Serving the Living and the Dead: Ceramic Production in Copper Age Campania, Southern Italy

de Falco, Maria

Abstract

Serving the Living and the Dead: Ceramic Production in Copper Age Campania, Southern Italy

Maria De Falco

The purpose of this study is to analyse the relationship between ceramic production and wider cultural processes taking place in Campania, and more widely in the Italian Peninsula, during the Copper Age (roughly 3900-2200 BC). The study aims to draw new inferences from the evidence of ceramic production by using a holistic approach. This integrates typological analysis typical of the Italian tradition with a broader, theoretically informed, technological approach involving macroscopic observations and archaeometric analyses, and applyies both to ceramic assemblages from four key multi-phase sites not previously investigated in this way.

These integrated typological and technological analyses of different ceramic assemblages make it possible to highlight and relatively date technological innovations as well as strong manufacturing traditions never previously fully characterised for Copper Age Southern Italy. Changes in production processes, vessel types as well as in aesthetics in Neolithic to Copper Age ceramics are defined, and possible functional and social explanations proposed. It is argued that the important socio-economic changes occurring in Southern Italy, especially during the 3rd millennium BC, resulted in radical changes in the production and purpose, and symbolic and material value, of ceramic objects. Embedded in the cultural processes ongoing in this period, a shift from a ‘ritual’ to a ‘functional’ demand for ceramic production is theorised for the first time for these contexts.

This integration of multiple lines of evidence (context, typology and technology) also highlights how research on ceramics can contribute to the definition and understanding of broader cultural processes at a regional and wider scale such as demands on production as well as symbolic, and economic drivers of change.

Serving the Living and the Dead: Ceramic Production in Copper Age Campania, Southern Italy

Two volumes

Volume 1:

Thesis

Maria De Falco

Submitted in requirement for the degree of Doctor of Philosophy

Department of Archaeology

Durham University

2023

Table of contents

Volume 1: Thesis

List of Tables

List of Figures

Statement of Copyright

Acknowledgements

This research project has been an incredibly important scientific and human stage of my life and it would have never been possible without the help and support of many people.

My first acknowledgement goes to my supervisors: Robin Skeates for welcoming me in Durham in the first place, for guiding me with patience and foresight, and for his ability to push me beyond my limits; Kamal Badreshany for training me with care, for all the hard working hours and coffees shared with me in the lab, and for his constant support throughout the process; Benjamin Roberts for his fundamental advices and for broadening my horizons. My gratitude also goes to the Durham University and Northern Bridge Doctoral Training Partnership for their financial support.

A special thanks goes to Paola Aurino for guiding my choices since my Bachelor's degree and sharing with me her knowledge of Campanian prehistory and beyond, remaining a fundamental point of reference for me; to Piero Talamo for allowing me to study the sites of Sala Consilina and Atena Lucana and for the stimulating ceramic conversations.

I am extremely grateful to all the institutions that hosted me through the years, allowing me to spend long days browsing through a number of pottery boxes, in particular: the Parco Archeologico di Paestum e Velia with its invaluable staff which have been friendly supporting me for almost 10 years; the Museo Archeologico Nazionale di Pontecagnano 'Etruschi di Frontiera', in particular its former director Luigina Tomay, its incredible staff and all the friends from Pontecagnano; the Archaeological Museums of Sala Consilina and Buccino, in particular their director Adele Lagi and welcoming staff. A further thank goes to all the other Museums and offices of the Soprintendenza Archeologia Belle Arti e Paesaggio which further contributed to my research. I am also grateful to Leon Bowen and Diana Alvarez-Ruiz for their kind and accurate SEM training at Durham University Physics Department.

I am particularly grateful to the University of Modena and Reggio Emilia, Dipartimento di Scienze Chimiche e Geologiche for hosting me as visiting PhD student, especially to Anna Cipriani and Daniele Brunelli for welcoming me with incredible kindness and for their precious insights. Since my very first day at Modena, I have been greeted and surrounded by amazing friends and colleagues who helped me to get through the last and most difficult stages of the PhD, to you goes my special thanks.

I am thankful to all the scholars and friends with which I could share stimulating discussions and that gave me important inputs for my research, in particular: Alberto De Bonis, Italo Muntoni, Silvia Amicone, Vanessa Forte and Delia Carloni. A further thanks goes to Kate Sharpe, not only for patiently editing my thesis but also for being a dear friend.

Durham University and city gifted me with some of my dearest friends, an amazing support and surprise in the happiest and hardest moments: wherever in the world, you will be always an essential part of my life. While I am not able to name everyone, special thanks go to Barbara, Valentina, Giorgia, Sonia, Ann Sølvia, Lisa, Martina, Ishiba and my unique Neville's Cross family: Emmanuel and Valentina.

None of this could have been possible without the love and support of all my friends and family for whom I never cease to be grateful, a special thanks goes to Aurora for always being there for me with a smile; Maria Laura for her daily support no matter the distance and for being the best friend I could ask for; my sister Francesca for being my safe harbour; my parents Antonio and Antonietta for their unconditional support and for shaping me as the person I am today together with all my family, in particular zia Rosamaria, zia Gigina and zio Mauro.

For providing innumerable forms of support in these years and contribution to this thesis, for the many human and scientific discussions, for feeding my heart and mind, I reserve my greatest thanks to Claudio, you were the best discovery of this research.

Chapter 1 - Introduction

1.1. Background to this research

The aim of this study was to analyse the relationship between ceramic production and wider cultural processes taking place in Campania, and more widely in the Italian Peninsula, during the Copper Age (roughly 3900-2200 BC). The study aimed to draw new inferences from the evidence of ceramic production by using a holistic approach integrating the typological analysis typical of the Italian tradition, with a broader, theoretically informed technological approach involving macroscopic observations and archaeometric analyses, applying both to ceramic assemblages never investigated from this perspective.

My interest in this specific area and period arose from working on several sites and ceramic assemblages over the course of my academic and professional career. In approaching contexts spanning the Neolithic and Early Bronze Age, two main issues led me to tackle this specific topic: on the one hand, the centrality the 4th and 3rd millennia BC have become prominent in recent years in the archaeological debate around the definition of later European societies (e.g., Harrison and Heyd 2007; Olalde *et al.* 2018; Heyd 2021); on the other hand, there was a gap in the study of Italian contexts from the same period. In particular, the latter are widely relatively dated and compared based on ceramic style, but Copper Age ceramic assemblages are the least studied from a technological and productive point of view, with very few targeted and integrated studies. In a prehistoric time period when important changes happened both at a local and at a European level (such as the rise of metallurgy, large-scale migrations, the specialisation of food production and processing, the development of warfare, and an increase in social inequalities), it felt crucial to challenge existing typological and stylistic approaches by applying extensive archaeometric and technological analyses to reveal the technological choices behind pottery production and to relate ceramic production to the broader cultural and socio-economic framework.

This time period is peculiar especially in Southern Italy where, for many years, archaeological evidence was limited to funerary contexts which, despite the increasing number of settlements being discovered, still dominate the record (Aurino 2013). The incomplete nature of the record led to difficulties in interpreting cultural dynamics and interactions between different human groups. As a result, chronology and cultural traditions were traditionally distinguished mainly from ceramic types and decoration (e.g., Pacciarelli and Talamo 2011). This approach hindered a comprehensive investigation of Copper Age contexts and of ceramic production itself, which was reduced to a chrono-cultural marker and rarely investigated to its full potential. Indeed, there are very few comprehensive archaeometric and technological studies on the Copper Age pottery of Campania, and these are also quite rare for Italy as a whole (e.g., Forte 2020).

Recent excavations and progress in archaeological research have exposed an intense network of connections between Campania and the rest of Italy, and with the broader European region. These 'foreign' influences, which developed between the 4th and 3rd millennia BC, were probably linked to raw material supply, especially metal ores (Aurino and De Falco 2022). They impacted Campanian communities in different ways, with various degrees of permeability and local adaptation evident across the Copper Age period. These connections are often identified only from the distribution of ceramic types, and need further investigation. Ongoing aDNA analyses (Mittnik *et al.* 2022), analysis of strontium isotopes in human remains and of lead isotopes to determine the provenance of metals, will further clarify mobility patterns and routes.

Ceramic production in Italy during this time span is significantly under-investigated compared to prior and subsequent periods, which have inspired more specific research questions regarding pottery production (e.g., regarding ceramic adoption and innovation in Neolithic societies, and related to specialisation and exchange in Bronze Age societies). Between the 4th and 3rd millennia BC, ceramics gradually shift from the multifunctional, simple shapes of the Late Neolithic to the highly specialised vessel types of the Bronze Age. This change, particularly evident at both the beginning and end of the Copper Age, reflects possible transformations in practices linked to food processing and consumption, cultural processes, and social relations, but also marks a change in symbolic meanings. For example, at some point during the Copper Age, ceramics assume a more significant role in funerary rituals. The technological, cultural, and functional features accompanying, triggering or resulting from these changes currently remain unclear.

From earlier, more homogenous later Neolithic traditions, regional styles and cultural groups emerge during the Copper Age, characterised by different material cultures, settlement patterns and, in some cases, burial practices. This fragmentation is paralleled by the development of trans-European phenomena that influence different local groups both through the movement of peoples and through the transmission of materials, knowledge and ideas. This process is clearly exemplified by the Bell Beaker phenomenon and also, in the Late Copper Age, by the Cetina phenomenon, both having major stylistic and cultural impacts on Southern Italy.

Despite the widespread use of ceramic types as a cultural and chronological marker, a reliable typological approach failed to become established for this period in Italy due to the variability and low degree of standardisation of Copper Age pottery (Cocchi Genick 2013). The use of tight typo-chronological sequences has proven its general validity for periods from the Bronze Age onwards, alongside integrated technological and archaeometric analyses. Large-scale archaeometric research projects have only recently been carried out for only a few Copper Age contexts (Levi *et al.* 2019; Forte 2020).

Thus, the main objectives of the present research have been to fill a gap in the archaeological research, to address important methodological and interpretative issues, and to address the current paradox of the great significance ascribed by archaeologists to ceramics as a chrono-cultural marker in the Italian Copper Age despite the very loose typological and stylistic approach applied, with the latter unsupported by detailed knowledge of the relevant production processes.

Despite scholarly agreement on its importance, and its ubiquity in the archaeological record, the potential of ceramic data to comprehensively address broader inter-regional economic, social, ideological, and ecological questions about past communities has not been fully realised. The production of ceramic objects is one of the most extensively investigated prehistoric activities, with a vast theoretical literature, and several different methodologies developed in the last 70 years. Despite this attention, a holistic approach considering all aspects of ceramic production, from typology to *chaîne opératoire* to ceramic composition is rarely employed. In most cases, a specific focus on either typology (the traditional Italian approach), manufacturing traces (initiated by the French school) or geo-chemical composition (as developed in Britain) is most common. Although some of these have been combined, the application of all three approaches in relation to broader scale cultural dynamics and research questions is rarely pursued in detail. In the present study, typological, technological and archaeometric approaches were combined and related to cultural processes at three scales:

- the site/contextual dimension, with observations of variations in pottery production between functional contexts (e.g., funerary, settlement);
- the regional level, with parallels between sites identified as belonging to the same cultural tradition; and
- the broader Italian and European context, with observations in relation to the main cultural processes occurring between the 4th and 3rd millennia BC that affected Copper Age societies.

1.2. Themes and research questions

Building on this background, this study produced a new, comprehensive, dataset for Copper Age Campania, filling a significant gap in current research. The aim has been to investigate more holistically the *chaînes opératoires* and technological choices behind pottery production using methods and theoretical approaches that consider all the steps of the ceramic production process: raw material selection and processing, fashioning and definition of vessel types, finishing and firing. In a departure from the Italian typo-chronological approach, the typology of the period and the region has been critically reassessed and integrated with archaeometric and technological analysis. A detailed integration of technological and typological analyses of ceramic vessels is fundamental to the detection of technological choices made by potters, which might in turn be linked to particular lifestyles and to specific activities (Schiffer and Skibo 1987; Spataro 2002; Tite *et al.* 2001).

By analysing the ceramic production from four core sites in Campania, a time span of about 1500 years has been covered, from *c.* 3900 BC at the transition between the Final Neolithic and the Copper Age, to *c.* 2100 BC at the transition to the Early Bronze Age. This large-scale ceramic analysis has allowed new insights into a key period for ceramic production, previously very under-investigated for Campania and the wider Italian Peninsula. This comprehensive new dataset was used to address three main themes:

- continuities and discontinuities in the ceramic production over the *longue durée*, investigated by targeting multi-phase sites covering all the main chronological phases and cultural traditions of Copper Age Campania;
- the interconnection between ceramic types/style and technological choices, addressed by rethinking the typological framework and integrating it with technological data;

- the potential contribution of comprehensive ceramic data to the definition of broader cultural processes, addressed by combining detailed ceramic and archaeological data.

To target these main themes the research questions addressed are:

1. How does pottery production work and change during the Copper Age in Campania?
2. What is the relation between style, technological choices and cultural traditions? Can specific ceramic traditions be recognised beyond cultural labels?
3. What is the provenance and places of origin of the ceramics?
4. What is the relationship between ceramic technological choices, the landscape and other daily activities?
5. Is there evidence of the circulation of pottery and people on a broader scale and between different sites?
6. Is there evidence of any cross-craft interaction?
7. How does ceramic technology inform our understanding of social organization in Copper Age Campania?
8. What do the 'technological traditions'/'technological styles'/'chain operatoires' and 'communities of practice' that have been identified tell us about the people that inhabited the various sites?
9. How do integrated ceramic analyses contribute to the understanding and definition of broader cultural processes?

