479.2.3; MC102487.1.2)). Equant and elongated, angular to sub-rounded. Size range: 0.15–1.9 mm, modal size: 0.15–0.25 mm. Modal size
contains more plagioclase, while larger feldspar inclusions are sanidine.

*Very few–rare*: rock fragments, grey colours speckled structure with black, white and grey. Equant and elongated, well-rounded. Size range: 0.6–1.6 mm, modal size: 0.8–1.0 mm.

*Few–very few*: olivine. Equant, rounded to well-rounded. Size range: 0.28–1.2 mm.

*Very few–absent*: ARF – clay pellets in brown to dark orange colours. Clear to diffuse boundaries, equant rounded shapes. Low to neutral optical density, concordant with the matrix. Size range: 0.24–2.9 mm. Absent in MC102387.2.1 and MC102512.1.2.

*Rare–absent*: iron nodules. Equant, rounded. Clear to diffuse boundaries, dark brown colours and concentric structure. Concordant with the matrix. Size range: 0.5–0.95 mm.

*Rare*: biotite. Elongated, sub-rounded. Size range: 0.3–1.2 mm.

*Very rare–absent*: hornblende. Equant, sub-rounded. Size range: 1.0 mm. (MC102199.2.2.)

**Matrix 70–87%**

Iron-rich matrix with few but evenly distributed biotite and feldspar/quartz particles. The appearance of the matrix is speckled in those areas that are also optically active. Often, the matrix in the interior area appears to be more fused. Direction of the clay plates is aligned with the margins in most samples. Heterogeneous distribution of textural features, especially clay pellets and larger clay bodies.

There is variation in optical activity, with generally little optical activity on the exterior and no to medium optical activity on the interior. Only MC102387.1.3 and MC102512.1.2 have medium optical activity across the section. The slip layer is highly optical active and has a brighter orange or grey colour. The matrix is orange in PPL and yellow-grey to dark orange in XP.

**Voids 3–15%**

Voids vary significantly between the samples, from 3–5% (MC102487.1.2) up to 15% (MC102387.2.1). Meso vughs and channels are most common. Occasionally, also macro vughs appear (MC102479.2.3). Channels tend to be moderately to well aligned to the margins and occur mostly in the rim area. Vughs have a more random orientation. Areas with a darker coloured matrix seem to have more vughs and channels in them which is probably related to use.

**Relationship to macroscopic fabric**: the samples are classified as M-fabric A (N=1), A1 (N=4) and G (N=2). The majority of samples from this group was classified during the macroscopic analysis as A1, with the exception of the lid and one Olcese olla 2 fragment – M-fabric G and the clibanus fragment – M-fabric A. A link between M-fabric A1 and G was already assumed during the macroscopic analysis based on the applied slip layer, this is now confirmed by the thin-section analysis.

**Comments**

General: this is a heterogeneous fabric group that is characterised by a mix of smaller sized quartz and feldspar inclusions (0.15–0.25 mm) and generally larger sized clinopyroxene and olivine inclusions set in a heterogeneous, iron-rich matrix. Some of the samples show indications of clay mixing of two similar clays but with colour variation (MC102479.2.3). Macroscopically, most samples were classified as plain M-fabric A(1) and a couple as G.

Production: the heterogeneity of this fabric group comes with a higher degree of uncertainty around possible production indicators. The potters selected an iron-rich clay. The abundance of textural features in the matrix (clay bodies, variation in colour and optical activity within the same sample, streaks, clay pellets and iron nodules in varying quantities) might tentatively suggest the mixing of two similar clays or the use of one highly variegated clay source. The clay was most likely volcanic based on the occurrence of biotite and feldspar particles and included the range of volcanic inclusions found in this fabric. Based on the narrow size range of quartz and (plagioclase) feldspar (0.15–0.25 mm) in comparison to the larger size range of most other inclusions, it is likely
that the former was added as temper (sieved) while the larger sized inclusions are natural to the clay. The amount of added temper varies between the samples.

Kneading of the clay paste varies too, from good to poor based on the distribution of inclusions. The varying occurrence of clay pellets suggests that sometimes the clay paste was also not sufficiently hydrated before forming. Forming methods varied too, depending on the form of the pot leading to variation in the alignment of voids and inclusions as well as the amount of voids. Generally however, all samples have moderate to strong alignment indicating the use of a wheel for forming. All of the samples were slipped after forming except the Olcese clibane 3 sample MC102199.2.2.

Firing atmosphere is consistently oxidising across the whole fabric group and maintained long enough to reach complete oxidisation. Firing temperature was around 800°C based on medium optical activity in most samples and the sometimes fused look of the matrix on the interior.

Provenance and circulation: this fabric group has similarities to fabrics originating and/or circulating in the Central Italian Volcanic Province (Peña 1992), the Pontine plain (Borgers et al. 2018 – Coarse augite fabric, especially the samples from the hinterland of Norba) and Mineralogical group 5 from Ostia (Capelli 2016). However, the V.2 group in general contains more quartz and larger and more rounded clinopyroxene than the other group from the Pontine plain as described by Borgers. Borgers assumes a local origin (Satricum) for her fabric group, while Capelli assumes an origin in southern Lazio or Campania. Based on the examination of the thin-sections from Satricum and clay samples from the region, the clay used for V.2 appears to be more variegated and leucite, typical for Satricum, is missing. Within the current dataset, the V.2 group only occurs within the Pontine plain. This group is related to both V.1 and V.3 based on the set of inclusions, especially the occurrence of clinopyroxene and olivine.

Use: darker coloured areas have more vughs.

V.3 ‘Red augite’ – Volcanic inclusions and clay pellets in iron-rich matrix

Samples (N=12): Net’05 4231.1.1; Net’06 P118.GS.101; Net’06 P118/GS/107; Net’07 P116/GS/50; Net’07 P145.GS.7; Net’07 GT2007_01/GS/66; Net’08 L34/D3/1; Net’08 L34.IS.1; Net’08 T2S3/F4/4; Net’08 T2S3/F5/; Net’08 T2S3/J3/8; Net’08 T2S3/P3/2.

Types: Olcese olla 2 (N=4), Olcese clibanus 2, Olcese coperchio 1 (N=2), Olcese coperchio 2, Olcese coperchio 3, baking tray (N=3).


Inclusions 5–15% 

General features: abundance of inclusions varies from 5% (Net’07 P145.GS.7) to 15% (Net’06 P118.GS.101). Equant shapes, mostly sub-rounded to well-rounded. Single to double spaced with a weak (Net’06 P118.GS.101; Net’07 P145.GS.7) to moderate (Net’08 L34.IS.1) alignment to the margins. Weakly bimodal, moderately sorted.

Inclusion types: coarse fraction 70%, 0.5–2.4 mm

Dominant–frequent: clinopyroxene. Equant and elongated, generally sub-rounded to rounded. Maximum size: 2.4 mm, modal size: 0.7 mm. Cleavage. Generally, the clinopyroxene are weathered, best visible at the margins of the minerals often having a different colour than the core. Some very weathered, well-rounded examples appear, which turned into minerals with a black colour in both PPL and XP.

Frequent–common: quartz. Equant, sub-angular to sub-rounded. Maximum size: 1.0 mm, modal size: 0.3 mm. Straight extinction.

Common: biotite. Elongated, sub-rounded. Maximum size: 0.9 mm, modal size: 0.6 mm. Strong alignment with the margins.
Common–few: chert. Equant and elongated, sub-rounded to rounded. Maximum size: 1.5 mm, modal size: 0.5 mm.

Common–few: feldspars/sanidine. Equant, angular to rounded. Maximum size: 1.1 mm, modal size: 0.3 mm. Simple twinning in some of the minerals (identified as sanidine). Net’06 P118.GS.101 contains more feldspar with especially the larger sized specimen being more angular.

Few: volcanic rock fragments, greyish colour (probably of the basic group, dolerite/basalt). Equant, well-rounded. Maximum size: 1.6 mm, modal size: 0.7 mm.

Few: olivine. Elongated, rounded to well-rounded. Maximum size: 1.2 mm, modal size: 0.5 mm.

Very few–rare: ARF – clay pellets. Round shapes with sharp to clear boundaries. Discordant with a high optical density. Bright orange colour in XP, slightly darker in colour than the matrix. Maximum size: 1.1 mm, modal size: 0.6 mm.

Rare–absent: leucite. Equant, sub-rounded. Maximum size: 1.4 mm, modal size: 0.6 mm.

Inclusion types: fine fraction 30%, 0.1–0.5 mm

Frequent: (microcrystalline) quartz.

Common: clinopyroxene.

Common: biotite.

Common: clay pellets.

Matrix 70–75%

Iron-rich matrix with a small amount of biotite and feldspar/quartz particles. Rusty brown to black colour in PPL. Very dark brown to black colour in XP. Variation between the samples in heterogeneity of the matrix, from homogenous with an even distribution of textural features and particles (Net’07 GT2007.1.GS.66; Net’08 T2S3.F4.4) to heterogeneous with many textural features, uneven distribution of particles and colour variation (Net’05 4231.1.1; Net’06 P118.GS.101).

Sample Net’06 P118.GS.101 and the oxidised part of Net’06 P116.GS.50 have medium optical activity. The other samples are not optically active and often have a fused look to the clay matrix. In the majority of samples, the inside is blackened (use related). Slip layers, if present, are highly optically active.

Voids 15%

Macro planar voids are dominant, with strong alignment to the margins.

Relationship to macroscopic fabrics: this group contains all the six thin-sections of M-fabric 1 (N=6), all the thin-sections from M-fabric 3 (N=2), all the thin-sections of M-fabric 17 (N=3) and one sample of M-fabric 9. Based on this, it is likely that M-fabric 1, 3 and 17 should be merged into one larger group. Possibly there is a relationship with M-fabric A.

Comments

General: this fabric group is characterised by the occurrence of (sub-)rounded clinopyroxene, biotite, chert, more angular feldspar and quartz with smaller and varying quantities of olivine, leucite, clay pellets and rock fragments set in an iron-rich matrix with biotite and feldspar particles. The inclusion distribution is weakly bimodal, which tentatively might point to tempering with a mix of clinopyroxene, biotite and quartz. The group shows considerable variation in the amount of inclusions as well as the level of homogeneity of the matrix. The majority of the samples has a slip layer in a very characteristic shade of reddish orange. The samples match only with coastal M-fabrics, including all samples from M-fabrics 1, 3 and 17. This group is usually referred to in the PRP database as ‘red augite’ because of the colour of the slip and matrix and the occurrence of black inclusions.
Appendix IV. Thin-section fabric descriptions

223

(clinopyroxene and biotite).

Production: an iron-rich variegated clay was selected for the production of this fabric group. The clay source is volcanic, based on the biotite and feldspar/quartz particles and the occurrence of a wide range of mostly rounded to well-rounded volcanic inclusions. Variation in heterogeneity of the matrix in colour, distribution of particles and textural features is likely to be natural to the clay but also could indicate variation in how well the clay paste was kneaded and hydrated. The size range of the inclusions is weakly bimodal but without any other indicators of temper being added it is not possible to assume tempering. Abundance of inclusions varies between 5–15% but assuming a variegated clay source, this could potentially be natural.

The weak to moderate alignment of the inclusions and strong alignment of voids suggests the use of a (slow?) wheel for forming, after which a thin layer of slip is applied to most of the samples, including all lids and ollae. Firing conditions were always oxidising and with the exception of Net’07 P145.GS.7, Net’08 L34.I5.1 and Net’08 T253.F5.5 were maintained long enough to reach complete oxidisation. Most samples are optically inactive and have a fused look, suggesting temperatures above 800 °C.

Provenance and circulation: the combination of sub-rounded to rounded mineral inclusions and clay matrix suggests that this fabric group originates from a tuff deposit. The occurrence of olivine and occasionally leucite could be an indication for a production location at or close to Satricum (Tufo Lionato clay). It furthermore bares similarity to especially V.2 and to a lesser extent V.1. All the samples in this group come from coastal sites, suggesting either a coastal origin or a coastal distribution for this fabric.

Use: most of the samples show blackening on the inside, which is probably related to use rather than firing conditions. This contrasts sharply with the red clay colour that makes this fabric also in hand specimen very recognisable.

V.4 Bimodal sanidine – clinopyroxene fabric

Samples (N=10): MC101701.1.8; MC101929.1.4; MC101929.2.5; MC102197.1.1; MC104034.2.5; MC104034.1.5; MC104036.3.12; Net’04 2301.8.DS01.5; Net’05 4232.1.5; Net’07 L34.GS.16.

Types: Olcese olla 3A (N=8), Olcese tegame 2 (N=2).


Inclusions 10–20%

General features

Abundance of inclusions varies between the samples, mostly due to variation in the amount of inclusions in the coarse fraction, ranging from 3% (Net’07 L34.GS.16) to 10% (MC101701.1.8). Equant shapes in sub-angular to rounded forms are dominant, but also elongated shapes occur occasionally. In general, the clinopyroxene and the inclusions in the fine fraction are more rounded than the sanidine and quartz in the coarse fraction. Single to open spaced with a moderate alignment to the margins. Bimodal size distribution, coarse fraction 0.6–1.7 mm and fine fraction very consistently 0.2–0.3 mm.

Inclusion types: coarse fraction 3–10%, 0.6–1.7 mm

Dominant: sanidine (twinning). Equant, angular to sub-angular. Size range: 0.6–1.4 mm, modal size 0.9 mm.

Few: quartz. Equant, sub-angular. Size range: 0.6–1.4 mm.

Few–very few: clinopyroxene. Equant, sub-rounded. Size range: 0.6–1.2 mm. Variation in the amount of clinopyroxene between the samples, with Net’04 2301.8.DS1.5 and MC104034.1.5 having significantly more clinopyroxene and less sanidine and quartz in the coarse fraction.

Very few: iron nodules. Equant, well-rounded. Size range: 0.4–1.7 mm. Variation in internal structure, with larger
specimen having a concentric structure and smaller ones more dense or dotted structure.

**Inclusion types:** fine fraction 90–97%, < 0.3 mm.

**Predominant:** feldspar/quartz.

**Few:** clinopyroxene.

**Matrix 65–85%**

Iron-rich, homogenous matrix with small iron nodules. Few feldspar/quartz and biotite particles with an even distribution. Exception is MC101929.2.5 which contains more particles that are unevenly distributed. No optical activity but some samples have a fused look (MC104036.3.12; MC101701.1.8; Net’05 4232.1.5).

Colour is homogenous but can vary within a sample due to incomplete reduction (MC104031.2.5) or oxidation (Net’07 L34.G5.16). Reducing firing conditions are dominant. Colour in XP is black to dark rusty brown. Colour in PPL is dark rusty brown to dark orange (104034.1.5) to black.

**Voids 5–15%**

Strong alignment of meso channel voids, especially in the rim area. Variation in the amount of channel voids, samples with less coarse fraction inclusions tend to have a higher amount of voids. Vughs occur especially around the iron nodules.

**Relationship to macroscopic fabrics:** this group was classified as parts of M-fabric A (N=1), B (N=2), C (N=1), D (N=3), 10sub (N=1) and 13 (N=1). This is a reflection of how difficult it is to identify this fabric group due to similarities with especially the quartz-feldspar 2 group and to a lesser extent the volcanic 1 group.

**Sub-fabric: non-bimodal**

**Samples (N=4):** MC104035.1.2; MC104035.5.13; MC104036.3.4; Net’08 T253.G5.6.

**Types:** Olcese olla 2 (N=3), Olcese tegame 2 (N=1).

**Database code:** Volcanic 4 sub / V.4sub.

This group is different from the V.4 group because the coarse fraction is missing. Furthermore, the colour of the matrix is less homogenous within each sample due to either incomplete oxidisation or use related discolorations (MC104035.1.2).

**Comments**

General: this fabric group is characterised by a varying amount of coarse fraction inclusions consisting of a mix of sanidine, quartz and clinopyroxene. The fine fraction has a very restricted size range of 0.2–0.3 mm with feldspar and quartz and some clinopyroxene. The matrix is homogeneous, iron-rich. The coarse fraction is likely to be added as temper, which is missing in the non-bimodal sub-fabric group. The main fabric group mostly contains Olcese olla 3A samples, while the non-bimodal sub-fabric has Olcese olla 2 and Olcese tegame 2 samples.

This group contains samples from both the plain and the coastal area. The samples have been classified in a wide range of M-fabric groups, indicating the difficulty to identify this fabric group macroscopically due to similarities with QF.2 and V.1. The difference is the more frequent and consistence occurrence of clinopyroxene in this fabric group as well as clinopyroxene and biotite particles in the matrix.

Production: an iron-rich, non-calcareous homogenous clay with clinopyroxene and biotite particles is used for this fabric. The fine fraction has a very limited size range of mostly sub-rounded to rounded 0.2–0.3 mm sized feldspar, quartz and small amounts of clinopyroxene, indicating that possibly the clay was levigated before larger sized temper consisting of more angular shaped sanidine, quartz and clinopyroxene was added. The lack of clay pellets, even distribution of particles and smaller inclusions and high degree of homogeneity of the matrix could also tentatively hint at levigation or at least sufficient hydration before kneading. The amount of added temper
varies and is not always well mixed into the clay or in the case of the sub-fabric completely missing.

Inclusions are moderately aligned while the voids show strong alignment, making forming on a fast wheel likely. Firing atmosphere varied a lot, from completely reduced to completely oxidised and everything in between. Firing temperature was more consistent, with often a fused look to the matrix and no optical activity temperatures probably reached over 800°C.

Provenance and circulation: this group matches the Coarse sanidine and augite group from the Pontine plain as described by Borgers et al. (2018). Similar fabrics are also attested in Ciampino (Borgers 2022), Ostia (Capelli 2016), the Tiber valley and Rome (Bertoldi 2011, 113–121). The heterogeneity of the fabric group, especially the amount of inclusions, might point to multiple production locations. In general, the production location is assumed to have been in the Tiber valley. The fabric group occurs both in the plain and the coastal area, but is much more prominent in the former.

**Volcanic family – Loners VL.A–VL.H**

*VL.A Hornblende and clinopyroxene*

**Samples (N=1):** Net’08 T253.P7.1.

**Type:** Olcese casserole 1.

**Database code:** Volcanic Loner A / VL.A.

**Inclusions 10%**

**General features**

Abundance of inclusions is 10%. Equant and elongated shapes, sub-rounded to well-rounded. Single to open-spaced. Moderately aligned to the margins. Strongly bimodal, moderately sorted. Size range 0.2–0.7 mm, modal size 0.2 and 0.35–0.4 mm.

**Inclusion types:** coarse fraction 80%, 0.25–0.7 mm.

*Frequent:* hornblende (based on 120 degree extinction and green/orange-brown colours). Equant and elongated, sub-rounded. Size range: 0.3–0.45 mm, modal size: 0.35–0.4 mm.

*Frequent:* clinopyroxene, weathered. Equant, rounded. Size range: 0.25–0.4 mm, modal size: 0.3 mm.

*Common:* feldspar (nepheline?). Equant and elongated, sub-rounded to rounded. Size range: 0.25–0.37 mm, modal size: 0.25–0.3 mm.

*Few:* black, opaque inclusions in XP and PPL (hematite?). Equant, well-rounded. Size range: 0.3–0.65 mm, modal size: 0.4 mm.

*Very few:* quartz with undulose extinction. Equant and elongated, sub-rounded. Size range: 0.25–0.5 mm.

*Very few:* iron nodules. Clear boundaries, uneven shapes. Distinguishable from the black inclusions based on the occurrence of ring voids around the iron nodules. Size range: 0.35–1.8 mm.

*Very rare:* grey rock fragments. Equant, rounded. Size range: 0.7–0.95 mm.

**Inclusion types:** fine fraction 20%, < 0.25 mm

*Common:* feldspar.

*Few:* quartz with undulose extinction.

*Few:* black, opaque inclusions in XP and PPL (hematite?).
Matrix 85%

Iron-rich matrix with a fused appearance of the matrix. Homogenous colour, texture and distribution of (very few) feldspar particles. Colour in XP is dark rusty brown, colour in PPL is dark orange. No optical activity. Slip layer, best visible in PPL with a grey colour.

Voids 5%

Meso and macro channel voids. Strongly aligned to the margins.

Relationship to macroscopic fabrics: match with M-fabric 5. As noted in the description of M-fabric 5, this sample contained more green inclusions (hornblende) than the other two specimens. This is clearly visible in thin-section and leads to the classification of this sample in a separate fabric.

Comments

General: this fabric is characterised by large rounded inclusions of hornblende, clinopyroxene and feldspar (nepheline) added as temper (0.25–0.4 mm), combined with the occurrence of hematite. The orange matrix is homogenous and compact with very few particles and shows no optical activity. Because of the occurrence of hematite, this fabric might be related to Volcanic Loner B, which was also classified into the same M-fabric as this sample. Furthermore, this sample represents the only Olcese casserole 1 in the whole dataset.

Production: an iron-rich clay with very few particles is used for the production of this fabric. Temper is added in the form of sub-rounded to well-rounded larger sized inclusions of hornblende, clinopyroxene and feldspar (nepheline) within the narrow size range of 0.25–0.4 mm, with smaller quantities of hematite and quartz occurring in the fine fraction. The temper is unevenly distributed across the matrix. The pot is wheel thrown based on the strong alignment of the voids and moderate alignment of inclusions. Afterwards, a slip layer is applied with a grey colour. Firing was at temperatures above 800°C based on the absence of optical activity and discoloration of the hornblende minerals. Oxidised firing atmosphere except for the final stage, which was reducing and led to the slip layer turning to a grey colour.


VL.B Opaque inclusions, olivine and clinopyroxene fabric


Type: Olcese olla 3B.

Database code: Volcanic Loner B / VL.B.

Inclusions 18%

General features

Abundance of inclusions is 18%. Mostly equant shapes, sub-angular to sub-rounded. Single-spaced to double-spaced. Weak alignment to the margins. Unimodal. Size range 0.1–2.6 mm.

Inclusion types

Dominant: opaque black inclusions, both in XP and PPL (hematite?). No voids surrounding the inclusions, like with the iron nodules. Equant, rounded shapes. Size range: 0.1–0.35 mm, modal size: 0.25 mm.

Common: olivine. Equant, sub-angular to sub-rounded. Weathered. Size range: 0.25–0.55 mm, modal size: 0.3–0.35 mm.