1.3. Organisation of the research

The research presented here focussed on four Copper Age sites in Campania, Southern Italy: Paestum, Pontecagnano, Sala Consilina and Aten Lucana. These were selected on the basis of their well-defined stratigraphy and chronology to provide a wide picture of technological change and continuity during the Copper Age. Three of the sites are multiphase, covering the entire Copper Age and all the main cultural groups traditionally recognised in the area. The four sites, with detail of specific contexts, cultural groups and chronologies are summarised in Table 1.1 and their locations shown in Figure 1.1.

Radiocarbon dates show that Paestum, Pontecagnano and Sala Consilina were each occupied for long periods, allowing the investigation of technological change and/or continuity in material culture, the relationships between people, the environment and raw materials across time. The main cultural traditions recognised in Campania for the period (Early Copper Age, Taurasi, Gaudo, Laterza and Cetina influence) are all attested, most at more than one site (Table 1.1).

Chronology and cultural tradition				Sites and contexts			
				Paestum	**Pontecagnano**	**Sala Consilina**	**Atena Lucana**
Early Bronze Age	*Early Bronze Age*	2000 BC	PALMA CAMPANIA				
Copper Age	*Final Copper Age*		CETINA				**Atena Lucana** Village Final Copper Age
Copper Age	*Late Copper Age*	2500 BC	LATERZA	**Agorà, Phase II** Living and Funerary *Laterza culture* Middle-Late Copper Age **Cerere Cemetery** funerary *Laterza culture* Middle-Late Copper Age	Limited evidences 2 km far from Gaudo cemetry *Laterza culture* Middle-Late Copper Age	**Phase II** Funerary *Lateza culture* Middle - Late Copper Age	
Copper Age	*Middle Copper Age*	3000 BC 3500 BC	GAUDO, TAURASI	**Gaudo cemetery** Funerary *Gaudo culture* Middle-Late Copper Age	**Gaudo cemetery** Funerary *Gaudo culture* Middle-Late Copper Age	**Phase I** Funerary *Taurasi culture* Middle Copper Age	
Copper Age	*Early Copper Age*		EARLY COPPER AGE	**Agorà, Phase I** Uncertain evidence Early Copper Age	**ANAS excavation** House Early Copper Age		
Late Neolithic	*Final Neolithic*	4000 BC	LATE AND FINAL NEOLITHIC				
Late Neolithic	*Late Neolithic*	4500 BC	LATE AND FINAL NEOLITHIC				

Table 1.1. Overview of the sites analysed with details of the contexts, chronologies, cultural traditions and types of evidence.

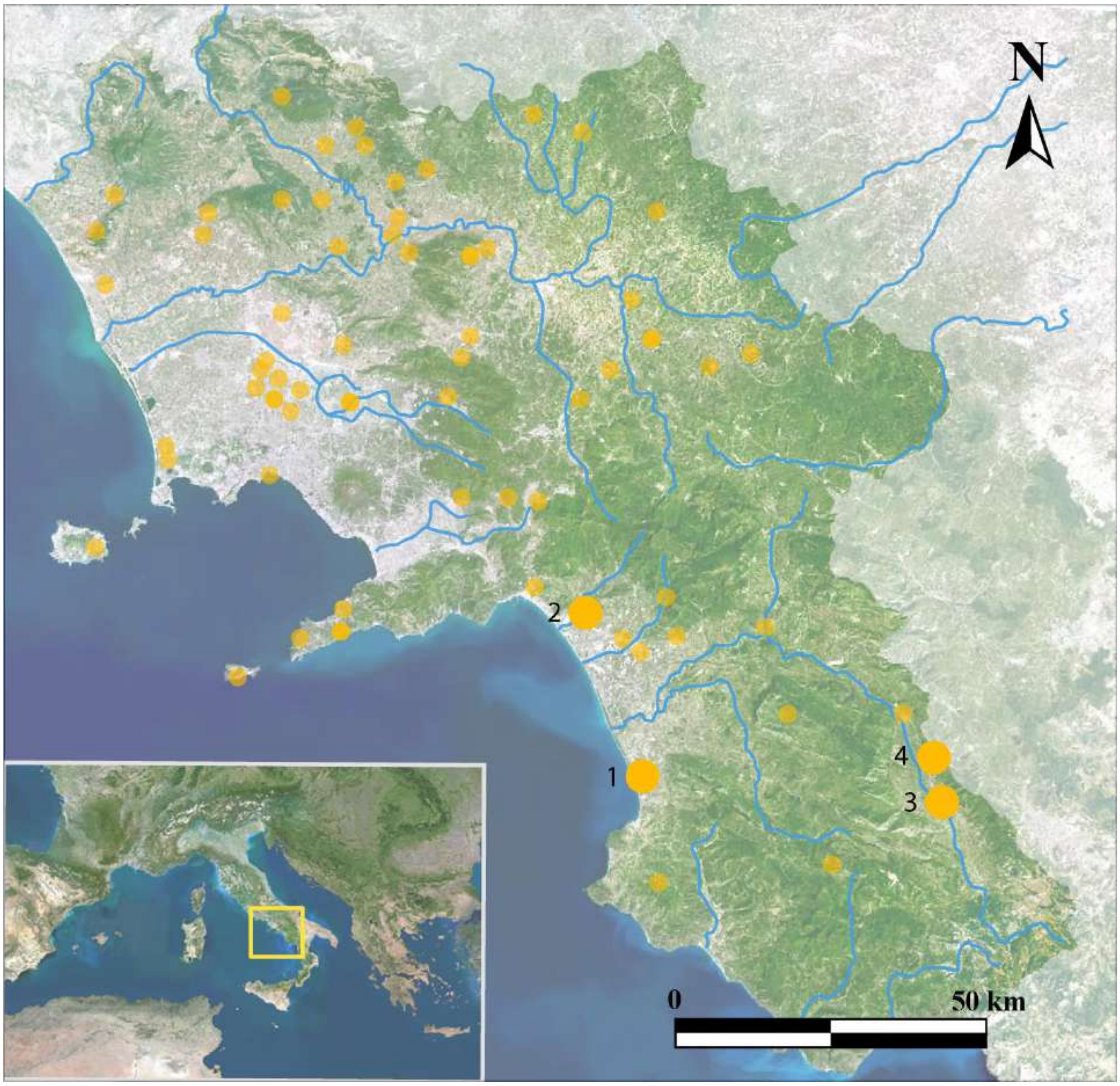


Figure 1.1. Distribution of sites (shaded dots) currently known for Copper Age Campania, pinpointing sites analysed in the present study: 1. Paestum: 2. Pontecagnano; 3. Sala Consilina; 4. Atena Lucana.

This ensured that cultural entities could be analysed both diachronically and synchronically by comparing sites traditionally interpreted as belonging to the same archaeological culture. Two of the cultural traditions are attested only at a single site: Taurasi only at Sala Consilina, and Cetina only at Atena Lucana. In both cases this is due to the limited published information and few sites detected. In the case of the Taurasi tradition, the eponymous cemetery was originally selected for study but accessibility issues due to Covid-19 prevented the complete analysis of the assemblage. In the case of Dalmatian Cetina influences, Atena Lucana is the only site in Tyrrhenian Southern Italy showing such strong connections with the Cetina phenomenon. It is attested in other sites in Campania but only sporadically and represented by only a few ceramic sherds, e.g., from Oliva Torricella (Albore Livadie 2011) and Gricignano d'Aversa (Marzocchella 1998).

For each site, the archaeological context was considered and, where available, the whole ceramic assemblage was analysed. This was not possible in all cases since the sites underwent very different processes of excavation and conservation, partly influencing the analysis and interpretation of the contexts. These variables are clarified for each context, as is the approach adopted for the analysis and sampling of each ceramic assemblage.

The methodology included a review of the typology available for Copper Age Campania, combined with documenting the ceramic assemblages and making macroscopic observations. Based on this initial evaluation, relevant samples from each site were selected for the archaeometric analysis. A number of analytical methods were used to address specific research questions regarding the pottery record: petrographic analysis in thin section was used to investigate composition and technological processes used in the ceramic manufacturing; analysis by XRD reinforced the mineralogical identification and provided important clues regarding firing temperatures reached during production; geochemical analysis by XRF allowed the identification of compositional groups that could be related to the petrographic fabrics identified; and targeted SEM-EDS analysis answered particular questions and further clarified the chemical composition of specific minerals and of the clay matrix of the samples from Paestum and Pontecagnano.

Specific attention was paid to the integration of typological, macroscopic and archaeometric results in order to analyse the ceramic assemblage using a holistic approach. The representation of the data through new graphics has also helped in the interpretation and combination of the results, which have been channelled into a broader reconstruction of Copper Age cultural processes in Campania and in the European context.

1.4. Structure of the dissertation

This dissertation begins with a critical assessment of current debates and approaches on the Copper Age of Europe and the northern part of the Mediterranean region, a with a focus on the 4th and 3rd millennia BC (Chapter 2). This clarifies the general context in which the present research takes place. Chapter 2 also provides a critical overview of the current state of research on the Copper Age in Southern Italy, highlighting recent scientific achievements and gaps in understanding.

Chapter 3 addresses the main approaches currently applied to the pottery record to contextualise and explain the theoretical background of this study. The discussion here draws on the workshop *'Across Technologies: what is left to explore in the concept of technological variability? Choices, traditions, identities and ideologies in prehistoric pottery production in Europe and the Mediterranean'*, which I convened as part of my research, on 19th January 2022 at the University of Durham, within the framework of the Department of Archaeology's *'Research Dialogues 2021'*.

Chapter 4 provides an overview of the sites and contexts analysed and their geological environments. The first section describes the geographical, geological and environmental characteristics of the Campania region, with specific attention paid to the possible sources of ceramic raw materials. In the second section, the main features of the chosen archaeological sites and contexts are outlined.

Chapter 5 focuses on the research process and empirical methods used to collect data from the ceramic assemblages of the selected sites, detailing the specific analytical instruments and procedures used.

The presentation of the results is organised into two chapters: Chapter 6 deals with the typological and macroscopic observations, Chapter 7 with the archaeometric data. In each chapter, the results are presented by site rather than chronology/cultural phase due to the complexity of the archaeological evidence, which is characterised by poorly defined cultural traditions that overlap both chronologically and spatially.

All the lines of evidence exposed in Chapters 6 and 7 are then combined and discussed together in the interpretation of the results in Chapter 8, which is presented according to revised cultural traditions and chronological phases. This allows continuities and changes in the ceramic technology and forms of different cultural traditions to be highlighted, contextualised and interpreted.

In Chapter 9, the new data derived from the present research are related to a wider body of literature. Several key issues are addressed concerning technical and cultural traditions, organisation of production, environment and raw material supply, ceramics in ritual practices and their symbolic meaning. Finally, the results of this multi-faceted interpretative approach are integrated to propose new understandings of the Copper Age human occupation of Campania as well as future development of the research (Chapter 10).

Chapter 2 - Copper Age Campania in context

2.1. Aims of this chapter

The main aim of this chapter is to situate the present research in its wider context by providing an overview of current archaeological debate on the Copper Age of Europe and of part of the Mediterranean region, with a focus on the 4th and 3rd millennia BC. A critical summary of the existing literature on the Copper Age in Southern Italy is included, highlighting the latest scientific achievements and gaps in current understanding of this period and region.

Studying Copper Age societies in Europe and the Mediterranean region is challenging due to the heterogeneity of the archaeological data, both chronologically and culturally. Between the 4th and 3rd millennia BC, the Italian peninsula underwent a clear shift in settlement patterns and a progressive change in the organisation of societies and their material culture. During this period, the surrounding Mediterranean and European world was occupied by many different societies (Heyd 2012, 2013). Whilst some had long adopted technological innovations such as metalworking, others still retained strong Neolithic traditions. Labelling these diverse cultures as ‘Late Neolithic’, ‘Copper Age’ or ‘Early Bronze Age’ is problematic due to the variety of their archaeological features and because labels will always be reductive compared to the complexity of past societies. The first challenge in analysing this time of change is therefore to define the ‘Copper Age’ using criteria that go beyond merely technological or other arbitrary distinctions, and to understand the processes that shaped it, bearing in mind the complexity of the human past.

2.2. Different words, different meanings: towards a definition of Copper Age

This section considers the current debate on how ‘Copper Age’ should be defined and characterised, and takes a close look at those aspects particularly relevant to the present research, including changes in technology, variations in subsistence and social practices, and ideology. Finally, a broader picture is drawn of the general chronology of the Copper Age in Europe and the Mediterranean region.

The detection of social change, and especially its causes and processes, has been a major challenge for archaeological theory (Kintigh *et al.* 2014) and remains one of the most difficult. During the last century, many theories emerged to explain social change, from culture historical concepts of diffusion and migration (Kossinna 1910; Childe 1925) involving allochthonous influences by superior societies, to more recent reconsiderations of migrations following the results of large-scale genetic mapping (e.g., Robb and Pauketat 2013; Papac *et al.* 2021; Shennan and Sear 2021). The debate followed the evolution of archaeological thought and paradigms during the past century (Trigger 2006; Zubrow 2014). Through different waves of theories and critiques, the basis was established for the current trend: a broader interdisciplinary approach that seeks to overcome the limits of archaeological thought (Kristiansen 2014).

In reality, ancient societies always appear to have been more complex than the 'labels' created by archaeologists - labels whose roots are often clearly based in taxonomy. Nevertheless, the need to identify specific 'ages' and 'cultures' has become both deeply embedded in scientific literature and partly necessary for clarity within the archaeological process. These two concepts are each undergoing major reconsideration (for the debate on archaeological cultures see Roberts and Vander Linden 2011; Cocchi Genick 2005, 2011; Dankers *et al.* 2020). In the case of the so-called 'three/four-age system', the main issue lies in the definition of the origin and characteristics of change. From simplistic early formulations based on technological evolution, a multifaceted perspective emerged, especially for the Neolithic and Copper Age. This shifted the definition of a 'Neolithic package' to the formulation of several different 'Neolithic packages' (Çilingiroğlu 2005) and, in the case of the Copper Age, from a 'materialistic' definition to a more complex socio-economic model of the 'secondary products revolution' (Sherratt 1981) and beyond.