Common: clinopyroxene. Equant, sub-angular to sub-rounded. Weathered. Size range: 0.3–0.7 mm, modal size: 0.3–0.4 mm.
Appendix IV. Thin-section fabric descriptions

**Few:** ARF – dark orange clay pellets. Rounded with sharp boundaries, but the more rounded the diffuser the boundaries are, high optical density and discordant. Size range: 0.15–0.4 mm, modal size: 0.37 mm.

**Few:** iron nodules, discernible from the other black inclusions because of voids surrounding the nodules. Very dark brown to black colour in XP and PPL. Equant shapes, rounded but sometimes with dips in the circle. Concentric circles structure. Size range: 0.4–2.6 mm, modal size: 1.0 mm.

**Rare:** feldspar. Equant, angular. Cracks or faceted. Size range: 0.55–0.85 mm.

**Rare:** rock fragments with grey-yellowish coloured inclusions in XP, darker brownish colours in PPL. Very fine speckled structure. Equant, predominantly rounded examples but also some sub-angular fragments. Size range: 0.3–0.8 mm, modal size: 0.45 mm.

**Very rare:** volcanic rock fragments (granite?). Equant, sub-angular. Speckled appearance, quartz–plagioclase combination. Size range: 0.35–0.4 mm.

**Very rare:** plagioclase fragment embedded in opaque black inclusion. Elongated, sub-rounded shape. Size: 0.7 mm.

**Matrix 72%**

Iron-rich heterogeneous matrix. The matrix is laminated and speckled on the exterior and more fused on the interior. Both colour and distribution of particles are heterogeneous. Relatively few feldspar particles throughout the section. Colour varies from grey-yellow to dark orange in XP and rusty brown to lighter grey-brown in PPL. The slip layer is light yellow-grey in XP and dark grey in PPL. The exterior shows high to medium optical activity while the interior is optically inactive.

**Voids 10%**

Channels and vughs, strongly aligned to the margins. Size range in two groups, meso and macro range. Larger voids mostly occur in the rim area.

**Relationship to macroscopic fabrics:** match with M-fabric 5. It is likely that this fabric and VL.A are related based on the occurrence of black opaque inclusions (hematite?), which is why they were classified in the same M-fabric.

**Comments**

General: this fabric is characterised by the occurrence of hematite, olivine and clinopyroxene set in an iron-rich, heterogeneous matrix with large iron nodules and a grey slip. This is the only Olcese olla 3B sample in the dataset and the fabric might be related to Volcanic Loner A based on the occurrence of hematite and belonging to the same macroscopic group 5.

Production: based on the heterogeneity of the matrix, with a laminated and speckled structure and colour variation and uneven distribution of particles, it is likely that two types of clay have been (poorly) mixed together. The first clay is iron-rich and similar to the clay of Volcanic Loner A while the second clay is possibly low calcareous, leading to the grey-yellow colours in the section. The latter is probably also used for the production of the grey slip layer. The inclusion distribution is unimodal, with hematite, olivine and clinopyroxene as the most common inclusions, together with the occurrence of a wide size variety of iron nodules. Voids are strongly aligned, suggesting throwing on a wheel after which a slip layer was applied. Firing was oxidising with reduction during the final stages. Temperature was below 800°C based on optical activity in the exterior margin and the slip layer.

**Provenance and circulation:** unknown provenance. Coastal fabric.
VL.C Clay pellets, biotite and clinopyroxene

Samples: Net’06 T2S5/GS/19.

Type: Olcese olla 2.

Database code: Volcanic Loner C / VL.C.

Inclusions 15%

General features

Abundance of inclusions is 15%. Equant and elongated inclusions, sub-angular to rounded shapes. Close to open spaced. Poor alignment to the margins, but possibly alignment to coils. Poorly sorted, unimodal distribution. Size range 0.2–1.7 mm.

Inclusion types

Frequent: ARF – clay pellets. Dark rusty brown to orange colours, sharp to clear boundaries. Equant and elongated, sub-rounded. High optical density, both concordant and discordant with the matrix. Size range: 0.3–2.0 mm, modal size: 0.45–0.65 mm.

Common: biotite. Elongated, sub-angular to sub-rounded. Size range: 0.55–0.95 mm, modal size: 0.65–0.7 mm.

Common: clinopyroxene, occasionally with simple twinning. Elongated and equant, angular to sub-rounded. Size range: 0.2–1.3 mm, modal size: 0.5 mm. Some inclusions are weathered (colour variation).

Few: olivine. Equant and elongated, angular to sub-rounded. Size range: 0.2–1.6 mm, modal size: 0.3–0.45 mm.

Very few: iron nodules. Equant and elongated, sub-angular to rounded. Size range: 0.2–0.75 mm, modal size: 0.4 mm.

Very few: quartz, some microcrystalline. Equant and elongated, sub-angular. Size range: 0.35–0.68 mm.

Very few: grey rock fragments, dense but speckled structure. Equant and elongated, sub-rounded. Size range: 0.45–0.65 mm.

Very few: feldspar. Equant, rounded. Size range: 0.35–0.8 mm. Weathered with many cracks.

Matrix 80%

Iron-rich matrix with many small darker coloured clay pellets and very few feldspar particles that are unevenly distributed across the matrix. Clay lenses appear in a lighter colour. Colour is bright orange in both XP and PPL, with clay lenses that are more optically active leaning towards yellow in XP. Matrix is highly optically active.

Voids 5%

Meso and macro channel voids. Strong alignment to the margins in the wall section, moderate aligned in the rim section. The inclusions and textural features seem to follow an S-curve in section, possibly indicating coil building.

Relationship to macroscopic fabric: this is the only thin-section that is made of the M-fabric 2. The inclusion types identified in the macroscopic analysis match with the inclusion types identified in thin-section.

Comments

General: this fabric is characterised by bright orange clay pellets and weathered volcanic inclusions set in an iron-rich matrix with small clay pellets and few feldspar particles. This fabric was identified as M-fabric 2.

Production: based on the characteristics of the matrix, the potter selected an iron-rich, non-calcareous clay. Because of the frequent occurrence of iron nodules and clay pellets as well as clay lenses, the clay source is
likely to have been either variegated or the potter mixed two types of clay but did not hydrate the clay paste sufficiently, leading to the abundance of clay pellets and lamination. Mixed into the clay paste is a volcanic temper (based on the angularity and size range) dominated by biotite, clinopyroxene and olivine. The inclusions are weakly aligned to the margins, while the alignment of the voids varies across the section. The distribution of the voids seems to follow an S-shape curve across the section. This distribution pattern, combined with the location of the clay lenses and the distribution of the inclusions tentatively hints at coil building rather than wheel turning. Firing atmosphere was oxidising and below 800°C based on the high optical activity of the matrix and the bright orange colour.


**VL.D Leucitite and (aegerine) augite**

**Samples (N=1):** Net’04 2301/7/DS/2.

**Type:** clibanus (unspecified).

**Database code:** Volcanic Loner D / VL.D.

**Inclusions 30%**

**General features**

Abundance of inclusions is 30%. Mostly equant shapes, but also elongated shapes appear. The inclusions are sub-rounded to well-rounded. Close to single spaced. Unimodal, moderately sorted. Most of the leucitite is significantly larger sized than the other inclusions. Moderate alignment.

**Inclusion types**

*Common:* leucitite. Dark red in XP, black-brown in PPL (in hand specimen pink), some examples with inclusions of skeletal leucite, clinopyroxene or quartz/feldspar or grey speckled rock fragments. Dense structure in XP, speckled structure with white and black-brown in PPL. Equant and elongated, sub-angular to sub-rounded. Size range: 0.25–2.4 mm.

*Common:* clinopyroxene (green colours, aegerine augite). Equant and elongated, sub-rounded to rounded. Size range: 0.15–1.25 mm. Weathered with colour variation between margins and core and many cracks.

*Common:* quartz, undulose extinction and normal extinction. Equant, sub-rounded to well-rounded. Size range: 0.15–1.18 mm.

*Few:* olivine. Equant, rounded to well-rounded. Size range: 0.3–1.3 mm. Weathered, visible in colour variation between core and margins.

*Few:* iron nodules. Dense structure, larger nodules have a more speckled structure. Equant, rounded. Dark brown to black colours. Size range: 0.3–2.3 mm. Some of the larger iron nodules are surrounded by ring voids.

*Rare:* grey rock fragments with a speckled structure with black, grey and white colours (granite?). Equant, rounded. Size range: 0.6–0.7 mm.

*Rare:* chert. Fine structure, light grey colours in XP, whiter colours in PPL. Equant, rounded to well-rounded. Size range: 0.6–1.0 mm.

*Rare:* biotite. Elongated, rounded. Size range: 1.0–1.6 mm. Concentration of biotite in the wall section.

*Rare:* leucite. Equant, rounded. Size range: 0.7–1.0 mm.

**Matrix 65%**

Iron-rich matrix with many different types of textural features leading to a heterogeneous colour. The different
clay bodies and clay pellets are evenly distributed and display variation in their optical density, colour and boundaries. The feldspar/quartz particles are evenly distributed across the matrix. Colour appears to be speckled in XP, being bright orange with greyish accents. The colour in PPL is bright light orange and homogenous. The matrix is highly optically active, with patterns clearly following the textural features within the matrix.

**Voids 5%**

Meso and macro channels are dominant, with a strong to moderate alignment to the margins. Vughs also appear, with a randomly oriented or opposite direction from the margin. One round mega vesicle in the centre of the section with remnant of the inclusion on the margins.

**Relationship to macroscopic fabrics:** this sample was also a loner in the macroscopic analysis, when it was classified as M-fabric 8.

**Comments**

General: this fabric is characterised by the occurrence of a wide range of inclusions up to 2.3 mm, most notably pink leucitite lava with skeletal leucite inclusions and occasionally feldspar and clinopyroxene inclusions, aegerine augite, quartz and olivine set in an iron-rich, heterogeneous matrix. It is likely that this fabric is tempered with leucitite (pink lava), quartz and augite. This sample is a match with M-fabric 8, which was also identified as a loner.

Production: an iron-rich clay was selected for the production of this fabric group and tempered with large sized leucitite (up to 2.3 mm), feldspar and clinopyroxene, rounded quartz and rounded aegerine augite in sizes up to 1.3 mm. The occurrence of clay pellets with a similar composition to the base clay, as well as larger clay bodies, suggests that the clay paste was not sufficiently hydrated. However, the particles and inclusions are evenly distributed so kneading was sufficient. Alignment of inclusions and voids is moderate to strong, indicating wheel turning although the fabric is quite coarse. Firing happened in an oxidizing environment but not long enough to reach complete oxidisation. Optical activity of the matrix is high and follows the pattern of the textural features in the matrix. Firing temperature was thus below 800°C.

Provenance and circulation: the occurrence of the uncommon leucitite with skeletal leucite (pink lava in hand specimen) as well as leucite point towards an origin in the Roman Magmatic provinces, specifically the Alban Hills. Although there are no direct matches with any of the Satricum fabrics, several Satricum fabric groups contain the exact same pink lava inclusions. These include SAT I.ad*Kq.vps(1-4)b; SAT IK*vps*(1-4*)bc and SAT I AD*K**-vps*(1-4).ab, occ. (large) FeMn / occ. (small) augite (Attema et al. 2003).