The determination of 4th–3rd millennia BC transformations in Europe and the Mediterranean region has seen a recent renewed archaeological attention. With clearer identification of its chronology and features, the Copper Age is becoming central to current scientific debate on later European prehistory, recognised as a pivotal time of change (Broodbank 2013: 314–25).

2.2.1. The breaking of the Three-Age system: Copper Age, Chalcolithic, Eneolithic

The first concepts of a 'Copper Age' (for a recent review see Pearce 2019) had clear evolutionist roots (Heyd 2012), based on a progressive development of technological skills, i.e., mainly copper metallurgy (e.g., Von Pulsky 1884; Chierici 1884; Montelius 1908). By the end of the 19th century, scholars around Europe started noticing a transitional stage between Neolithic and Bronze Age societies, characterised by a major use of copper (Roberts and Frieman 2012) and alternatively called Copper Age, in Hungary (Von Pulsky 1884), the Chalcolithic e.g., in France (Jeanjean 1885) or the Eneolithic, e.g., in Italy (Chierici 1884), modifying the three-age system postulated by Thomsen in 1831. Notwithstanding chronological, cultural and terminology issues, between approximately 4000 and 2000 BC, important transformations were clearly occurring in European social and economic organisation (Robb 2007: 287).

Early definitions of a Copper Age were based on the technological progress linking the presence/absence of metals and material specialisation with an economic advance (Kuijpers 2017: 3). Consequently, the debate on the emergence of metallurgy was closely interlinked with the detection of this multifaceted period (for recent syntheses, see Kienlin and Zmmermann 2012; Roberts and Thornton 2014). The complexity of the metallurgical process itself, as with the spread of agriculture, led to theories of migration that implied a Near Eastern origin of such specialisations: *ex oriente lux* (Kossinna 1910; Childe 1930). These migration theories (for a recent review see Roberts 2008; Hakenbeck 2008) were rooted in a culture-historical approach and have persisted into more recent times (e.g., Gimbutas 1991; Mallory 1989; a more sophisticated model in Kristiansen 1989; Kristiansen and Earle 2015; Anthony 1990, 2007; discussion on the Indo-European issue in Prescott 2013; Heggarty 2014; Vander Linden 2016; and a review of aDNA analyses in Furholt 2017). From the 1970s onwards, migration theories progressively lost ground in favour of a more complex approach that acknowledged other major changes that occurred during the European Copper Age, beyond the use of copper, and at different times and places.

The first true revolution in European Copper Age research was the notable insight of Andrew Sherratt (1981) with his ‘secondary products revolution of the Old World’. With regard to Late Neolithic societies, he understood how they were affected (albeit at different moments) by major social and technical innovations that involved different aspects of their organisation: an increase in production, the introduction of animal traction, the development of ploughing, and the use of the wheel and cart (Figure 2.1). Sherratt’s analysis of this changing time was not limited to technological innovations, but included alterations in settlement patterns, closely interlinked with trade and exchange processes (Sherratt 1982).

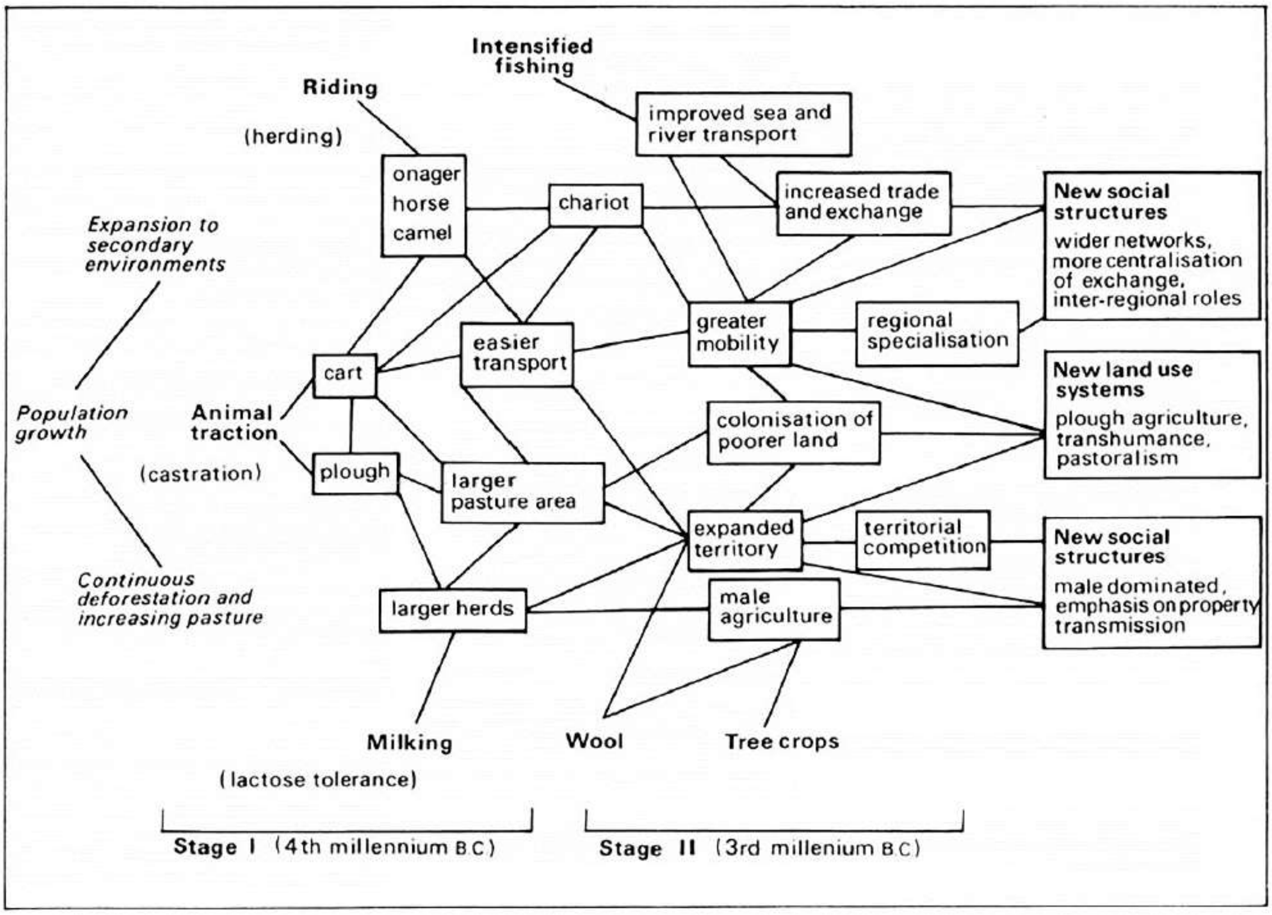


Figure 2.1. Interaction chart developed by Sherratt to explain his secondary products complex (Sherratt 1981: 286).

As pointed out by Greenfield (2010), Sherratt's primary merit in creating his revolutionary schema was the way he combined, in a coherent model, factors that, in some cases, had already been observed (e.g., Bökönyi 1974 for milking, Flannery 1965 for wool). Despite early criticism (Chapman 1982), subsequent research has focused predominantly on detecting this process around Europe and defining all the features linked to it (e.g., Licardus 1991).

Alongside zooarchaeological and metallurgical studies (e.g., Marciniak 2011; Thornton and Roberts 2009), another focus for Copper Age research is understanding the creation of structured societies. These are variously explained as age-stratified societies (Cazzella and Moscoloni 1985), unranked networks for the circulation of goods (Cardarelli 1992; Guidi 1992), emerging inequalities (Guilaine 2007), or the emergence of a new category of political individuals (Shennan 1982; Thorpe and Richards 1984; Braithwaite 1984). The generation of social complexity is a highly debated topic that involves the definition of 'complexity', still controversial in the archaeological discourse with regard to its visibility in the archaeological record and utility as an explanatory concept (e.g., Kohring and Wynne-Jones 2007). In recent years, a frequent setting for this debate has been the Iberian Peninsula, where the structure of early Copper Age settlements is striking and has led to many speculations on the composition of the communities who built them (e.g., Cunliffe and Keay 1995; Chapman 1999, 2003; Díaz-del-Río and Sanjuán 2006; Cruz-Berrocal *et al.* 2013). From the old hypothesis that they were Aegean colonies (for a review of this theory see e.g., Jorge 2003), the debate has shifted in recent years towards a more critical analysis of the indicators of a complex society (e.g. in the sites of Los Millares and Valencina de la Concepción). Nevertheless, the notion of complex and structured societies remains a major issue in Copper Age research (e.g. García Sanjuán and Murillo Barroso 2014: 133), and there is still a need to find, if possible, a suitable definition that is applicable on a broader scale.

Progress in scientific methods of analysis applied to archaeology, the so-called ‘third scientific revolution’ (Kristiansen 2014), has allowed major steps forwards in decoding this complex period. Ground-breaking discoveries made through genome studies regarding the movements of people in 3rd millennium BC Europe are paving the way for further studies on mobility and migration (Haak *et al.* 2015; Kristiansen *et al.* 2017; Olalde *et al.* 2018; Saupe *et al.* 2021). At the same time, lipids analysis is shedding light on the use and processing of secondary products (Craig *et al.* 2003).

The origin and development of metallurgy has also been the subject of wide research and recent syntheses. In this case also, the key to establishing new models is the use of an interdisciplinary methodology coupled with multiple sophisticated analytical techniques (Roberts and Thornton 2014: 6) generating a more holistic approach. It is now clear that it is not the presence/absence of specific characteristics or the first development of a technological skill that makes a European Copper Age society different from a Neolithic one, but rather the prevalence of these elements and the scale of their impact on societies (Greenfield 2010: 43–5).

2.2.2. The plough, copper, and ancestors: between tradition and innovation in the 4th and 3rd millennia BC

The active debate on the features peculiar to the Copper Age has highlighted the fact that there is no simple, universal definition of the Eneolithic, the Chalcolithic or the Copper Age. Some key concepts have emerged: the chronology and features of Copper Age social and economic changes vary around Europe and the Mediterranean, and the impact of new (or previous) innovations that involved major socio-economic changes in that period is recognised to be more significant than the date of their first appearance. Despite their regional and chronological variability, some features have been recognised as characteristic of the Copper Age (Figure 2.2). In their recent synthesis on the value of a Chalcolithic age, Bartelheim and Krauß coherently point out that 'the period in question should be rather defined structurally than just by stressing the appearance of a specific material' (2012: 94). Nevertheless, its 'metallic terminology' (Broodbank 2013: 305), beyond its obsolete literal meaning, hints at other new trends typical of this period: the emergence of greater distinctions in social status, often displayed in metal-rich burials; the emergence of metallurgical specialisation, varying in intensity and purpose from utilitarian to symbolic; and gender and warrior identities.

A. Society

1. Emergence of sharply organised settlement centres and fortifications along traffic roads.
2. Advance of a hierearchised social order. Existence of a regional and super-regional upper class, tied to distinct families. Inclusion of children in the hierarchical system.
3. Emergence of first status symbols and signs of power.
4. Erection of first monumental burial grounds through the accumulation of earthern mounds.
5. Segmentation of the society based on the specialisation of labour: prospectors, miners, craftsmen, traders, beside a population with an agro-pastoral life subsistence.
6. Pronunciation of the different role of both gender in society also through a gender differentiated burial custom.
7. Application of metric systems as well as an astronomical knowledge.

B. Economy

1. Specialising in stock elevation and creation of larger herds, indications of a new sheep race.
2. Begin of horse elevation and use of the horse as riding and traction animal.
3. Utilisation of animals for transport and use of their power for soil cultivation
4. Introduction of the ard (*Hakenpflug*) and through it the possibility of a more efficient soil cultivation.
5. Careful tillage with a systematic suppression of weed.
6. Cultivation of spices and herbs.
7. Increased salt production
8. Exploitation of flint, copper ores (and gold?) in mines.
9. Specialised craftsmanship, visible particularly in the highly developed gold and copper metallurgy, also by an altered flint technology
10. Sharp cutback of wood and production of charcoal as presupposition for a systematic metallurgy.
11. Organisation of transport and the dissemination of raw materials, emergence of trade, also with regions farer away.
12. First-time appearance of wheel models as a sign of knowledge about wagons.
13. Innovations in boat construction make possible secure transport also along the coastal shores.

C. Religion

1. First occurrence of cult places outside the settlement houses.
2. Construction of large ditch systems with cultic depositions in the ditch or in the enclosed area.
3. Orientation of other-world imaginations to the model of a strongly segmented societal order.
4. Changes in the burial cults, arise of partial burials, collective and multiple burials with funeral succession (*Totenfolge*).
5. Rise of new cult practices, connected with sun worship, with stock elevation and intensified with the male gender.
6. Introduction of new hoarding customs.

Figure 2.2. List of the features identified by Lichardus (1991) as characteristic of the 3rd millennium BC in Europe.

Broodbank (2013: 262) suggests that there were four major changes between the 4th and 3rd millennia BC around the Mediterranean. First, the onset of a drier climate, probably the last major climate alteration before the present day and, consequently, of a Mediterranean environment similar to that of today (Finné *et al.* 2011; Roberts:1998: 159–206). Second, the expansion of the first large-scale societies in Egypt and

Mesopotamia with the emergence of power and social stratification, mass production and early writing (Wengrow 2008; Yoffee 2005: 91–109). Third, a shift on the northern side of the Mediterranean from typical Neolithic villages to different kinds of societies, smaller than their southern counterparts but moving towards becoming 'complex societies' (Broodbank 2013: 269) where inequality and the distribution of power become more visible. Lastly, an increase in long-range connections, especially by sea (Broodbank 2013: 325—39).