**V.L.E Calcareous clay with quartz, clinopyroxene and red chert**

**Sample:** Net’08 T2S3.O3.9.

**Type:** Olcese olla 1.

**Database code:** Volcanic Loner E / V.L.E.

**Inclusions 15%**

**General features**

Abundance of inclusions is 15%. Inclusions are relatively evenly distributed across the matrix. Equant and elongated shapes, mostly sub-rounded to well-rounded. Single to open spaced. Poor alignment to the margins. Unimodal, moderately sorted with a size range between 0.1–1.0 mm, modal size: 0.2–0.35 mm.

**Inclusion types**

**Dominant:** quartz. Equant shapes, rounded. Size range: 0.2–0.6 mm, modal size: 0.2–0.35 mm.
Few: clinopyroxene in yellow colours in XP, some are aegerine augite with green colours in PPL. Equant and elongated, sub-rounded to well-rounded. Some have very uneven shapes (weathered), these are usually sub-rounded. Size range: 0.25–1.0 mm, modal size: 0.25–0.35 mm.

Few: grey chert with red patches (iron stains). Equant to elongated, rounded to well-rounded. Size range: 0.85–1.7 mm.

Few: speckled rock fragments in white, black and grey or microcrystalline quartz. Equant, rounded to well-rounded. Size range: 0.3–0.6 mm, modal size: 0.3 mm.

Very few: opaque black inclusions (very small iron nodules or hematite?). Equant, rounded to well-rounded. Size range: 0.1–0.6 mm, modal range: < 0.3 mm.

Rare: ARF – clay pellets in bright orange colours in PPL. Clear to diffuse boundaries, neutral optical density, concordant with the matrix. Size range: 0.2–0.4 mm.

Rare: feldspar (plagioclase). Equant and elongated, rounded. Size range: 0.35–0.8 mm.

Matrix 82%

Heterogeneous matrix in both colour, textural features and distribution of particles. Areas with fewer particles have a more fused matrix, while the other parts of the matrix are more speckled (calcite?). Particles consist of feldspar/quartz and biotite and have an uneven distribution. Colour varies from grey and brown to rusty brown in XP and buff light brown in PPL. There is no optical activity.

Voids 3%

Small number of voids in general, compact fabric. Meso vesicles across the section, while macro and mega channels are located close to the margins. (Secondary) calcite on the margins of some of the meso vesicles. The channel voids are strongly aligned to the margins in the wall area.

Relationship to macroscopic fabric group: classified as M-fabric 5. All samples in this macroscopic group are loners in the microscopic analysis, but share the occurrence of black, opaque inclusions.

Comments

General: this fabric is characterised by the occurrence of mostly rounded quartz (0.2–0.6 mm) set in compact, heterogeneous matrix containing feldspar/quartz and biotite particles. This fabric is probably not related to the other two fabrics with hematite (VL.A and VL.B) because the matrix and dominant inclusion type are very different. This is the only Olcese olla 1 sample in the dataset.

Production: a variegated clay was selected for the production of this fabric, which was combined with rounded quartz sand as temper. The auxiliary inclusions, all volcanic, occur in such small quantities that it is likely that they are natural to the clay. Distribution of inclusions is fairly even while particles are unevenly distributed across the matrix, indicating poor kneading of the clay paste before forming. Alignment is not very strong, so this pot might not have been made on a fast wheel. Firing was oxidising and probably above 800°C because of no optical activity. Calcite is deposited in some of the voids.


VL.F Rounded sand and olivine


Type: Olcese olla 2.

Database code: Volcanic Loner F / VL.F.
Inclusions 25%

General features

Abundance of inclusions is 25%. Most inclusions are equant and rounded to well-rounded, but also elongated and sub-rounded inclusions occur. Close to double spaced, unimodal and moderately sorted. Weak alignment of inclusions to the margins, especially noticeable for elongated inclusions. Size range: 0.2–0.9 mm, modal size: 0.2–0.3 mm.

Inclusion types

Predominant: quartz. Equant, rounded to well-rounded. Size range: 0.2–0.65 mm, modal size: 0.2–0.25 mm. Examples of undulose extinction and microcrystalline structure occur both.

Few: clinopyroxene (partly aegerine augite). Equant and elongated, sub-rounded to rounded shapes. Size range: 0.2–0.9 mm. Weathered.

Rare: feldspar (sanidine). Equant and elongated, rounded to well-rounded. Size range: 0.45–0.7 mm.

Rare: rock fragments with grey, white, black colours and speckled appearance. Equant, well-rounded. Size range: 0.2–0.5 mm.

Rare: chert. Equant, well-rounded. Size range: 0.25–1.0 mm.

Very rare: olivine. Equant, rounded shapes. Size range: 0.25–0.3 mm.

Matrix 68%

Matrix with few but evenly distributed feldspar/quartz particles. One large clay body in the core, with a lower amount of particles and inclusions. The matrix appears to be fused on the interior, which also has a black colour (use related). The colour is homogeneous but varies across the section due to use, from exterior to interior fading from bright orange to black in XP and light bright orange to black in PPL. The exterior shows medium optical activity while the interior is not optically active.

Voids 7%

Meso and macro channels. Strong alignment to the margins on the external wall section, where most voids are located. Clay patch surrounded by channel voids in the centre.

Relationship to macroscopic fabric: match with M-fabric 6. The inclusion types identified macroscopically match with the thin-section description. The grey inclusions described for the M-fabric probably include the rock fragments, chert and microcrystalline quartz. This is the only thin-section taken from M-fabric 6.

Comments

General: this fabric is characterised by rounded to well-rounded quartz inclusions (0.2–0.65 mm) and a small quantity of clinopyroxene, feldspar, chert and rock fragments set in an orange firing, non-calcareous pure matrix with very few particles. The sample is blackened on the inside due to use. This fabric matches with M-fabric 6.

Production: a homogenous clay source is used to which rounded quartz in a narrow size range (0.2–0.6 mm) is added as temper. Because of the restricted size range of the temper, sieved sand is likely to be used while most of the other (volcanic) inclusion types are probably natural to the clay. Inclusions are evenly distributed across the matrix, so the clay paste is well kneaded and because of the lack of clay pellets probably also sufficiently hydrated. Voids are strongly aligned especially on the exterior wall, suggesting wheel turning as forming method. Firing was oxidising and below 800°C.


Use: fused matrix and black interior, no optical activity interior.
Appendix IV. Thin-section fabric descriptions

VL.G Compact quartz and clinopyroxene fabric

Sample: MC101923.1.1.

Type: Olcese coperchio 1.

Database code: Volcanic Loner G / VL.G.

Inclusions 10%

General features

Abundance of inclusions is 10%. Equant shapes, with sub-rounded to rounded forms. Spacing varies across the section due to uneven distribution of the particles from open to close spaced. Weak alignment of the inclusions to the margins. Strongly unimodal fabric, moderately sorted. Size range: 0.2–1.4 mm, modal size: 0.2–0.3 mm.

Inclusion types

Frequent: quartz. Equant, sub-angular to sub-rounded. Size range: 0.2–0.6 mm, modal size: 0.2–0.3 mm. Most of the quartz in the modal range is microcrystalline.

Frequent: clinopyroxene. Equant and elongated, sub-rounded to rounded. Size range: 0.4–0.8 mm.

Common: sanidine. Equant, rounded. Size range: 0.3–0.55 mm.

Rare: biotite. Elongated, rounded. Size range: 0.25–0.35 mm.

Rare: ARF – clay pellets. Rounded clay pellets with sharp to clear boundaries and high optical density. Pellets are discordant with the matrix. Colour is bright dark orange. Size range: 0.3–0.5 mm.

Matrix 87%

Iron-rich, homogenous matrix with evenly distributed feldspar and biotite particles. No optical activity except for a small part of the rim area. Colour in XP is dark brown-orange and in PPL dark brown to orange. Colour variation between outer wall and inner wall, could be related to use with the outer wall being blackened.

Voids 3%

Very few voids. Meso planar voids, weak alignment to the margins.

Relationship to macroscopic fabric: this sample was classified as M-fabric A, but based on the thin-section analysis does not belong in this group because of a different ratio between quartz and clinopyroxene.

Comments

General: this fabric is characterised by the occurrence of (microcrystalline) quartz, clinopyroxene and feldspar (0.2–0.8 mm) set in an iron-rich, non-calcareous homogenous and compact matrix with feldspar and biotite particles. This sample was classified as M-fabric A based on the occurrence of quartz, feldspar and clinopyroxene but is different due to the shape of the inclusions and a different ratio between feldspar and clinopyroxene.

Production: an iron-rich clay is combined with a quartz, feldspar and clinopyroxene temper (size range 0.2–0.8 mm). The clay paste is badly mixed, leading to an uneven distribution inclusions. Furthermore, the occurrence of larger sized clay pellets with a similar composition to the matrix indicate that the clay paste was not sufficiently hydrated. Both inclusions and voids show weak alignment to the margins, making forming on a fast wheel unlikely. Firing conditions were oxidising. Only a small part of the rim still shows optical activity, suggesting firing temperatures around 800°C.


Use: blackening outside.
VLH Aegerine augite and rock fragments

Sample: MC102487.2.3.

Type: Olcese olla 2.

Database code: Volcanic Loner H / VLH.

Inclusions 7%

General features

Abundance of inclusions is 7%. Both equant and elongated shapes, mostly sub-rounded forms. Open to close spaced, uneven distribution of inclusions especially the larger sized inclusions. Weak alignment to the margins. Unimodal, very poorly sorted. Size range: 0.15–2.0 mm.

Inclusion types

Frequent: aegerine augite. Equant and elongated, sub-rounded to rounded with the larger specimen having very uneven boundaries. Size range: 0.25–2.0 mm.

Frequent: ARF – clay pellets. Equant, well-rounded shapes with clear to sharp boundaries. High optical density, discordant with the matrix. Dark orange colours in PPL. Size range: 0.1–0.7 mm.

Common: feldspar. Equant, sub-angular to sub-rounded. Size range: 0.2–1.9 mm, modal size: 0.2–0.4 mm.

Few: rock fragments, speckled in grey and white colours. Equant, sub-rounded to rounded. Size range: 0.15–1.2 mm, modal size: 0.2–0.4 mm.

Few: microcrystalline quartz. Equant, sub-angular. Size range: 0.2–0.4 mm.

Very rare: biotite. Elongated, rounded. Size: 1.2 mm.

Very rare: volcanic rock fragments. Brown-greyish colour, the larger specimen with a large feldspar inclusion in the middle and a smaller clinopyroxene inclusion on the side. Equant, sub-rounded. Size: 0.7 and 1.3 mm.

Matrix 90%

The matrix is iron-rich and homogenous but with a speckled and striated appearance. The matrix contains few feldspar and clay pellet particles and is highly optical active. Colour in XP is bright yellow-orange and in PPL bright orange. One larger clay body in the matrix (2 mm). Very thin slip layer in the same colour as the clay pellets.

Voids 3%

Compact fabric with very few voids. Weak alignment. Couple of macro vughs in the centre of the section. Smaller meso channels towards the margins.

Relationship to macroscopic fabric: this sample was classified as M-fabric A1 mostly based on colour and slip layer, however the inclusion types are different from most M-fabric A1 samples (classified as V.2).