These four points highlight some of the major processes of the period, with climate change reinforcing the need for adaptations in subsistence and production activities, a process interlinked with a set of distinct additional features. Despite their earlier origins, mining and metallurgical activities acquired greater significance in this period, together with specialised craftsmanship. Agricultural techniques were much enhanced by the introduction of the plough and animal traction, alongside the increased secondary exploitation of animals. Some settlements became structurally more complex with the introduction of defensive systems, impressive cult places and cemeteries.

All these changes appear clearly throughout the archaeological record of Europe: the increase in metal objects (Roberts *et al.* 2009); remains of ards and ploughing, e.g., plough marks in Denmark, Germany and Poland (Tegtmeier 1993; Sherratt 2006: 336–7); possible ritual ploughing at Saint Martin de Corleans (Mezzena 1997, 1998); depictions of carts and ploughing activities, e.g., on the Cemmo statue-menhir, Valcamonica (Cocchi Genick 2004) and in Monte Bego rock art (Arcà 1999); evidence of animal traction (Sherratt 2006; Ivanova 2017; Klimscha 2017); and large cult places and monumental burials, e.g. in Switzerland (Harrison and Heyd 2007), in Italy (Ingravallo *et al.* 2010), and in Spain (Díaz-del-Río and García Sanjuán 2006). These changes imply further social transformation, generally inferable with reference to social anthropological models (for a recent review, see Robb and Pauketat 2013: 3–33) but which left few unequivocal material traces. The emergence of social inequalities has been widely recognised and discussed (Kristiansen and Larrson 2005; Guilaine 2007; Muller *et al.* 2015; Jeunesse 2015) and is evident both in the appearance of status and power symbols and in the differentiation of burial customs, with the occurrence of monumental tombs and exceptional burial practices and goods (e.g., de Marinis 2009), albeit with regional variations.

A clear example is the phenomenon of statue stelae that spreads throughout Europe, from Ukraine to Iberia between the 4th and 3rd millennia BC (Figure 2.3). These statue-menhirs with anthropomorphic features exhibit local variability, and different local groups can be identified (e.g., North Italian, Ukrainian), yet they also show ‘a set of widely shared formal conventions which unite far-flung local traditions’ (Robb 2009: 170). Among these, gender and power attributes are the most evident (Guilaine 1980: fig. 14.5). Interpretations of this phenomenon have varied, from suggestions that they are a sign of Indo-European migrations (Mallory 1989) to the most common, which considers them to be representations of gods or ancestral figures (Barfield 1995; Fedele 1995; Robb 2009: 172).

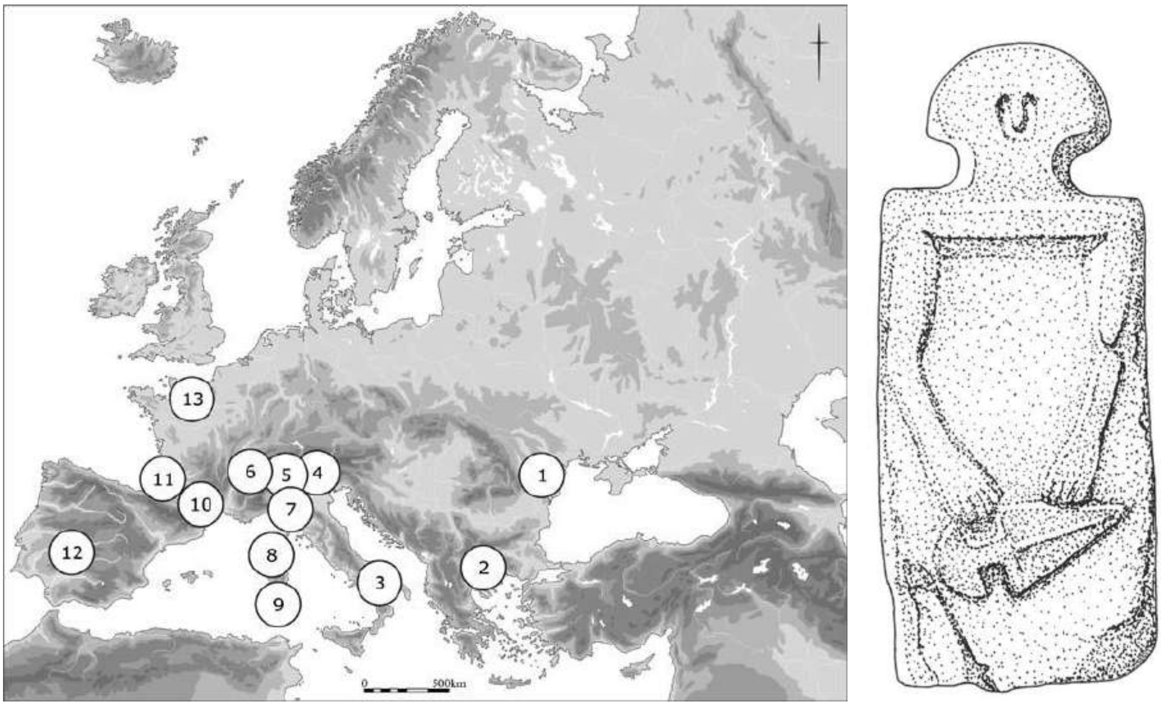


Figure 2.3. A) Map of statue stelae regional traditions in Europe, 3500–2000 BC. 1. Ukraine. 2. Northern Greece. 3. Southern Italy. 4. Adige Valley. 5. Valcamonica/Valtellina. 6. Val d’Aosta/Sion. 7. Lunigiana. 8. Corsica. 9. Sardinia. 10. Eastern Provence. 11. Tarn. 12. Iberia. 13. Paris Basin/Channel Islands (Robb 2009: fig. 1). B) Stelae from Taponecco, Licciana (Cocchi Genick 2012: fig. 12.11).

These transformations imply a modification of ideology and religious beliefs. Large-scale constructions, settlements and collective burials point towards a growing sense of community and the ability to manage more demanding communal works. Burial grounds became distinct and divided from settlement areas, and often hosted collective[1] and multiple burials that were used for extended periods, e.g., Gaudo culture, Southern Italy,

[1] The term ‘collective burial’ is here intended to refer to a funerary complex with several depositions, according to Leclerc’s definition (Leclerc 1990), that implies a structure constructed to afford the chance to re-open it in order to place new deposits. It is different from a ‘multiple burial’, in which all the individuals were buried at the same time. A collective burial has no synchronic implication (Duday *et al.* 2009: 104).

(Bailo Modesti 2006); Sizandro Valley, Portugal (Lillios 2015), and the new practices of depositing artefacts in hoards were introduced (Heyd 2012). The internal dynamics of societies were clearly undergoing major changes, hinted at, for example, by a more dispersed settlement distribution, a change in modes of self-representation (statue stelae and burial customs) and a growing attention to social differentiation (including some exceptional burials). At the same time, transformations were occurring with regard to external interactions, particularly in terms of relationships between different groups of people. Two key aspects are the emergence of a warrior ideology, and the development of networks of exchange.

The emergence of a warrior ideology (Kristiansen 1999; Jeunesse 2015; Treherne 1995; Frieman *et al.* 2017; and for a recent critique, Dolfini 2022) has several implications: it is closely linked with social inequalities and gender identity and points toward increasing conflict among different groups. Weapons are symbolic of wealth and rank, both for their intrinsic value and, in some cases, their implication in trade and exchange (Robb 2007: 315).

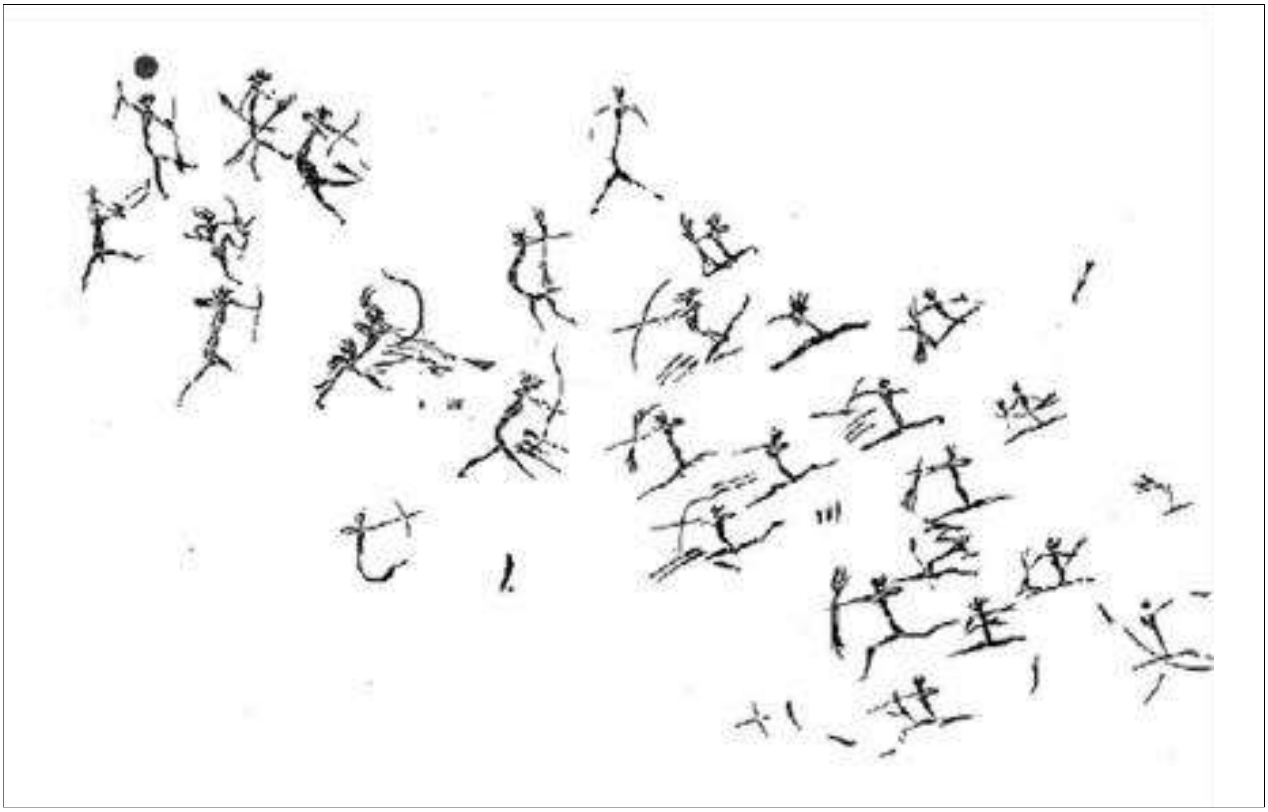


Figure 2.4. Battle scene at Les Dogues shelter, Ares del Maestre, Castellón, Spain. Tracing by Porcar (1953). (López-Montalvo *et al.* 2017).

Furthermore, they are often used to highlight male identity and probably also the relation of the individual to the community, as exemplified by Northern Italian Copper Age burial customs (de Marinis 2009) and statue stelae iconography (Carancini 2012; Robb 2007: 315–7). The appearance of warrior ideology and the increase in conflict in Copper Age societies, are a close consequence of the emergence of local polities. The leaders of these new states, or ‘Lilliputian lords’, as Broodbank labels them (2013: 314), in the northern Mediterranean region becomes more evident from the funerary record (*cf.* the burial of Mirabella Eclano in Bailo Modesti and Salerno 1998), from the increasing number of fortified sites (*cf.* Los Millares in southern Iberia, Chapman 1990: 152; Molina González and Cámara Serrano 2010), and from growing evidence of conflicts (as illustrated by Iberian Copper Age rock art, e.g., Los Dogues rock-shelter, north of Valencia Figure 2.4, Lillios 2008: 235).

Control of raw material sources, goods production and circulation undoubtedly contributed to the generation of unequal nodes of power and control, if only at a local scale. Trade and exchange were certainly not new to European societies at this time. Neolithic circulation of raw materials and finished artefacts was highly advanced (e.g., jade axe networks, Pétrequin *et al.* 2012, 2017). Nevertheless, Copper Age societies appear interconnected in a more complex way: in addition to the long-distance movement of raw materials, a broader circulation of ideas, information, styles and know-how is also widely attested. Around the Mediterranean and across Europe, shared ideologies and sets of material culture emerge. The migration of peoples (as shown by isotopes and DNA analyses) can provide only a partial explanation of this phenomenon. Small-scale connections are also evident, involving continuous contact and exchange between neighbours (the Brownian motion theorised by Horden and Purcell 2000), movements of people through marriage bonds (Brodie 1997, 2001), and structured interaction and circulation patterns, as theorised for the Bell Beaker phenomenon (Vander Linden 2007), always remembering that human agency lies at the base of any circulation of goods and know-how (Vander Linden 2007: 349). From a more general perspective, Copper Age Europe seems characterised by a circulation of socially shared symbols and practices beyond material culture, which shaped changing societies in broadly similar but locally diverse ways.

2.2.3. Chronological framework for a changing world: Europe and the Mediterranean

The several socio-economic and ideological transformations that occurred between the 5th and 3rd millennia BC in Europe and the Mediterranean make this region a complex mosaic of cultures, in some cases with shared cultures and ideologies. A slight delay from east to west can be detected in the spread of features generally defined as ‘Copper Age’, such as the uptake of metallurgy, with earlier dates in south-eastern Europe (5th

millennium BC) and later dates further west, with a persistence of Neolithic traditions in northern Europe (Figure 2.5 and Figure 2.6).