Comments

General: this fabric is characterised by a wide range of volcanic inclusions, with aegerine augite as the most common one. The inclusion abundance is relatively low (7%) and with a wide size range (0.15–2.0 mm). The matrix is non-calcareous, iron-rich and with few particles but with striation, speckles and variation in optical activity. This sample was classified as M-fabric A1 based on the occurrence of a slip layer and the mix of volcanic inclusions, but is different due to the lower amount of inclusions and the dominance of aegerine augite.

Production: an iron-rich clay was selected for this pot. There are no indications for temper being added. Since the type of inclusions are all volcanic, the clay source was a volcanic clay. The occurrence of a wide range of textural features within the matrix (speckles, striation, clay pellets, clay bodies) suggests either a variegated clay
source and incomplete hydration of the clay paste or both. Furthermore, the uneven distribution of inclusions and clay pellets shows poor kneading of the clay paste before forming. Both inclusions and voids show weak alignment, making forming on a fast wheel unlikely. A thin slip layer in the same colour as the matrix was added. Firing atmosphere was oxidising and long enough to reach complete oxidation. Firing temperature was below 800°C based on the high optical activity of the matrix throughout the section.

Provenance and circulation: the used clay is similar to the clay used for the Satricum fabric family SAT I. However, no match could be established with any of the SAT I fabrics. Pontine plain fabric.
Quartz-feldspar family – Fabric groups QF.1–QF.6

QF.1 Quartz and feldspar-rich fabric

Samples (N=20): MC101557.1.1; MC101700.2.7; MC101705.1.1; MC101707.2.16; MC101713.2.2; MC101889.2.1; MC101911.2.1; MC101927.2.4; MC102197.2.4; MC104027.2.2; MC104032.2.2; MC104035.4.5; MC104035.4.6; MC104036.1.1; MC104036.2.1; Net’07 P116.GS.9; Net’07 P116.GS.13; Net’08 T2S3.E2.4; Net’08 T2S3.I4.4; Net’08 T2S3.J4.4.

Types: Olcese olla 2 (N=5), Olcese olla 3A (N=4), Olcese olla 3B, Olcese coperchio 1 (N=2), Olcese clibane 1, Olcese clibane 2, Olcese clibane 3, Olcese tegame 2 (N=5).

Database code: Quartz-feldspar 1 / QF.1.

Inclusions 15–25%

General features

There is some variation in the abundance of inclusions, with outliers at 15% (MC104035.4.5) to 25% (MC101707.2.16), but the majority of samples has around 20% inclusions. Depending on the amount of inclusions, spacing varies from close-spaced to single-spaced. The inclusions are equant in shape and mostly sub-rounded. The Olcese olla 2 and Olcese olla 3A samples have a moderate to strong alignment, which is especially noticeable in comparison to the other types in this fabric group that have a weak alignment to the margins. The inclusion size varies between 0.1–0.45 mm with a unimodal distribution. The inclusions are moderately to poorly sorted.

Inclusion types

Dominant: quartz, often multi-faceted (polycrystalline) or with undulose extinction. Equant, sub-rounded. Size range: 0.1–0.4 mm but occasionally up to 0.9 mm (MC101889.2.1), modal size: 0.2 mm.

Common–very few: greyish rock fragments consisting of smaller particles (micro-granite, sandstone?). Equant and elongated shapes, rounded. Size range: 0.1–0.45 mm, modal size: 0.25 mm.

Few: feldspar (partly sanidine identified based on twinning). Majority is badly altered and appear white-grey in XP and yellowish-grey in PPL with a speckled-fused structure. Equant, sub-rounded to rounded shapes. Size range: 0.1–0.3 mm, modal size: 0.15 mm.

Few–very few: plagioclase, some very clear examples of multiple twinning. Elongated, sub-rounded. Size range: 0.1–0.4 mm, modal size: 0.2 mm (Net’08 T2S3.G5.6; MC101889.2.1).

Few–absent: clinopyroxene, weathered mostly in yellow or pink colours. Equant shapes, sub-rounded to rounded. Larger specimen have very irregular shapes. Size range: 0.1–0.65 mm, modal size: 0.2 mm. (MC101707.2.16; MC101713.2.2; MC104035.4.5).

Few–very few: ARF – clay pellets, well-rounded, orange colour similar to the matrix to dark brown (best visible in PPL). High to neutral optical density with diffuse boundaries. Concordance with matrix. Variation in size of the clay pellets, size range: 0.2–2.0 mm.

Very few–rare: iron nodules, rounded shapes. Larger specimen have diffuse boundaries (MC101889.2.1), while smaller specimen have sharp boundaries with a concentric circle structure or are completely opaque (MC104035.4.5). Size range: 0.3–1.8 mm.

Rare: chert. Elongated to equant, rounded to well-rounded. Size range: 0.35–0.65 mm, modal size: 0.5 mm.

Rare–absent: biotite. Elongated, sub-rounded. Size range: 0.1–0.38 mm (MC101889.2.1; MC104035.4.5).

Matrix 55–75%

The matrix is iron-rich with a varying degree of heterogeneity in relation to the amount and size of the clay
pellets / bodies and iron nodules in the individual samples. This also leads to heterogeneous colours (except in sample MC101707.2.16), varying from dark (bright) orange to dark rusty brown in XP and dark brown to dark orange and yellow orange in PPL. Particles, consisting of feldspar and varying amounts of biotite are unevenly distributed across the matrix (e.g. MC101889.2.1; MC104035.4.5). In some samples there are indications for poorly mixed clay pastes based on the occurrence of areas with significantly fewer inclusions (MC101889.2.1; MC104035.4.5). Optical activity is little (MC104036.1.1) to none. Samples without optical activity generally display a more homogenous colour.

**Voids 10–20%**

There is variation in the amount, type and size of voids depending on the type the sample belongs to. It is likely that this is related to variation in forming techniques between different shapes.

Samples MC101707.2.16, MC101713.2.2 and MC101889.2.1 (Olcese olla 3A) have channel and vugh shaped voids that are strongly aligned to the margins. Vughs are macro sized, channels extend up to 1.4 mm.

Samples MC101927.2.4 and MC104035.4.5 (both Olcese coperchio 1) have fewer voids than the Olcese olla 3A samples. This is likely to be because by different shaping technique in relation to a different shape. Voids are mostly vesicles and a small number of vughs. Micro vesicles and meso vughs (see MC101927.2.4). The voids are weakly aligned to the margins.

The clibane and tegami samples are dominated by larger sized vughs with a strong alignment to the margins.

**Relationship to macroscopic fabric:** the samples in this fabric group have been classified as M-fabric A (N=3), B (N=2), C (N=1), D (N=4), E (N=2), F (N=1), I (N=2) coastal M- fabric 9 (N=2), 10 (N=1) and 16 (N=2). These macroscopic fabrics share in their description that they all contain sand. Furthermore, they are characterised as (relatively) fine.

**Comments**

General: this fabric group is characterised by the dominance of sub-rounded to rounded quartz in a narrow size range (0.1–0.4 mm), which is likely to be added as temper. Other inclusion types that occur are fine grained rock fragments, feldspars, chert and varying quantities of clay pellet and iron nodules and occasionally clinopyroxene. The matrix is iron-rich and heterogeneous. Variation in the amount of temper added occurs in relation to the different cooking ware forms present within this fabric group.

This fabric group occurs both in the plain and the coastal area, but is far more prominent in the plain. Although classified into several different M-fabrics, they all share the assumption of sand being added as temper and being relatively fine grained. All samples from M-fabric E and I are included in this group, indicating that these two macroscopic groups should probably be merged.

Production: an iron-rich variegated clay source is used for this fabric, containing varying amounts of biotite and feldspar particles as well as clay bodies. There is variation between the samples in the occurrence of clay bodies, clay pellets and the distribution of the particles within the matrix. Kneading of the clay paste is not consistent, leading to variation in evenness of distribution of the inclusions and particles. Inclusions are dominated by sub-rounded to rounded quartz (sand) which is added as temper and probably sieved before mixing into the clay based on the narrow size range (0.1–0.4 mm). Other inclusions often show signs of weathering, falling mostly within the same size range as the quartz, include fine grained rock fragments, chert and feldspar. The samples that are not ollae also more often contain small quantities of clinopyroxene while most of the Olcese olla 2 samples seem to have a narrower size range (0.2–0.4 mm).

Besides minor variations in inclusion types and size in relation to form, there is also variation in voids based on forms in relation to forming methods. Olcese olla 2 samples contain fewer voids (5%) and mostly small vesicles while Olcese olla 3A samples contain larger sized channels and vughs that are strongly aligned to the margins. In general, all the ollae samples have a stronger alignment of inclusions than the other samples. The lids also have fewer voids that are weakly aligned. The clibane and tegami samples are dominated by larger sized vughs with
a strong alignment to the margins.

Firing atmosphere varied and does not show a relation to specific forms. It ranged from complete oxidisation, to incomplete oxidisation and complete reduction. Consequently, colour is varied within this fabric group. Firing temperature varied as well, although generally optical activity is low to none, suggesting temperatures around 800°C.

Provenance and circulation: this fabric group bears similarities to the Pontine plain Fine clay mixing fabric which originates from Forum Appii and/or Ad Medias (Borger et al. 2018) based on the size and types of inclusions. The clay however also looks very similar to the ‘red augite’ group (V.3), but in comparison to the red augite group, this fabric group contains smaller amounts of biotite and clinopyroxene inclusions. This group is also related to QF.2 based on the inclusions. Similar fabrics are attested at Vasanello (Peña 1992) and Rome (Bertoldi 2011). Based on similarities to different fabric groups from the Pontine plain, of which one is directly connected to a local Republican production, a local origin in the Pontine plain for this fabric is hypothesised. However, considering its wider circulation in and around Rome, a more northern provenance cannot be excluded completely. Within the Pontine region, this fabric occurs in both the coastal area and plain, but is more common in the latter.

**QF.2 Bimodal quartz-feldspar and iron nodules**

**Samples (N=21):** MC101701.1.9; MC101706.2.3; MC101713.2.3; MC101714.2.2; MC101906.1.3; MC101910.1.1; Net’04 2301.13.10; Net’05 4277.1.3; Net’06 T2S5.GS.26; Net’06 T2S5.GS.40; Net’07 GT2007_01.GS.55; Net’07 N.S.1.GS.8; Net’07 N.S.1.GS.9; Net’07 P116.GS.25; Net’07 P116.GS.35; Net’07 P145.GS.8; Net’07 T2S3.GS.50; Net’08 T2S3.B2.1; Net’08 T2S3.I4.5; Net’08 T2S3.P6; Net’08 T2S3.P7.32.

**Types:** Olcese olla 2 (N=6), Olcese olla 3A (N=13), Olcese clibane 2, Olcese tegame 3.

**Database code:** Quartz-feldspar 2 / QF.2.

**Inclusions 20–30%**

**General features**

Abundance of inclusions varies slightly between samples, 20–30%, but overall a rather homogenous group. Samples closer to 20% contain fewer larger sized quartz/ feldspar inclusions (e.g. MC101910.1.1) while samples closer to 30% have a larger coarse fraction (e.g. Net’07 P116.GS.25). Inclusions are not always evenly distributed across the matrix, with sometimes clusters of larger inclusions closer to the margins. Equant and elongated shapes, angular to sub-rounded inclusions. Close spaced, especially the larger inclusions cluster together in some of the samples. Moderately to strongly aligned to the margins. Bimodal fabric with variation in prominence of coarse fraction, with a fine fraction size < 0.3 mm and coarse fraction size range 0.8–1.7 mm. Especially the Olcese olla 3A samples tend to be more coarse (towards 70%) in comparison to the other shapes.

**Inclusion types: Coarse fraction 40–70%, > 0.3 mm**

**Frequent:** quartz. Equant, sub-angular to sub-rounded. Size range: 0.5–1.5 mm, modal size: 0.5 mm and > 1.0 mm. Straight extension of the larger sized quartz inclusions.

**Frequent:** feldspar (sanidine/nepheline). Equant, sub-angular to sub-rounded. Size range: 0.5–1.5 mm, modal size: 0.5 mm and > 1.0 mm. Based on the size and shape of these inclusions, they appear to be related to the quartz inclusions. Together they form the dominant groups within this fabric.

**Few:** rock fragments or microcrystalline quartz. Speckled, greyish colours. Equant and elongated, rounded. Size range: 0.45–1.25 mm, modal size: 0.45–0.55 mm.

**Few–very few:** clinopyroxene. Equant and elongated, sub-rounded to rounded. Size range: 0.3–1.6 mm. Some very weathered examples with uneven boundaries occur.
Very few–rare: iron nodules. Equant, well-rounded. Dense internal structure. Ring voids around the larger sized nodules. Size range: 0.3–2.7 mm.

Very few–rare: chert, grey sometimes with partly rusty colours (iron stains). Equant and elongated, rounded. Size range: 0.65–2.35 mm.

Very few–rare: ARF – clay pellets, sometimes with particles. Colour is the same as the matrix. Sharp to merging boundaries, often with voids around the pellet. Neutral optical density, concordant with the matrix. Equant, rounded. Size range: 1.0–1.5 mm.

Inclusion types: Fine fraction 30–60%, < 0.3 mm

Predominant: quartz/feldspar.

Few: microcrystalline quartz.

Few: clinopyroxene.

Very few–absent: iron nodules.

Matrix 55–70%

Iron-rich matrix. Homogeneous distribution of feldspar particles and textural features, but variation in the amount of particles between samples from few (Net’04 2301.13.10) to many (MC101713.2.3). There is no optical activity, but variation in the degree of vitrification exists, with some samples having a more fused look.

Homogenous colour but variation between core and margins due to incomplete oxidisation or reduction, except Net’04 2301.13.10 which is completely reduced and Net’07 T2S3.GS.50 which is completely oxidised. Colour in XP is dark orange brown to black. Colour in PPL is very dark brown to black. Orange samples have brighter colours in the core, darker samples have lighter colours in the core in comparison to the margins.

Voids 5–15%

Variation in amount of voids occurs, abundance of voids generally around 10% but also outliers to 15% (Net’06 T2S5.GS.40). (Very) strong alignment to the margins, especially in the rim area were also the majority of the voids are located. Macro channels are dominant, but macro vughs also occur. Some samples have secondary calcite in some of the voids located close to the margins (MC101910.1.1; Net’06 T2S5.GS.40)

Relationship to macroscopic fabric: plain M-fabric B (N=1), D (N=1), F (N=1), J (N=3), and coastal M-fabric 9 (N=3), 10sub (N=2), 11 (N=3), 12 (N=3), 13 (N=3) and 16 (N=1). All described as sandy, with varying amount of larger inclusions as mix quartz/feldspar and iron nodules, clay pellets/ red chert. The sandy appearance makes the correct fabric identification difficult. Many of the M-fabrics in QF.2 overlap with QF.1.

Comments

General: this fabric group is dominated by the occurrence of an equal mix of sub-angular to sub-rounded quartz and feldspar accompanied by smaller quantities of rock fragments, chert, clinopyroxene, clay pellets and iron nodules set in a homogeneous, iron-rich matrix with feldspar particles. The quartz-feldspar inclusions occur in different size ranges, making this fabric bimodal (0.5 mm and > 1.0 mm). However, there is variation in how prominent the coarse fraction is, from >60% for the Olcese olla 3A samples to 40-50% for the other types present within this group. This group occurs both in the plain and in the coastal area, but is more prominent in the coastal area.

Production: this fabric is made with an iron-rich homogenous clay containing varying quantities of feldspar particles. A mix of sub-angular to sub-rounded quartz and feldspar (0.5–1.5 mm) is added as temper. There is variation in how well mixed in the temper is, visible in the distribution of the coarser inclusions, while the finer sized inclusions are generally evenly distributed. This makes it likely that the other inclusions are natural to the clay. Furthermore, there is quite some variation in the amount of temper added in relationship to form. Olcese...
olla 3A samples contain significantly higher amounts of temper than the other samples.

All samples have strong to very strong alignment of the voids to the margins, indicating forming on a fast wheel. Firing atmosphere was varied but mostly incomplete oxidation or incomplete reduction. None of the samples show any optical activity, while several have a melted look to the matrix, indicating temperatures reaching above 800°C.

Provenance and circulation: this fabric group matches the Coarse sanidine group from the Pontine plain (Borgers et al. 2018). It is similar to the Rome and Tiber valley fabric (Olcese 2003) and also circulated in Rome (Thierrin-Michael 2003). It appears to be related to QF.1 based on inclusions, however, a different clay source is used. An origin in the Tiber valley, Rome or northern Campania is assumed for this group. Within the Pontine region, this fabric circulated both in the plain and the coastal area but is more common in the latter.

QF.3 Heterogeneous matrix with fine quartz-feldspar and iron nodules

Samples (N=3): MC102372.1.1; MC102376.1.2; MC102486.2.4.

Types: Olcese olla 2.


Inclusions 10–15%

General features

Abundance of inclusions varies between 10% (MC102486.2.4; MC102376.1.2) and 15% (MC102372.1.1). Equant and elongated shapes, sub-angular to rounded. Close to open spaced, uneven distribution of the inclusions through the matrix. Moderately aligned to the margins. Unimodal, moderately sorted.

Inclusion types

Frequent: quartz, larger minerals with undulose extinction. Equant, sub-angular to rounded. Size range: 0.1–1.1 mm, modal size: < 0.2 mm.

Common: iron nodules. Opaque, dark brown to black colours in both PPL and XP. Often surrounded by ring voids. Equant, rounded. Clear to diffuse boundaries. Variation in internal structure from dense to patchy. Size range: 0.3–1.15 mm.

Few–very few: speckled, grey rock fragments. Equant and elongated, larger fragments are sub-angular, smaller ones are sub-rounded to rounded. Size range: 0.25–0.9 mm. Fragment in MC102376.1.2 with a rock fragment attached to a couple of quartz/feldspar minerals. Only MC102376.1.2 contains larger sized rock fragments.

Few: clinopyroxene. Equant, sub-rounded to rounded. Size range: 0.2–0.6 mm.

Few–rare: chert, grey colours. Equant and elongated, rounded. Size range: 0.3–0.9 mm. MC102376.1.2 contains less chert (but more rock fragments).

Very few–rare: sanidine (simple twinning). Equant and elongated, sub-rounded to rounded. Size range: 0.2–0.65 mm. MC102372.1.1 contains more sanidine than the other samples.

Matrix 75–83%

Iron-rich matrix with a heterogeneous colour and small iron nodules. Uneven distribution of feldspar/quartz and few biotite particles, especially in MC102372.1.1 and MC102376.1.2. Optical activity varies across the sections, with some areas with low optical activity. This might relate to textural features, especially in MC102376.1.2. The slip layer is highly optical active. Colour varies within and between the samples from dark brown to dark orange in XP and dark orange to grey-orange in PPL.
Appendix IV. Thin-section fabric descriptions

Voids 7–10%
Meso and macro vughs around iron nodules and vughs in the opposite direction from the margins (e.g. MC102372.1.1). Meso channels are more aligned with the margins than the vughs generally are. The vughs and channels in MC102376.1.2 are better aligned.

Relationship to macroscopic fabric: M-fabric A and A1. MC102486.2.4 incorrectly classified as A due to deterioration of the slip layer.

Comments
General: this fabric group is characterised by the occurrence of fine quartz (< 0.2 mm) and a larger sized (up to 1.15 mm) set of inclusions consisting of iron nodules, rock fragments, sanidine, chert and clinopyroxene set in a heterogeneous matrix with iron nodules, quartz/feldspar and biotite particles. All samples are slipped and belong to the Olcese olla 2 type. This fabric group only occurs in the Pontine plain and was identified as M-fabric A1.

Production: based on the colour of the matrix and the occurrence of only orange clay pellets, the use of two clays is assumed. One orange firing, iron-rich clay and one low calcareous clay with a green-greyish colour. Clay pellets only occur in orange, suggesting that the iron-rich clay was not properly hydrated when mixed with the low calcareous clay. Furthermore, the heterogeneous colour and uneven distribution of larger sized inclusions indicate the lack of proper kneading of the clay paste before forming. Inclusions are moderately aligned and the voids are very strongly aligned, making wheel throwing likely. Form repertoire is limited to Olcese olla 2. All samples contain a bright orange slip layer. The slip layer has the same colour as the iron-rich clay component. Firing is homogeneous with completely oxidising conditions, but temperatures not high enough or long enough to eliminate optical activity completely (< 800 °C).

Provenance and circulation: unknown provenance. Circulation is limited to the Pontine plain.

QF.4 Compact and fine quartz–feldspar fabric
Samples (N=3): Net’08 T2S3.H4.1; Net’08 T2S3.H4.9; Net’08 T2S3.N2.4.
Types: Olcese olla 1, Olcese clibane 2, Olcese tegame 1.

Inclusions 30%

General features
Abundance of inclusions is around 30% and consistent between the samples. Strongly bimodal fabric, large fraction only makes up a very small portion of the whole. Size range large fraction is 0.15–0.25 mm, with the exception of chert and iron nodules up to 1.3 mm. Fine fraction is very homogenous in size, 0.10–0.15 mm. Both equant and elongated shapes appear, mostly in sub-rounded forms. Strong alignment to the margins especially towards the margins themselves. Close spaced and moderately sorted.

Inclusion types: Coarse fraction 5%, > 0.15 mm
Predominant: quartz and/or feldspar. Equant, sub-angular to sub-rounded. Size range: 0.10–25 mm, modal size 0.15 mm.
Very few: clinopyroxene, yellow colours in XP. Equant, sub-rounded. Size range: 0.15-0.25 mm, modal size 0.19 mm.
Very few: iron nodules, black to dark brown colour. Equant, sub-rounded (not round!). Size range: 0.3–1.3 mm, modal size: 0.45 mm. Majority of iron nodules is large, but Net’08 T2S3.N2.4 also contains smaller sized iron nodules.

Very few: ARF – clay pellets in bright to dark orange, not the same colour as the matrix. Equant and elongated, rounded to well-rounded. Sharp boundaries, high optical density. Discordant within the matrix. Size range: 0.3-0.7 mm, modal size: 0.4 mm.

Very few: chert, grey colour in XP, light yellow-grey in PPL. Equant, sub-angular. Size range: 0.65–0.85 mm, modal size: 0.8 mm. (Net’08 T2S3.N2.4; Net’08 T2S3.H4.9).

Inclusion types: Fine fraction 95%, 0.1–0.15 mm

Predominant: quartz and/or feldspar.

Very few–rare: clinopyroxene.