In recent works of synthesis, Heyd recognises three stages in a possible process of 'Chalcolithisation' of Europe (Heyd 2012, 2013). A first phase spans the 5th–4th millennia BC, during which can be found the beginnings of most of the Copper Age-defining characteristics. The region of south-eastern Europe is at the core of Lichardus' theories (Lichardus 1991) and has always been central in the debate about the origin of the Chalcolithic.

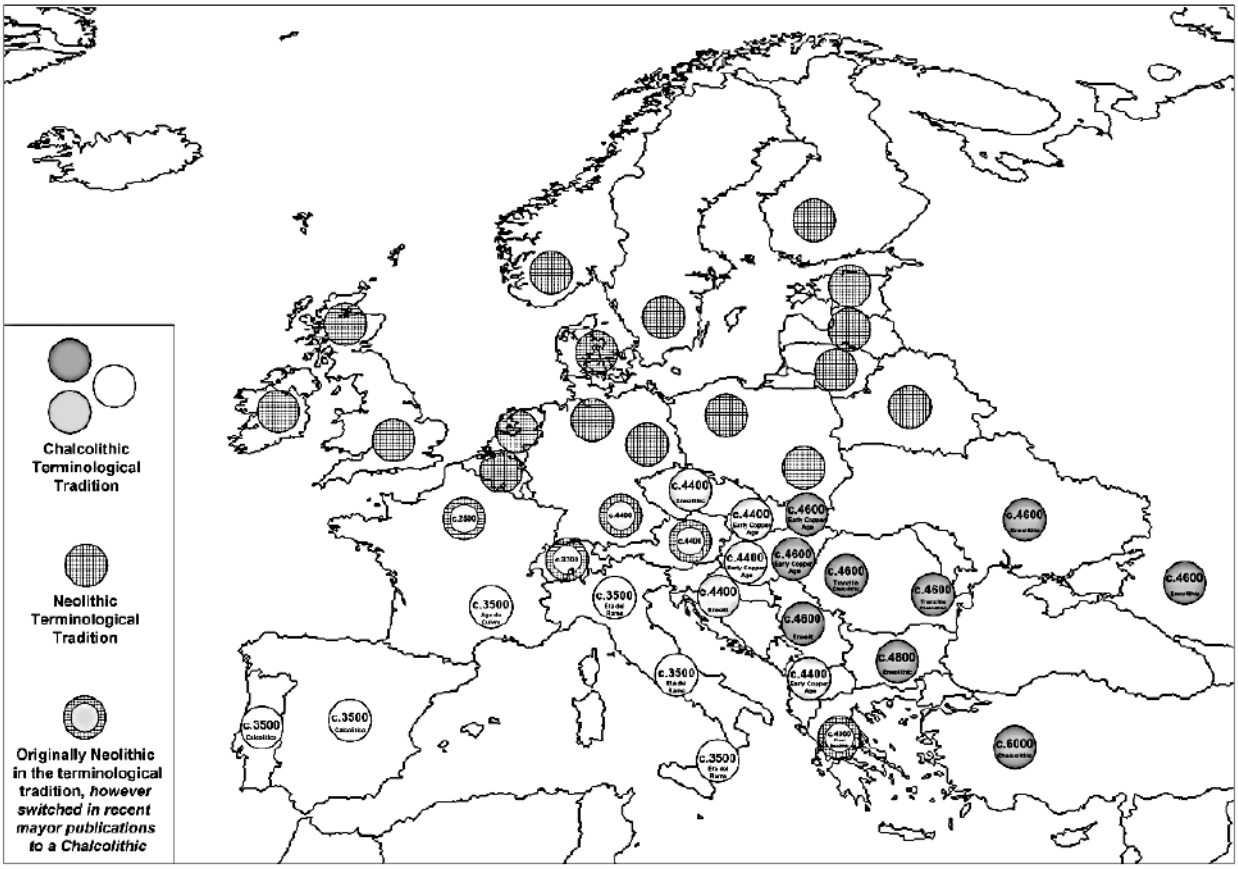


Figure 2.5. Traditional terminology and approximate date of beginnings of Copper Age in Europe (after Heyd 2012: fig. 7.4).

The first copper objects appear there in the 5th millennium BC, occurring in graves, some of which are extremely rich in metal objects and ornaments. Examples are recorded from the great cemetery of Varna (Krauß *et al.* 2017; Higham *et al.* 2007; Renfrew 1986) and in association with large-scale structured societies such as the Tripolye 'mega villages' (Kruts *et al.* 2001; Kohl 2007). Many of Lichardus' Copper Age characteristics were already appearing further west by the first half of the 4th millennium BC. Despite a general continuity of Neolithic traditions all around central and western Europe, characteristics such as ditched villages, enclosures and monumental burials (Lichardus 1991), had started to develop. Exported metal objects and metallurgical techniques appeared progressively further west and south-west, exemplified by the circulation of gold lozenges and the development of Alpine metallurgy (Heyd and Walker 2014).

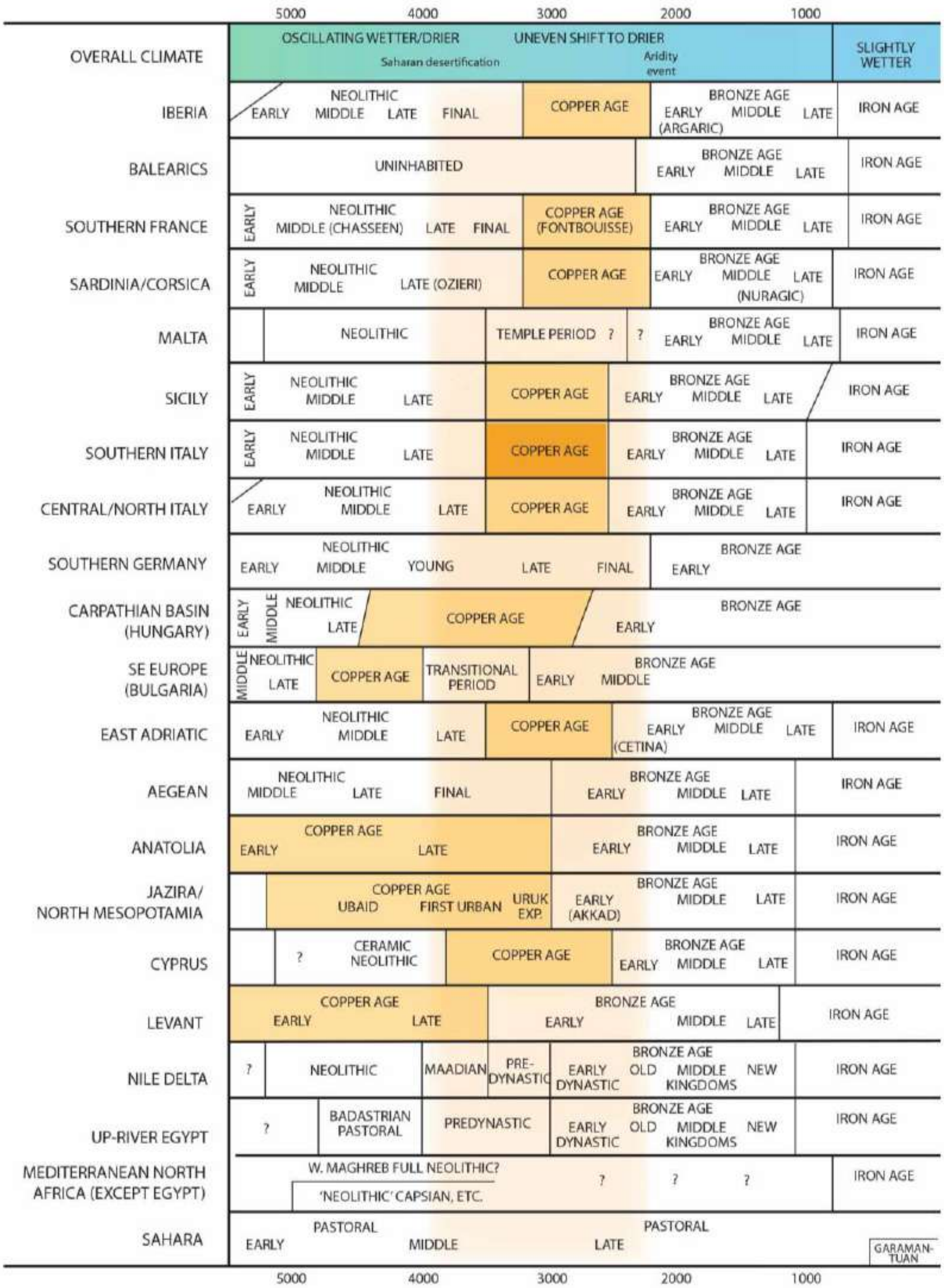


Figure 2.6. Chronological chart of Europe and the Mediterranean (after Broodbank 2012: 12–13; Bartelheim and Krauss 2012: tab. 6.1).

This brings us to a second phase, between the second half of the 4th millennium and the 'long 3rd millennium' BC (Broodbank 2013: 304): a period that saw the development of the majority of the Copper Age societies including those in Southern Italy. At this time, Europe was still a mixture of cultures and peoples with different socio-economic structures. Those in south-eastern Europe show classic 'Copper Age' characteristics (such as the emergence of social inequalities, organised cemeteries etc.), although the region saw a contraction in the number of metal objects compared to the previous abundance - a so-called 'metal depression' (Heyd 2012: 105).

This was the start of a transitional period that would lead to the emergence of 'Early Bronze Age' societies in Greece and the Balkans (*ibid.*) that would in turn influence Southern Italy (Cazzella *et al.* 2007). At the same time, western Europe was experiencing the opposite process: the Caucasus, Italy, southern France and Iberia lack conspicuous evidence of the early diffusion of metalworking techniques or objects, but at this moment the number of copper objects increased and Copper Age societies developed.

Central and northern Europe experienced a different pattern. A general cultural continuity from the Middle Neolithic can be recognised, and only around the first half of the 3rd millennium BC did a general transformation take place with the emergence of the Corded Ware complex (Furholt 2014). This region was still characterised by a scarcity of metal objects and especially of local metallurgy. This led Brodie (1997, 2001) to hypothesise the presence of a Chalcolithic frontier (dividing communities possessing copper metallurgical know-how and west Europeans without the knowledge of copper production) which caused a substantial stasis in the spread of metallurgy, in his interpretation mediated by inter-marriages between Neolithic and Chalcolithic communities and the consequent establishment of exchange networks. However, Brodie's theory, which implies the coexistence of hypothetical Neolithic and Copper Age societies without any contact for almost a millennium, does not take into consideration the more complex pattern of adoption of metallurgy now recognised in Eurasia (Roberts *at al.* 2009).

Moving into the 3rd millennium BC, we reach the last of Heyd's stages of 'Chalcolithisation': the pan-European Bell Beaker phenomenon (Heyd 2013: 99). Probably starting in around 2700 BC (the earliest date is from the Iberian Peninsula - see Harrison and Heyd 2007) this phenomenon, which is characterised by a specific material culture and ideology, spread around Europe with general large-scale trends alongside a degree of regional variability (Heyd 2012). In addition to four larger geographical domains of distribution, namely the Atlantic region, the Mediterranean, Central Europe and the Beaker tradition in the western part of the great Northern European Plain (Heyd 2007a), an eastern periphery is also recognised (Heyd 2007b). Here, Bell

Beaker features were re-elaborated and integrated into the local tradition, (as evidenced by Italian contexts (e.g., Nicolis and Mottes 1998). In this way, the Bell Beaker material culture spread through the whole of Europe, albeit through different patterns of spread and adoption (migrations, small-scale movements, exchange networks and hybridisation).

Despite Heyd's apparently coherent tripartite model of 'Chalcolithisation', that broadly describes the trends occurring in 4th and 3rd millennia BC Europe, the complexity of the interconnections starting in the 5th millennium BC can still barely be described or even archaeologically detected. This pattern is also recognised within smaller areas such as Southern Italy. Alongside the large-scale changes and trends previously discussed, Copper Age Southern Italian cultures show both links with previous local traditions and the reception of external influences that were then re-elaborated and embedded into the local culture, often generating complex hybrids.

2.3. 'L'Eneolitico': the discovery of an Italian Copper Age

This section will present an overview of the Italian Copper Age and the state of the current archaeological debate, with a specific focus on the Campania region. The Copper Age in the Italian Peninsula is generally set between 3800 and 2200 BC; its identification as a transitional period between the Neolithic and the Bronze Age dates to the late 19th century, when Italian prehistoric studies were starting to flourish, connected to the broader European debate thanks to the work of several scholars.

The first discussions about an Italian Copper Age date to the end of the 19th century when some of the founders of Italian prehistoric studies, Regazzoni, Strobel and Chierici, assimilated the debate going on in Europe and beyond concerning the detection of a transitional phase between the Neolithic and the Bronze Age (such as the discussions at the *Congrès international d'anthropologie et d'archéologie préhistoriques* held in 1876 in Budapest, Pearce 2019: 136). Some years later Chierici coined the term '*Eneolitico*' (from the Latin *aeneus*: bronze, and Greek *lithos:* stone) in his interpretation of the important sites of Rinaldone and Remedello (Chierici 1884), both rich in metal grave goods, when he needed to indicate a period between the Neolithic and the Bronze Age, when lithic tools were still used alongside a few metal objects.

The identification of the set of characteristics of the Italian Copper Age has been a long process. The terminology associated with the Eneolithic derives from the introduction of metal, as research progressed however, it became clear that the origin of metalworking in Italy could be found as early as the Late Neolithic (*c.* 4300 BC, Pearce 2015). The growing number of cemeteries with metal objects reinforced the hypothesis of an Italian Copper Age (Colini 1898–1902; Cornaggia Castiglioni 1971), as did the incredible finding of Ötzi, which allowed an insight into the biography of a Copper Age man (De Marinis 2013).

The characteristics previously defined for the European Copper Age (Section 2.2) are also largely applicable to the Italian Peninsula. They have been clearly specified by Cazzella and Guidi in their consideration of the concept of the Eneolithic in Italy (Cazzella and Guidi 2011: 29–30). Among other features, the Italian Copper Age is characterised by an early development of metallurgy dating from the Late Neolithic (for a summary see Dolfini 2014). It includes the statue stelae phenomenon with some striking examples, e.g., from Lunigiana (Ratti 1994); from Valcamonica and Valtellina (Casini 1994), and from Apulia, Southern Italy (Tunzi Sisto 2015) and Sardinia (Atzeni 2004). It is also characterised by a growing attention to the disposal of the dead, e.g., the complex Rinaldone culture ritual at La Selvicciola, Ischia di Castro, in Central Italy (Petitti *et al.* 2002; Dolfini 2006; Negroni Catacchio 2011), and by signs of growing social complexity (e.g., Dolfini 2022); and it consistently yields traces of the early stages of ploughing, e.g., examples from Campania (Marzocchella 1998: 113; Giampaola *et al.* 2007; Laforgia *et al.* 2007; Nicosia *et al.* 2007).

Research on Copper Age Italy has shifted through various paradigms. It initially followed the general trend of diffusionist theories of the origins of Copper Age societies and of metallurgy in particular (Puglisi 1959; Radmilli 1963 and a synthesis in Bernabò Brea 1968–69). Despite its long history, the diffusionist theory been greatly critiqued, especially in the Anglophone literature (e.g., Trump 1966: 84; Renfrew 1971), resulting in more subtle considerations of contacts and influences rather than simply large-scale migrations (Cazzella 2003; Cazzella *et al.* 2007, 2011; Cultraro 2001). From the second half of the 20th century on, several papers and congresses helped draw a clearer picture of the Italian Copper Age (Renfrew and Whitehouse 1974; Cocchi Genick 1988; IIPP 2008; Cocchi Genick 2013).

For a long time, the major archaeological distinctions in Copper Age Italy were based on tight chrono-typological series built with particular reference to the pottery record. This approach led to the incorrect identification of cultures based only on selected diagnostic features, e.g., recent analyses by Cocchi Genick (2012a: 464–8, 2013), which split the material evidence into excessively strict stylistic phases. With the introduction of an absolute chronological framework, it became clear that pottery typology could no longer be considered a reliable indicator for the detection of different phases, cultures and societies in this highly dynamic period (Cazzella and Guidi 2011; Aurino 2013: 164; Cocchi Genick 2013) with its broad circulation of stylistic motifs.

Despite its early detection, the definition of the Italian Copper Age remained uncertain until the end of the last century. Two major issues affected the research in this field: the consistently low visibility of settlement evidence, and the blurred boundaries between the Copper Age and previous and subsequent periods. It was only around the turn of the last century that a sufficient amount of new data became available thanks, in many cases, to large-scale rescue excavations (e.g., Fugazzola Delpino 2003, 2007; Laforgia and Boenzi 2011; Anzidei and Carboni 2020; IAPP 2021) and to the re-examination of old excavations. Through these various studies, the Italian Copper Age shifted from being a largely uncharacterised transitional period between the Neolithic and the Copper Age, to a complex period with distinct features and social dynamics (Cazzella and Guidi 2011).

Thanks to new discoveries and the application of modern analytical methods, the debate on Copper Age Italy has developed towards themes that are more in line with current European research questions. Some of the core concepts currently investigated for this period include: the type and mode of development of 'foreign' influences, especially in the Late Copper Age on the verge of the Bronze Age, especially regarding the Bell Beaker phenomenon and Cetina influences (Aurino and De Falco 2022; Recchia 2020; Gori 2020; IAPP 2021); the development of metalworking and raw material provenance in relation to exchange and mobility networks (Aurisicchio and Medeghini 2020; Iaia and Dolfini 2022); the development of social inequalities (Recchia and Cazzella 2021); and genetic flows and movement of peoples (Cavazzuti 2020; Fernandes *et al.* 2020).

2.4. Copper Age Campania: chronology, cultural traditions and long-distance connections

The aim of this section is to outline the main features and issues of Copper Age Campania in relation to Europe and the Mediterranean region in order to help situate the research questions, the sites selected for the archaeometric investigations, and the core objectives of this dissertation within a wider context.

The chronology and cultural development of Copper Age Campania were for a long time hard to assess, partly due to the lack of radiocarbon dates for the core contexts and partly to the scarcity of settlement evidence. In recent years, both aspects have improved thanks to large-scale rescue excavations (Fugazzola Delpino 2003, 2007; Nava *et al.* 2007; Laforgia and Boenzi 2011) and radiocarbon dating campaigns (Talamo *et al.* 2011; Aurino 2013). Traditionally, the definition of chronological phases and archaeological cultures in this region has been tied to a typo-chronological approach, often based on pottery styles. Examples are provided by the work of Pacciarelli and Talamo, in their chrono-cultural subdivision of the Copper Age in Tyrrhenian Southern Italy (Pacciarelli and Talamo 2011; Pacciarelli 2011), and by the wider analysis of Southern Italy by Cocchi Genick (1996). These subdivisions are often based only on ceramic style rather than the more complete dataset including settlement patterns, funerary practices, etc., used in the definition of different archaeological *facies* (for a clarification of the concepts of *facies* and cultures see Appendix 1). The main *facies* traditionally recognised in Campania are summarised in Table 2.1. As mentioned above, they are based mostly on pottery style and do not always match with the radiocarbon dates.

Period (Italian term and English translation)	**Archaeological *facies*/cultural tradition**
Eneolitico Iniziale – Initial Copper Age	Macchia a Mare - Spatarella
Eneolitico Antico 1 – Early Copper Age 1	Ceramic style detected only at the site of Taurasi
Eneolitico Antico 2 – Early Copper Age 2	Piano Conte and Taurasi
Eneolitico Medio – Middle Copper Age	Gaudo
Eneolitico Tardo – Late Copper Age	Laterza
Eneolitico Finale – Final Copper Age	Cetina influences

Table 2.1. Main periods and *facies* traditionally identified for Copper Age Campania (after Pacciarelli and Talamo 2011).

In order to give a more objective and comprehensive outline of the Campania Copper Age phases and cultural traditions, in the present study a distinction was used for periods based on the available radiocarbon dates with reference to the main cultural traditions identified. All dates currently available have been recalibrated with IntCal 20, OxCal and colour coded by cultural tradition in Table 2.2 and Figure 2.7, as further explained below.

Radiocarbon dating for Campania is far from comprehensive, nevertheless some fixed points can be established thanks to the distinctive geology of the region, which is strongly influenced by its volcanic complexes. Several eruptions occurred during prehistory, stemming from the volcanic complexes of Somma-Vesuvio and Campi Flegrei caldera. These impacted the human occupation of Campania, especially in the Campana Plain (Di Vito *et al.* 2021), resulting in a close interconnection between archaeological and volcanic layers, and between human and volcanic activities. The main events are summarised in Table 2.3.

Site	Details	Date BP	±	Calibrated date BC		Reference
				1σ	2σ	
Mulino di S. Antonio		5070	70	**3956-3792**	**4036-3657**	Albore Livadie et al. 1987-88
Casalbore	Layer 5a	4834	20	**3645-3541**	**3650-3532**	Passariello et al. 2010
Casalbore	Layer 4c	4824	30	**3645-3533**	**3650-3528**	Passariello et al. 2010
Pompei	V 1 13 context 4	4799	33	**3638-3531**	**3641-3526**	Nilsson and Robinson 2005
Casalbore	Tomb 86	4784	20	**3633-3531**	**3635-3527**	Passariello et al. 2010
Pompei	V 1 13 context 4	4771	32	**3631-3528**	**3639-3385**	Nilsson and Robinson 2005
Casalbore	Layer 4b	4768	54	**3636-3519**	**3644-3377**	Passariello et al. 2010
Taurasi	Tomb 2/9	4683	20	**3515-3377**	**3522-3373**	Passariello et al. 2010
Taurasi	Tomb 3/1	4662	25	**3509-3372**	**3516-3369**	Passariello et al. 2010
Afragola		4635	70	**3521-3351**	**3631-3104**	Laforgia and Boenzi 2011
Taurasi	Tomb 5/4	4632	23	**3494-3366**	**3510-3359**	Passariello et al. 2010
Paestum Gaudo	Tomb IXa	4593	45	**3496-3141**	**3516-3104**	Aurino 2013
Taurasi	Tomb 1/4	4567	24	**3370-3193**	**3488-3108**	Passariello et al. 2010
Buccino	Tomb 1-2	4530	100	**3371-3035**	**3515-2924**	Holloway 1973
Casalbore	Layer 4 SE	4527	28	**3356-3109**	**3362-3102**	Passariello et al. 2010
Paestum Gaudo	Tomb IXb	4478	45	**3333-3095**	**3356-3018**	Aurino 2013
Castel Baronia	Tomb 139	4400	80	**3314-2911**	**3339-2896**	Gangemi 1988
Buccino	Tomb 3	4320	120	**3316-2703**	**3349-2627**	Holloway 1973
Caivano	US 9A above PA2	4248	20	**2897-2881**	**2909-2782**	Passariello et al. 2010
Piano di Sorrento	Tomb 2	4247	37	**2909-2779**	**2921-2696**	Passariello et al. 2010
Caivano	US67 b below A3	4230	20	**2895-2785**	**2902-2706**	Passariello et al. 2010
Caivano	US89 above PA2	4216	22	**2891-2775**	**2897-2701**	Passariello et al. 2010
Caivano	US66 c in PA2	4215	20	**2890-2776**	**2896-2701**	Passariello et al. 2010
Caivano	US67 c below A3	4192	23	**2881-2704**	**2889-2675**	Passariello et al. 2010
Sala Consilina	Tomb 1077	4175	24	**2876-2700**	**2884-2639**	Passariello et al. 2010
S.Maria a Peccerella	US 9	4160	60	**2876-2639**	**2890-2578**	Langella et al. 2008
Sala Consilina	Tomb 1074	4140	20	**2861-2636**	**2871-2626**	Passariello et al. 2010
Sala Consilina	Tomb 1073	4128	20	**2851-2631**	**2867-2583**	Passariello et al. 2010
Mirabella Eclano	T. of the Chieftain	4104	48	**2851-2577**	**2874-2496**	Passariello et al. 2010
Mirabella Eclano	T. of the Chieftain dog	4102	30	**2845-2579**	**2865-2501**	Passariello et al. 2010
Sala Consilina	Tomb 1076	4098	20	**2837-2580**	**2851-2573**	Passariello et al. 2010
Afragola	V sottotratta lotto 13	4030	60	**2661-2467**	**2865-2350**	Laforgia and Boenzi 2011
Buccino	Tomb 7	4025	100	**2852-2456**	**2876-2296**	Holloway 1973
Caivano	IV sott. Lotto 13 S 36	4022	45	**2578-2471**	**2846-2457**	Laforgia and Boenzi 2011
Gricignano	US 2314-2254 top AMS	4010	100	**2568-2476**	**2574-2471**	Holloway 1973
Buccino	Tomb 9	4010	20	**2844-2349**	**2876-2237**	Passariello et al. 2010
Gricignano	US 2315 top AMS	4000	20	**2566-2474**	**2572-2468**	Passariello et al. 2010
Atena Lucana	US 300	3868	75	**2461-2210**	**2568-2067**	Passariello et al. 2010

Table 2.2. All radiocarbon dates currently available for Copper Age Campania, calibrated with OxCal Intcal 20, at 2σ, colour coded by cultural tradition as explained in Figure 7 (dates from Aurino 2013; Albore Livadie and Gangemi 1988; Holloway 1973; Laforgia and Boenzi 2011; Langella *et al.* 2008; Passariello *et al.* 2010).

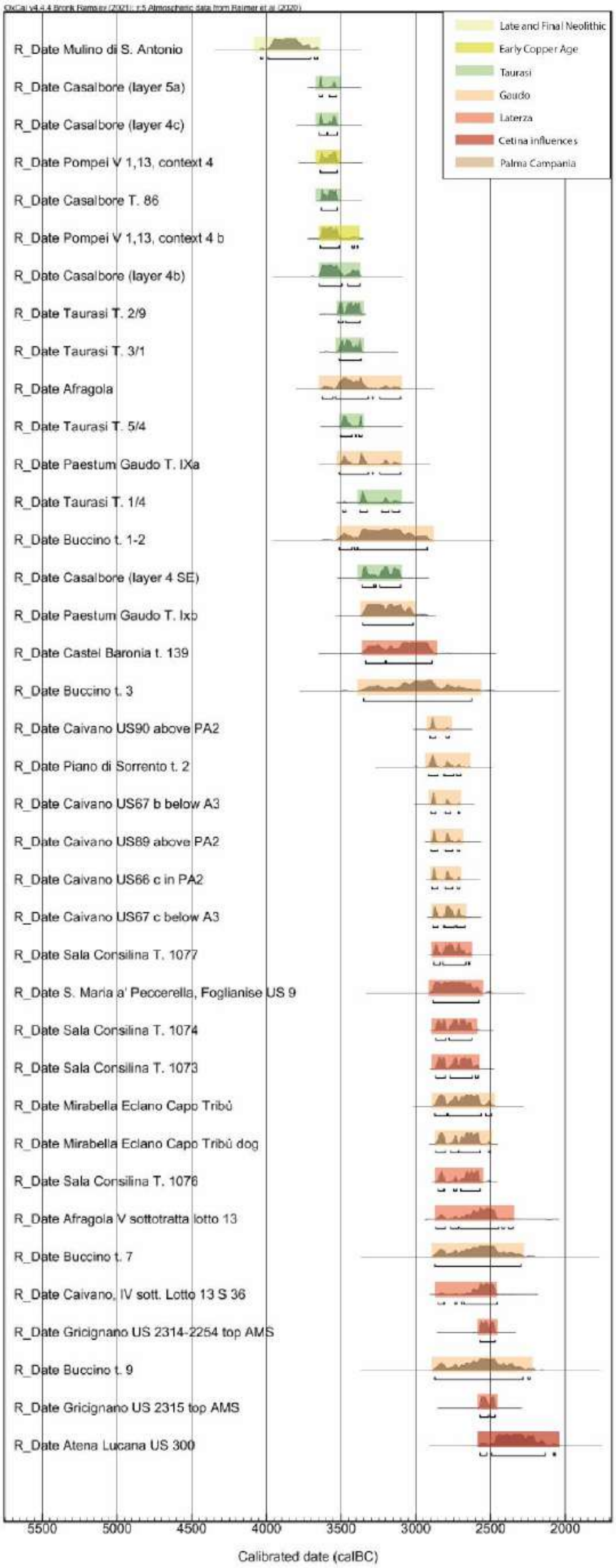


Figure 2.7. All the radiocarbon dates currently available for the Campania region calibrated with OxCal Intcal 20, at 2σ, colour coded by cultural tradition.