Matrix 67%

Homogenous matrix in colour, texture and distribution of numerous feldspar/quartz particles. Matrix appears to be speckled, possibly indicating a low calcareous content. Colour is yellow-orange in PPL and yellow-grey, orange or dark brown in XP. The matrix is highly optically active.

Voids 3%

Very few voids, compact fabric. Narrow meso vughs along the margins of the walls. Strong alignment.

Relationship to macroscopic fabric: this group overlaps with M-fabric 10 and loner M-fabric 7. These two macroscopic groups should be merged.

Comments

General: this fabric is characterised by a very consistent high amount inclusions (30%) of predominantly quartz and feldspar and small amounts of clinopyroxene, chert, iron nodules and clay pellets. The size distribution is strongly bimodal, with only a small fraction belonging to the coarse fraction (5%) and 95% of the inclusions belonging to the fine fraction (< 0.15 mm). The matrix is compact, homogenous, iron-rich and low calcareous and rich in quartz/feldspar particles and fires bright orange. This fabric group is macroscopically identified as coastal groups 7 and 10.

Production: an iron-rich, low calcareous clay was selected for this fabric, containing a lot of quartz and feldspar inclusions. Because of the abundance of particles and the clear cut-off point as well as the dominance of the fine fraction, levigation can be hypothesised. Also the homogeneity of the matrix in general and the low amount of textural features, including clay pellets, could indicate levigation or at least sufficient hydration and kneading. The coarse fraction contains similar inclusions types to the fine fraction, as well as iron nodules and chert but makes up only a very small portion of all the inclusions. The inclusions are evenly distributed across the matrix. The clay paste was thus sufficiently kneaded, which is further supported by the low amount of voids. Both inclusions and voids are strongly aligned, indicating forming on a fast wheel. Firing happened in an oxidising environment and was maintained long enough for complete oxidisation leading to a characteristic bright orange colour. All samples are highly optically active, indicating firing temperatures below 800°C.

Provenance and circulation: the fabric bears similarities to Satricum fabric SAT II AD*ws(3-4).a–black organic. Provenance is however unknown. Circulation is limited to the coastal area.
Appendix IV. Thin-section fabric descriptions

QF.5 Bright red clay matrix with quartz


Types: Olcese tegame 1 (N=2), Olcese coperchio 2.

Database code: Quartz-feldspar 5 / QF.5.

Inclusions 10%

General features

Abundance of inclusions is consistent within the group, around 10%. Equant, sub-rounded to rounded shapes. Double to open-spaced. The inclusions are not distributed evenly across the matrix. Strong alignment to the margins. Well-sorted, unimodal distribution. Size range: 0.2–1.5 mm, with especially sample Net’08 T2S3.F2.1 containing more larger sized inclusions (clinopyroxene and iron nodules).

Inclusion types

Predominant: quartz, equant, rounded to well-rounded shapes. Majority of the quartz inclusions show undulose extinction. Size range: 0.2–0.45 mm, modal size: 0.4 mm.

Common–rare: clinopyroxene. Equant, sub-angular to sub-rounded. Size range: 0.4–1.5 mm. Most prominent in Net’08 T2S3.F2.1 and almost absent in the other samples.

Few–rare: iron nodules. Equant and elongated, rounded to well-rounded. Dark brown to black colours. Size range: 1.1–1.6 mm.

Very few–rare: rock fragments, equant, rounded. Fragments consist of smaller inclusions giving the inclusions a speckled appearance (basalt/dolerite?). Size range: 0.25–0.45 mm, modal size: 0.3 mm.

Few–very few: ARF – clay pellets. Clay pellets occur in two colours: bright orange and yellowish-brown. Orange clay pellets have clear to diffuse boundaries, rounded equant shapes with a high optical density and are concordant with the matrix. Size range: 0.6–0.8 mm. The yellowish-brown clay pellets have sharp boundaries, rounded, equant shapes with high optical density and discordant with the matrix. Size range: 0.35–0.7 mm.

Matrix 85–87%

Heterogeneous matrix, likely to be caused by the mixing of two clays. Indicative are the streaks and speckles visible with different colours, especially visible in Net’08 T2S3.F2.1, with bands of yellowish-green clay and orange clay. Clay pellets occur in the same colours. The matrix contains biotite, quartz and feldspar particles that are evenly distributed. No optical activity. Colour in XP is very dark rusty brown, colour in PPL is rusty brown.

Voids 3–5%

Combination of vughs and vesicles. The meso vughs are strongly aligned to the margins, especially in the wall. Micro and meso vesicles are more concentrated in the rim area. Sample Net’08 T2S3.F2.1 has vughs concentrated around the streaks of clay and textural features, which is related to bad mixing of the clay paste.

Relationship to macroscopic fabric: M-fabrics 9 (both tegami) and 15. M-fabric 9 also described as sand fabric, but a large group that is split across different microscopic fabric groups. M-fabric 15 was identified as a loner based on the clearly badly mixed clay paste.

Comments

General: this fabric group is characterised by the occurrence of predominantly quartz and varying quantities of clinopyroxene, rock fragments, iron nodules and clay pellets set in a heterogeneous matrix that is predominantly bright orange but also contains yellow-grey streaks. Two different types of clay have been mixed together, also causing an uneven distribution of inclusions, to which the rounded quartz is added as temper. This fabric group only occurs in the coastal area.
Production: two types of clay have been selected and poorly mixed together: an iron-rich clay and a low calcareous yellowish-grey clay. Temper in the form of rounded quartz is added to the mix. Indication for poor kneading are numerous: streaks, clay pellets in different colours suggesting incomplete hydration, clay bodies, the occurrence of voids around textural features and uneven distribution of inclusions are visible in all samples. Both inclusions and voids are strongly aligned, indicating forming on a fast wheel. Firing atmosphere was oxidising and maintained long enough to reach complete oxidisation. Firing temperature was above 800°C based on the absence of optical activity.


**QF.6 Clay pellets and quartz inclusions**

**Samples:** MC102384.1.1; MC102479.2.9; MC104028.2.2.

**Types:** Olcese olla 2.

**Database code:** Quartz-feldspar 6 / QF.6.

**Inclusions 5%**

**General features**

Abundance of inclusions is 5%. Equant and elongated shapes, angular to sub-angular. Size range: 0.15–1.1 mm. Open-spaced, weak alignment to the margins. Poorly sorted, unimodal.

**Inclusion types**

*Common:* ARF – clay pellets. Dark rusty orange colour in XP. Equant and elongated, sub-rounded to well-rounded. Sharp to clear boundaries, high optical density, discordant with the matrix. Size range: 0.25–0.8 mm.

*Common:* quartz. Equant and elongated, mostly rounded but also sub-angular. Size range: 0.15–0.35 mm, modal size: 0.2 mm.

*Few:* clinopyroxene. Equant and elongated, sub-angular to sub-rounded. Size range: 0.2–0.6 mm, modal size: 0.35–0.4 mm.

*Rare:* microcrystalline quartz. Equant, sub-angular. Size range: 0.15–0.35 mm.

*Rare:* black opaque inclusions (best visible in PPL). Equant and elongated, rounded. Size range: 0.2–0.6 mm, modal size: 0.2–0.25 mm.

*Very rare:* microcline. Equant, rounded. Size: 0.25 mm.

*Very rare:* iron nodules. Equant, rounded with circular structure. Size: 1.1 mm.

**Matrix 92%**

Iron-rich matrix with few evenly distributed quartz and feldspar particles. The matrix is heterogeneous due to the appearance of different textural features in a darker colour than the matrix, especially visible in MC102479.2.9. These include clay pellets, clay bodies and streaks. Areas that are optically active have a more speckled structure. Colour in XP is bright dark orange, colour in PPL is bright orange brown.

**Voids 3%**

Macro vughs are dominant. Macro channels also occur, especially in the rim area. Moderate to well aligned.

**Relationship to macroscopic fabric:** the samples in this group all come from different M-fabrics from the plain, namely A1/H, C and G. What is shared between them is the occurrence of a slip layer and the bright orange colour as well as the occurrence of darker coloured clay pellets.
Appendix IV. Thin-section fabric descriptions

Comments

General: this fabric is characterised by a low amount of inclusions (5%) consisting of dark orange clay pellets and quartz, accompanied by small amounts of clinopyroxene, microcrystalline quartz, microcline and iron nodules set in a dark orange, compact, heterogeneous, iron-rich matrix. This group only occurs in the Pontine plain and is restricted to Olcese olla 2 types, with a slip layer.

Production: based on the occurrence of many different types of textural features in different colours, it is likely that two types of clay have been mixed together with a varying degree of hydration leading to the occurrence of many clay pellets in a darker colour than the matrix as well as streaks. The two clays are not well kneaded, for which the uneven distribution of inclusions is also indicative. Alignment of both inclusions and voids is weak to moderate, suggesting forming at lower speeds. This is further supported by the direction of the textural features and their optical activity. After forming, a slip layer has been applied. Firing atmosphere was oxidising and maintained long enough to reach complete oxidisation. Optical activity varies within the samples based on textural features and is low to moderate, indicating temperatures around 800°C.


Quartz-feldspar family – Loners QF.A–QF.C

QFL.A Coarse angular quartz and rock fragments

Sample: Net’06 P118.GS.65.

Type: Olcese olla 2.

Database code: Quartz-feldspar Loner A / QFL.A.

Inclusions 12%

General features

Abundance of inclusions is 12%. Equant and elongated shapes, sub-angular to rounded. Close to double spaced. Strongly aligned to the margins. Unimodal, poorly sorted.

Inclusion types

Dominant: quartz. Equant and elongated, sub-angular to rounded. Larger sized fraction is sub-angular, while the smaller sized quartz inclusions are more rounded. Size range: 0.1–1.2 mm, modal size: < 0.3 mm. The modal size group also includes microcrystalline quartz.

Few: feldspar (sanidine and plagioclase). Equant and elongated, sub-angular to rounded with (like the quartz inclusions) the large inclusions being more angular than the smaller sized inclusions. Size range: 0.25–0.55 mm.

Few: clinopyroxene. Equant and elongated, sub-rounded to rounded. Size range: 0.15–1.45 mm. Majority of the clinopyroxene appear to be weathered.

Very few: iron nodules. Equant, rounded. Dark brown to black colours. Size range: 0.25–1.55 mm.

Rare: ARF – clay pellets in dark brown colours. Diffuse boundaries, neutral to low optical density, concordant with the matrix. Size range: 0.1–0.85 mm.

Rare: grey coloured chert. Equant, rounded. Size range: 0.4–2.5 mm.

Rare: rock fragment, fine structure with larger clinopyroxene, feldspar and quartz inclusion. Equant, rounded with irregular shape. Size: 1.55 mm.
Matrix 83%

Iron-rich matrix with a heterogeneous, speckled colour caused by textural features. Particles are dominated by quartz/feldspar, combined with a small amount of biotite. They are numerous and evenly distributed across the matrix. The colour is bright dark orange in XP and dark brown on the exterior and dark orange on the interior in PPL. The slip layer has a grey colour. The colour variation might be use related. Optical activity is high.

Voids 5%

Macro vughs in the wall area, strongly aligned to the margins. Macro and meso channels concentration in the rim area close to the margin but also at the core. The channels are strongly aligned with the margins.

Relationship to macroscopic fabric: M-fabric 9, described as sandy. This sample is different due to the more angular shape of the quartz inclusions and the different matrix.