Volcanic complex	Common name	Chronology	Reference
Phlegrean	**Agnano 3**	4440±50BP; 3340-2920 BC cal. 2σ 4340±50BP; 3100-2880 BC cal. 2σ	Passariello *et al.* 2010 Di Vito *et al.* 1999
Phlegrean	**Paleoastroni 2**	4170 ±40BP; 2890-2620BC cal. 2σ	Passariello *et al.* 2010 Di Vito *et al.* 1999
Phlegrean	**Agnano-Monte Spina**	4420±58 BP; 3335–2913 cal BC 2σ	Zanchetta *et al.* 2019
Phlegrean	**Astroni eruptions sequence**	<4000±20; 2580-2470 cal. BC 2σ	Passariello *et al.* 2010 Di Vito *et al.* 1999
Somma-Vesuvio	**Avellino Pumices**	3546±17 BP; 1944-1779 cal. BC 2σ	Passariello *et al.* 2020

Table 2.3. Summary of the main volcanic phenomena occurring during the Copper Age (after Di Vito *et al.* 2021).

Based on the radiocarbon dates and volcanic stratigraphy, four main periods can be distinguished in Copper Age Campania. These only partly follow the original divisions in Table 2.1:

- **Early Copper Age, 3900–3650 BC** (based on parallels with radiocarbon dated sites outside Campania) characterised by scarce and blurred archaeological evidence.
- **Middle Copper Age, 3650–2900 BC,** characterised by the cultural traditions of Taurasi, Gaudo and Laterza.
- **Late Copper Age, 2900–2300 BC,** characterised mostly by the Laterza culture and the final evidence of the Gaudo culture.
- **Final Copper Age, 2300–2200 BC,** characterised only by a few pieces of evidence and Cetina culture influences.

As outlined in Table 2.1, the *facies* of Taurasi, Gaudo and Laterza were originally considered to be successive, but new excavations and the use of radiocarbon dating have revealed a more complex interaction between these cultural entities. As shown in Table 2.2 and Figure 2.7, they are now characterised by a chronological and spatial overlapping (for the spatial overlapping see Section 2.4.1.2). The partial nature of the evidence, almost exclusively of a funerary nature for the Taurasi and Gaudo traditions, makes it very difficult to fully determine the characteristics of an archaeological 'culture'. The distinction between these two cultural traditions is based mostly on funerary practices: cremation burials inside or near stone structures in the case of the Taurasi culture, collective rock-cut burials in the case of the Gaudo tradition. The material culture, though quite distinctive and coded for Gaudo burials, shows similarities between the two traditions in the shapes and decoration of the vessels (see below). Only limited settlement evidence (poorly preserved) is documented for the Gaudo culture, at Caivano and Afragola (Laforgia *et al.* 2007; Laforgia and Boenzi 2011), and in the area of Rome, with some local variations (Anzidei and Carboni 2020). No settlement evidence is currently associated with the Taurasi tradition. It must be noted that this difficulty in detecting and directly relating settlements to funerary evidence might also be linked to a different form of material production and presentation in non-funerary activities and contexts. Aurino hypothesises that the settlements in the Gaudo *facies* might represent a 'space of freedom' where the rules of the highly coded material repertoire linked to the ritual practices did not apply (Aurino 2013: 170). Nevertheless, it is undeniable that at the present stage of research, the main evidence available in Campania for both Taurasi and Gaudo cultures is mainly funerary (Bailo Modesti and Salerno 1998).

Defining the Laterza tradition has also been problematic since the wide distribution of its pottery style includes strong local variations. Two main nuclei can be recognised: the area of Lazio and Campania, characterised by large settlements and burial grounds with coherent settlement patterns and material culture (e.g., at Gricignano d'Aversa in Campania and Torre Spaccata, Osteria del Curato etc., in the Rome area), with rare collective rock-cut tombs (the only known example being in Paestum, near the Temple of Cerere); and the area of Puglia and Basilicata, characterised by a scarcity of settlement evidence and a majority of rock-cut collective grave cemeteries (Laterza, Gioia del Colle, etc.) and burial and ritual practices in caves, e.g., Grotta Nisco (Venturo *et al.* 2011) and Grotta Cappuccini di Galatone (Ingravallo 2002).

Unusual burial practices are attested in caves and at sites such as Salve, characterised by the use of tumuli and cremations (Aprile *et al.* 2018), and Valle Sbernia, where a former flint mine was used for collective burials with a material repertoire linked both to the Laterza and Gaudo cultures (Tunzi Sisto 1999). Since the pottery style generally associated with the Laterza culture is also attested in Central-Northern Italy, it is mostly recognised as broader shared ceramic style (Cocchi Genick 2009), indicative of the circulation of models and ideas rather than of a widespread culture (Cocchi Genick 2013).

Regardless of distinctions between facies, cultures or groups, it is clear that the evidence for Copper Age Campania still does not allow clear distinctions to be drawn between different cultures. In order to avoid complex terminologies, and blurred identifications of more-or-less homogeneous cultural groups that are chronologically overlapping, it seems more appropriate at the present stage of research to talk about various, partially contemporaneous and spatially close cultural traditions with both different and shared practices. Therefore, although the main distinctions between cultural traditions were used in this study (Early Copper

Age, Taurasi, Gaudo, Laterza and Cetina influence), these are used critically and tested by comparing contextual and ceramic data, and are ultimately reassessed in the discussion of the results (Chapter 8).

The main features of the four phases of the Campanian Copper Age (Early, Middle, Late and Final) are detailed in the following sections in terms of their chronology, key sites and distribution in the region, described alongside their associated material culture, subsistence practices, funerary and ritual practices, and extra-regional connections.

2.4.1. Sites, landscape and subsistence patterns in the region

The 4th and 3rd millennia BC in Campania have for many years been characterised by an almost complete predominance of the so-called 'villages of the dead' (Bailo Modesti and Salerno 1998): extensive burial grounds with no consistent traces of settlement. As noted, in recent years the archaeological record has improved dramatically, shedding some light on the settlement strategies of the period: the distribution of sites appears quite diffuse, associated with the major natural commmunication routes between the coast and the inner mountains and further along the Adriatic shore.

2.4.1.1. Early Copper Age (3900–3650 BC)

This period is characterised by a lack of radiocarbon dates mostly due to the scarcity of evidence, which often comes from insecure contexts. Late Neolithic aspects, such as the Diana-Bellavista cultural tradition, persist into the first half of the 4th millennium, as testified by the Serra d'Alto-Diana phase of Mulino di S. Antonio, Avella, dated to 4036–3657 cal BC 2σ (Albore Livadie *et al.* 1987–88, Table 2.2 in yellow) developing local differences in Southern Italy and Sicily (Robb 2007: 295; Pacciarelli and Talamo 2011: 87–8). At the same time, features characteristic of the full Copper Age start to emerge, such as the scaled pottery typical of this period across the whole Italian Peninsula. Evidence of this Early Copper Age phase is often found in caves, e.g., Grotta dell'Ausino, Grotta di S. Angelo a Fasanella, Grotta di Polla (Talamo 2008a) and in open air sites, e.g., Frasso Telesino, Avella-Mulino di S. Antonio, Pontecagnano, Foglianise-Masseria di Gioia, Paestum-Agorà (Talamo 2008a) but mostly as restricted assemblages of ceramics with no clear stratigraphy.

The material culture is generally limited to pottery (the only material class published for these sites) characterised by distinctive decorations, incised zig-zag and triangle motifs in the earliest phases (Figure 2.8A) and simple shapes and impressions in later ones (Figure 2.8B). No metal objects are attested, while just a few lithic tools—retouched flint blades and one unretouched obsidian bladelet—are reported for the site of Pontecagnano (Aurino 2011: fig. 19).

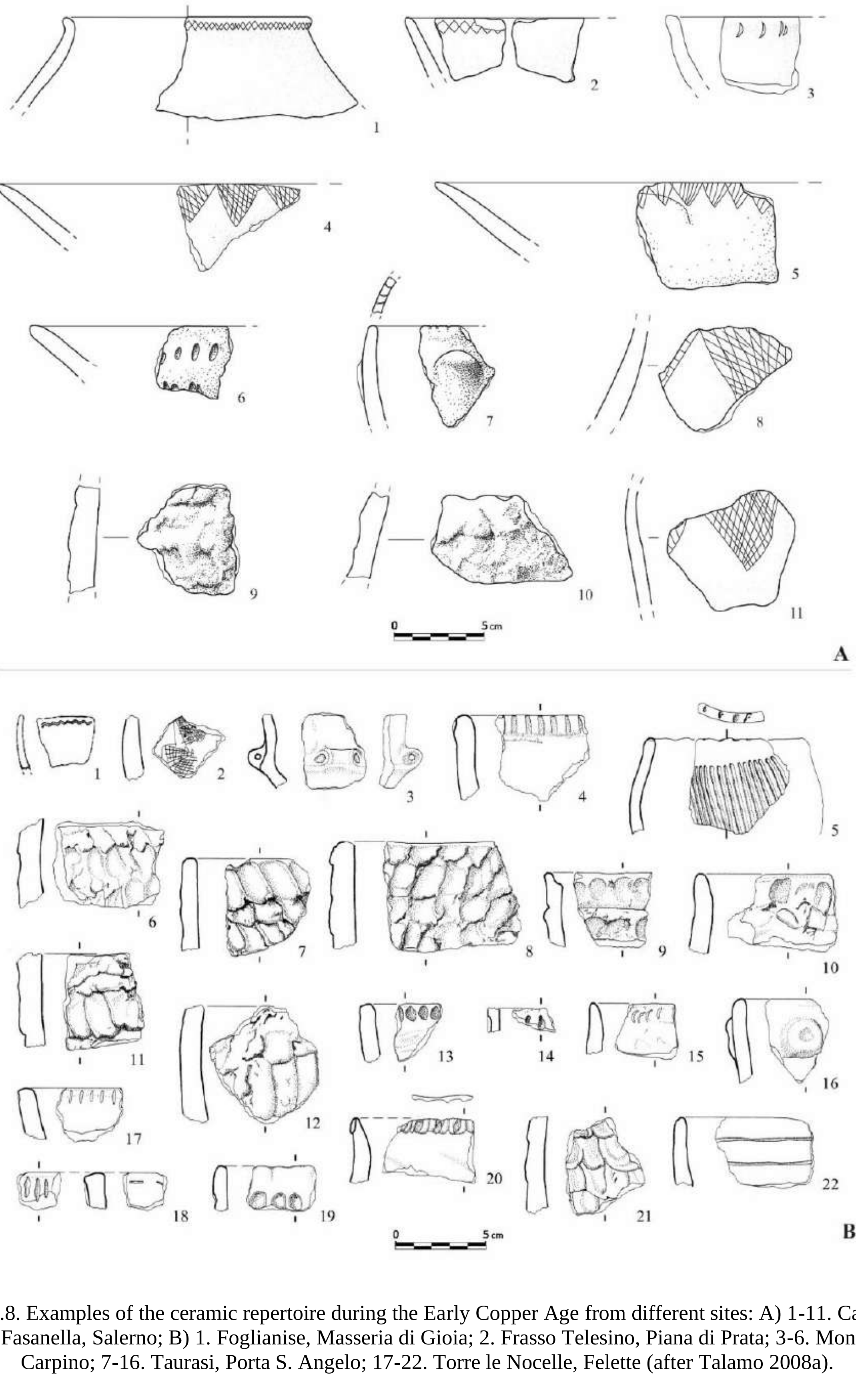


Figure 2.8. Examples of the ceramic repertoire during the Early Copper Age from different sites: A) 1-11. Cave of S. Angelo a Fasanella, Salerno; B) 1. Foglianise, Masseria di Gioia; 2. Frasso Telesino, Piana di Prata; 3-6. Montemiletto, Carpino; 7-16. Taurasi, Porta S. Angelo; 17-22. Torre le Nocelle, Felette (after Talamo 2008a).