Comments

General: this fabric is characterised by an iron-rich, highly optical active, heterogeneous matrix with strongly aligned quartz and feldspar inclusions (0.1–1.2 mm). The larger sized inclusions are sub-angular while smaller sized inclusions tend to be more rounded, possibly indicating the addition of temper. This fabric is set apart from the other quartz-feldspar groups based on this angularity and the occurrence of rock fragments and grey chert as well as a grey slip layer.

Production: a variegated, iron-rich clay is used, possibly combined with temper in the form of sub-angular, large quartz inclusions (up to 1.2 mm). The even distribution of inclusions and particles indicates a well-kneaded clay paste. Strong alignment of the inclusions and voids even in the core of the section suggests forming on a fast wheel, after which a slip layer was applied. The shape of the Olcese olla 2 rim is very distinct due to its elongated almond shape, which is another indication (together with the grey slip) that this fabric group has a different provenance. Firing was below 800°C based on high optical activity of both the slip layer and the matrix. Firing atmosphere was initially oxidizing but reducing during the final stages.


QFL.B Sand with bright orange clay pellets

Sample: Net’07 T2S3.GS.32.

Type: Olcese clibanus 2.

Database code: Quartz-feldspar Loner B / QFL.B.

Inclusions 20%

General features

Abundance of inclusions is 20%. Equant and elongated shapes, sub-rounded to rounded. Single to double spaced. Strong alignment along the margins. Unimodal, moderately sorted. Most inclusions fall with a narrow size range of 0.3–0.4 mm.

Inclusion types

Dominant: quartz. Equant and elongated, sub-rounded to rounded. Size range: 0.1–0.55 mm, modal size: < 0.38 mm. Microcrystalline quartz and individual minerals occur together.

Common: ARF – two types of clay pellets. Type one in bright orange colours in both PPL and XP, diffuse boundaries, neutral to high optical density, concordant with the matrix. Size range: 0.15–0.95 mm. Type two is a darker rusty brown in XP and almost black in PPL with sharp boundaries, high optical density and discordant with the matrix. Size range: 0.15–0.8 mm.
**Appendix IV. Thin-section fabric descriptions**

**Few:** feldspar. Equant and elongated, larger fragments sub-angular to sub-rounded, smaller minerals rounded. Size range: 0.1–2.0 mm, modal size: 0.1–0.3 mm.

**Few:** clinopyroxene. Equant and elongated, sub-rounded to rounded. Size range: 0.1–1.0 mm, modal size: < 0.37 mm.

**Few:** olivine. Equant, rounded. Size range: 0.15–1.4 mm. Weathered (colour variation between margins and core) and irregular shapes, sometimes with holes in the mineral.

**Very few:** biotite. Elongated, sub-rounded. Size range: 0.3–1.0 mm.

**Very few:** rock fragments, speckled structure with grey and white colours. Equant, sub-rounded to rounded. Size range: 0.2–0.9 mm.

**Matrix 7%**

Matrix with clay pellets and iron nodules in different sizes. Homogeneous distribution of feldspar/quartz particles and textural features. Textural features occur throughout the sample, sometimes surrounded by voids. Colour variation between the core and the margins, with a greyish-yellow to greyish-orange and brown colour in XP and a light orange to brown colour in PPL. The rim is optically active.

**Voids 73%**

Macro vughs, mostly occurring in the core and around textural features and larger clay pellets. Random orientation. Meso and macro channels, also mostly occurring in the core with a strong alignment to the margins. Closer to the margins, some mega channels occur (use related?).

**Relationship to macroscopic fabric:** classified as M-fabric 14. This sample was also during the macroscopic analysis a loner with sand (quartz/feldspar) and black inclusions (clinopyroxene and biotite) combined with bright orange inclusions (clay pellets).

**Comments**

General: this fabric is characterised by the dominance of sub-rounded to rounded quartz inclusions combined with smaller amounts of bright orange and dark orange clay pellets and igneous inclusions set in a clay matrix with clay pellets and iron nodules. This fabric was identified as M-fabric 14, which was also a loner.

Production: a variegated clay source containing clay pellets and iron nodules was used for this fabric. The clay is tempered with rounded quartz (0.1–0.55 mm). The occurrence of small quantities of clinopyroxene and biotite suggests a volcanic clay. The clay paste was probably not sufficiently hydrated before kneading, since clay pellets are abundant, varied in size and composition and often surrounded by ring voids. Voids are large in size but do have a strong alignment to the margins, suggesting wheel throwing. Firing happened in an oxidising environment but not for long enough, leaving the core grey. The optical activity of the matrix in the rim area indicates firing below 800°C.


**QFL.C Plagioclase and biotite fabric**

**Samples (N=4):** MC104035.4.8.

**Types:** Olcese tegame 2.

**Database code:** Quartz-feldspar Loner C / QFL.C.

**Inclusions 25%**
General features

Abundance of inclusions is 25%. Equant and elongated shapes, angular to sub-angular shapes. Close-spaced and moderately aligned to the margins (especially the biotite). Unimodal fabric. Size range 0.1–0.8 mm, modal size 0.2 mm. Many of the inclusion types have a very narrow size range between 0.15–0.2 mm, with the exception of biotite, nepheline/sanidine and the quartz/rock fragments (larger sizes).

Inclusion types

**Dominant:** plagioclase (based on multiple twinning). Equant and elongated, angular to sub-angular. Size range: 0.15–0.2 mm.

**Common:** biotite. Elongated, well-rounded. Size range: 0.25–0.4 mm, modal size: 0.3 mm.

**Common:** clinopyroxene (including aegerine augite). Equant, angular to sub-angular. Size range: 0.15–0.2 mm.

**Few:** nepheline/sanidine. Equant and elongated, either rounded or angular. Significantly larger than the other inclusion types. Size range: 0.3–0.5 mm, modal size: 0.45 mm.

**Few:** black, opaque inclusions (very small iron nodules or hematite). Equant, sub-rounded. Size range: 0.15–0.3 mm, modal size: 0.2 mm.

**Few:** quartz, multicrystalline or rock fragments (?). Equant, sub-rounded shapes. Size range 0.2–0.25 mm. Narrow size range, slightly larger than the plagioclase inclusions.

**Rare:** iron nodules, dark brown to blackish colours. Equant shapes, rounded shapes. Size range 0.4–0.65 mm, modal size 0.5 mm. Concentration of iron nodules in the rim area.

Matrix 65%

Iron-rich matrix with clay pellets and clay bodies in a darker colour and few quartz/feldspar particles. The colour is heterogeneous in section due to its speckled appearance and the textural features, bright dark orange in XP and bright orange-brown in PPL. Optical activity is medium to low. A slip layer is applied.

Voids 10%

Vughs and channels, strongly aligned to the margins both along the wall and the rim. Meso channels range and meso to macro vughs, which are generally larger than the channel voids.

Relationship to macroscopic fabric: M-fabric E. Most of the inclusions described in the macroscopic fabric description are confirmed by the thin-section analysis.

Comments

General: this fabric group is characterised by the occurrence of plagioclase and smaller quantities of biotite, clinopyroxene, rock fragments and iron nodules. Although the size distribution is unimodal, the majority of the plagioclase falls within a narrow size range (0.15–0.2 mm) and is angular, making it likely that this is added as temper. The inclusions are set in an iron-rich clay matrix with clay pellets and textural features. This group was identified as M-fabric E.

Production: an iron-rich variegated clay with few quartz/feldspar particles is selected for this fabric. The occurrence of numerous textural features and iron nodules suggests incomplete hydration and a variegated clay. Angular to sub-angular plagioclase, probably sieved because of the narrow size range (0.15–0.2 mm), is added as temper. The other inclusion types could either be natural to the clay source or be of the temper. Temper and particles are evenly distributed, indicating a well kneaded clay paste. Alignment of voids and inclusions is moderate to strong, indicating wheel forming. A slip layer is applied before firing. Firing atmosphere was oxidising and at temperatures around 800°C based on low optical activity.

Appendix V

Site assemblages

Description format for the site assemblages

General information: PRP id number, date of the site, area (based on buffers), toponym / synonym, survey method, units / sample numbers, references to publication with information about the site.

Functional assemblages: complete assemblages including non-Republican material (if present) based on the functional categories as used within the PRP classification system.

Form assemblages: based on Republican fragments. If Imperial material is present, this is filtered-out based on shapes (different cooking ware shapes in Imperial period) or ware groups (bucchero, terra sigillata, African red slip ware, etc.) and specific types (for the amphorae).

Types: only present the Republican Olcese cooking ware types because these are the core data of this study. Excludes Republican table wares (black gloss), other kitchen wares (basins, mortaria), amphorae (Graeco-Italian, Dressel 1, Van der Werff types) and all non-Republican types.

All the data, including the fabric and assemblage classifications, the z-score tables and the R script used for the re-classification of the coastal data can also be found on https://github.com/FVerhagen/Thesis-Roman-Daily-Life.
## Overview of the selected sites

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Coastal sites

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<td>References Piccaretta 1977, 89–90; Tol 2012, chapter 3–4</td>
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11345 Functional assemblage (N=57)

```
= Indet  = Architecture  = Transport  = Storage
= Kitchen Ware  = Table Ware  = Special function
```

11345 Form assemblage (N=8)

```
= Kitchen = Transport
= Jar, 2  = Baking cover, 1  = Amphora, 3
= Lid, 1  |  = Serving  |
```

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<td><strong>Units/samples</strong> Net’05 4276–4277; Net’05 4288–4289; Net’08 Lib.34</td>
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#### Functional analysis (N=2048)

- Indet
- Architecture
- Transport
- Storage
- Kitchen Ware
- Table Ware
- Special function

#### Form assemblage (N=58)

- Kitchen
- Transport
- Jar, 20
- Pan, 2
- Basin...
- Bowl, 10
- Jug, 3
- Amphora, 15
- Serving

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Daily life in the Roman Republican countryside

Site 15068

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<td>Survey</td>
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15068 Functional analysis (N=364)

15068 Form assemblage (N=51)

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### References

Attema, de Haas & Tol 2010, 247–251; Attema, de Haas & Tol 2011, 227; Tol 2012, chapter 3–5, specifically 231–237

**Type**

- Olcese olla 1: 400–200 BC, 2
- Olcese olla 2: 400–200 BC, 28
- Olcese olla 3A: 200–0 BC, 12
- Olcese olla 7: 100 BC–100 AD, 3
- Olcese clibane 2: 300–0 BC, 2
- Olcese tegame 1: 325–200 BC, 4
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Site 15108

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15108 Functional assemblage (N=359)

15108 Form assemblage (N=25)

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**Pontine plain sites**

**Site 14002**

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**References** Tol et al. forthcoming; de Haas et al. forthcoming

---

### Olcese assemblage

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![14019 Functional assemblage (N=1211)](image)

![14019 Form assemblage (N=118)](image)

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References Tol et al. forthcoming; de Haas et al. forthcoming

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References Tol et al. forthcoming; de Haas et al. forthcoming

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Appendix V. Site assemblages

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References: Tol et al. forthcoming; de Haas et al. forthcoming

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Appendix V. Site assemblages

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14057 Functional assemblage (N=302)

14057 Form assemblage (N=13)

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![Graph showing functional assemblage](image1)

![Graph showing form assemblage](image2)
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