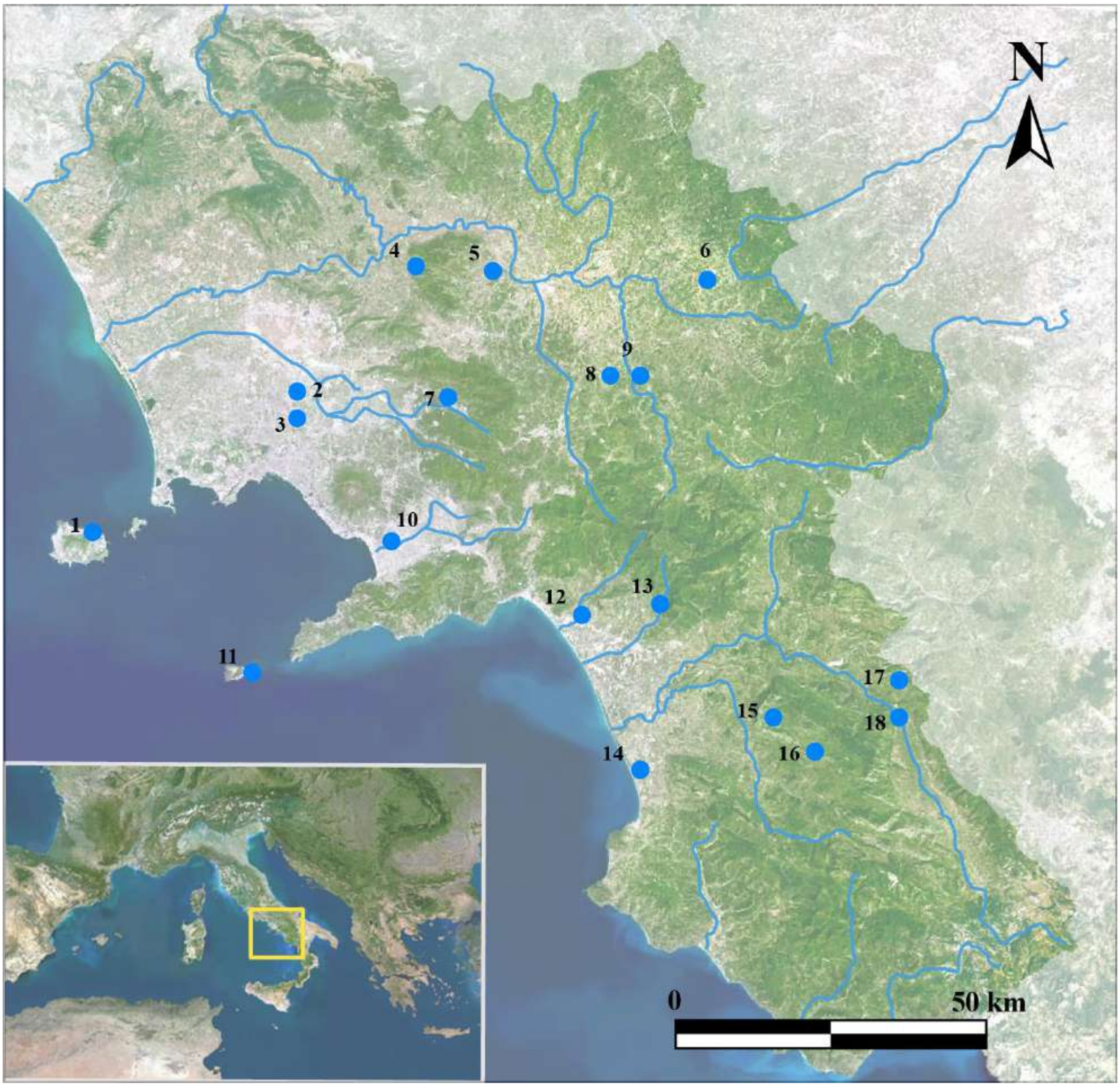


Figure 2.9. Map of currently known Early Copper Age sites (blue dots): 1. Ischia: 2. Caivano; 3. Afragola; 4. Frasso Telesino; 5. Foglianise, loc. Masseria di Gioia; 6. Ariano Irpino; 7. Avella; 8. Montemiletto; 9. Taurasi, Porta S. Angelo; 10. Pompei; 11. Capri, Grotta delle Felci; 12. Pontecagnano, Anas; 13. Olevano sul Tusciano; 14. Paestum; 15. Ausino; 15. S. Angelo a Fasanella; 17. Grotta dello Zachito; 18. Grotta di Polla..

The settlement pattern appears to follow the trend of the Final Neolithic (Figure 2.9), showing continuity with previous Serra d'Alto and Diana culture occupations, e.g., Foglianise and Masseria di Gioia (Talamo 2008a); Caivano and Afragola (Laforgia and Boenzi 2011) and Pontecagnano (Aurino 2011). At the site of Pontecagnano, a rare example of a Copper Age settlement evidence for this time span has been excavated and published (Figure 2.10). This structure, further detailed in Chapter 4.3.2.1, and the associated material culture, suggest a mixture of Neolithic traditions with styles that became widespread during the Copper Age. Parallels can be found in structure C from Maccarese, Torre Spaccata and Osteria del Curato via Cinquefrondi (Aurino 2011: 40–4).

Figure 2.10. Early Copper Age structure excavated in Pontecagnano, Salerno, represented by a circular foundation ditch about 6m in diameter, dug in the soft travertine with embedded post-holes and two central post holes.

2.4.1.2. Middle Copper Age (3650–2900 BC) and Late Copper Age (2900–2300 BC)

Towards the middle of the 4th millennium BC, two main features appear in the region: the deposition of cremated human remains in stone structures (Taurasi cultural tradition), and the establishment of large cemeteries with collective rock-cut tombs (Gaudo cultural tradition). The absolute chronology available for cremations in Campania derives from the site of Taurasi and spans the period from 3522 to 3108 cal BC (2σ, Table 2.2, Talamo *et al*. 2011). Further radiocarbon dates are available for the few cremations and inhumations attested at the site of Casalbore, all between 3650 and 3102 cal BC (2σ, Table 2.2, Talamo *et al.* 2011: 40–1). The earliest dating for collective tombs in Campania is from tomb IX in the Gaudo cemetery at Paestum, ranging between 3516 and 3102 cal BC (Aurino 2013). An equally early date is attributed to the site of Buccino, spanning 3515–2296 cal BC, 2σ, although this is uncertain due to the large error range of the radiocarbon determination (Table 2.2, Holloway 1973). These two burial practices therefore appear to be contemporaneous during the second half of the 4^{th} millennium BC. No evidence of cremation is attested in the 3rd millennium BC, while the rock-cut cemeteries extend into the mid-3rd millennium BC, e.g., Piano di Sorrento (2921–2696 cal BC, 2σ, Table 2.2, Talamo *et al.* 2011) and Mirabella Eclano, tomb of the Chieftain (2874–2496 cal BC, 2σ, Table 2.2, Talamo *et al.* 2011), with some even later dates from Gaudo cemeteries still unpublished. Two other contexts with less definable cultural features and attribution are also dated to this period: the settlement of Caivano (IV sottotratta, lotto 10) dated between 2909 and 2675 cal BC (2σ, Table 2.2, Talamo *et al.* 2011) and Afragola (V sottotratta, lotto 1) dated between between 3631and 3104 BC (2σ, Table 2.2, Laforgia and Boenzi 2011: 252–4).

The main cremation sites in the Campania region (Figure 2.11) are the eponymous site of Taurasi (Talamo 2004, 2008a) in north-east Campania, Sala Consilina in the south (Talamo 2008a), and Succivo in the Campana Plain (Talamo 2008a). The burial practices attested at these sites will be further addressed in Section 2.4.2; a selection of the associated material culture is illustrated in Figure 2.12. Further evidence of cremation, although unclear, comes from the site of Casalbore, slightly south of Taurasi, in the Campanian Antiapennine (lower pre-Apennine mountains).

The context is only briefly published but five burials are reported with evidence of cremations in association with inhumations (Albore Livadie and Gangemi 1988). The tomb trenches were apparently covered by stones, and the grave goods and some of the bones showed traces of exposure to fire. Ochre traces are also reported inside the tombs. This very peculiar evidence is unfortunately poorly understood since a systematic analysis of the whole context was not undertaken. The material culture appears consistent with other evidence, especially that from the site of Sala Consilina, phase I (Figure 2.12E). Similar evidence, dated to the second half of the 4^{th} millennium BC, is also emerging in northern Apulia, not far from the Campanian border, at the cemetery of Giardinetto, Orsara di Puglia (Tunzi *et al.* 2014).

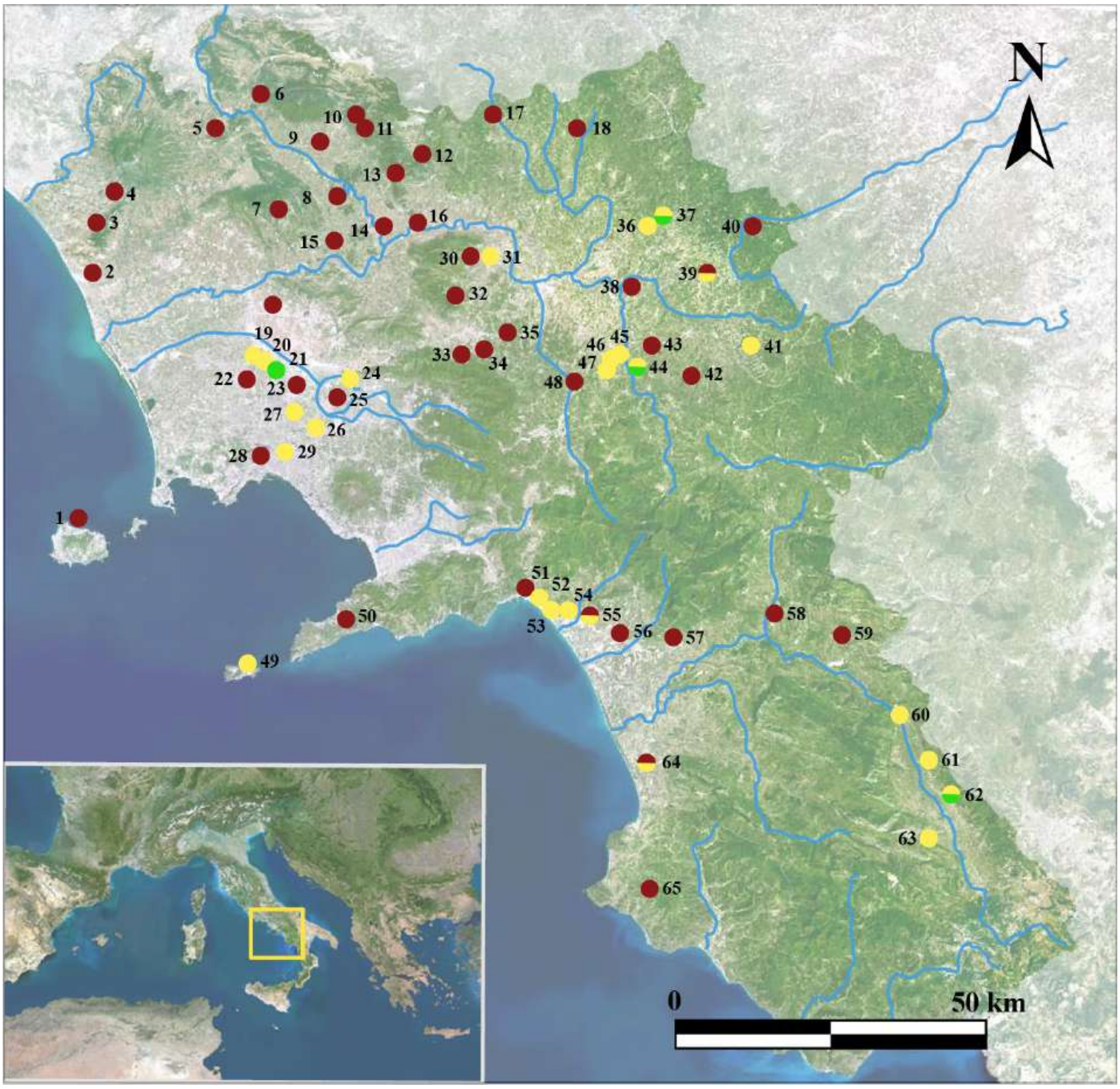


Figure 2.11. Map of the sites currently known for Middle and Late Copper Age by cultural tradition. Green dots: Taurasi; red dots: Gaudo; yellow dots: Laterza: 1. Ischia, Lacco Ameno; 2. Mondragone; 3. Piedimonte Massicano; 4. Sessa Aurunca; 5. Vairano Patenora; 6. Ailano; 7. Treglia; 8. Alvignano; 9. Alife; 10. Piedimonte Matese; 11.S. Potito; 12. Civitella; 13. Faicchio; 14. Amorosi; 15. Caiazzo; 16. Telese; 17. Sassinoro; 18. Colle Sannita; 19. Carinaro; 20. Gricignano; 21. Succivo; 22. Aversa; 23. Caivano; 24. Acerra, Gaudello; 25. Acerra, Parmiano; 26. Casalnuovo; 27. Afragola; 28. Napoli, Materdei; 29. Poggioreale; 30. Camposauro; 31. Foglianise, S. Maria a' Peccerella; 32. Amorosi; 33. Cervinara; 34. S. Martino Valle Caudina; 35. Tufara di Montesarchio; 36. Buonalbergo; 37. Casalbore; 38. Apice; 39. Ariano Irpino; 40. Savignano Irpino; 41. Castel Baronia; 42. Gesualdo; 43. Mirabella Eclano; 44. Taurasi, Macchia dei Goti; 45. Felette; 46. Torre Le Nocelle; 47. Montemiletto; 48. Pratola Serra; 49. Capri, Grotta delle Felci; 50. Piano di Sorrento; 51. Salerno; 52. Picarielli; 53. Oliva Torricella; 54. Fuorni; 55. Pontecagnano; 56. Bellizzi; 57. Eboli; 58. Contursi; 59. Buccino; 60. Grotta di Polla; 61. Atena Lucana; 62. Sala Consilina; 63. Grotta del Pino, Sassano; 64. Paestum; 65. Serramezzana.

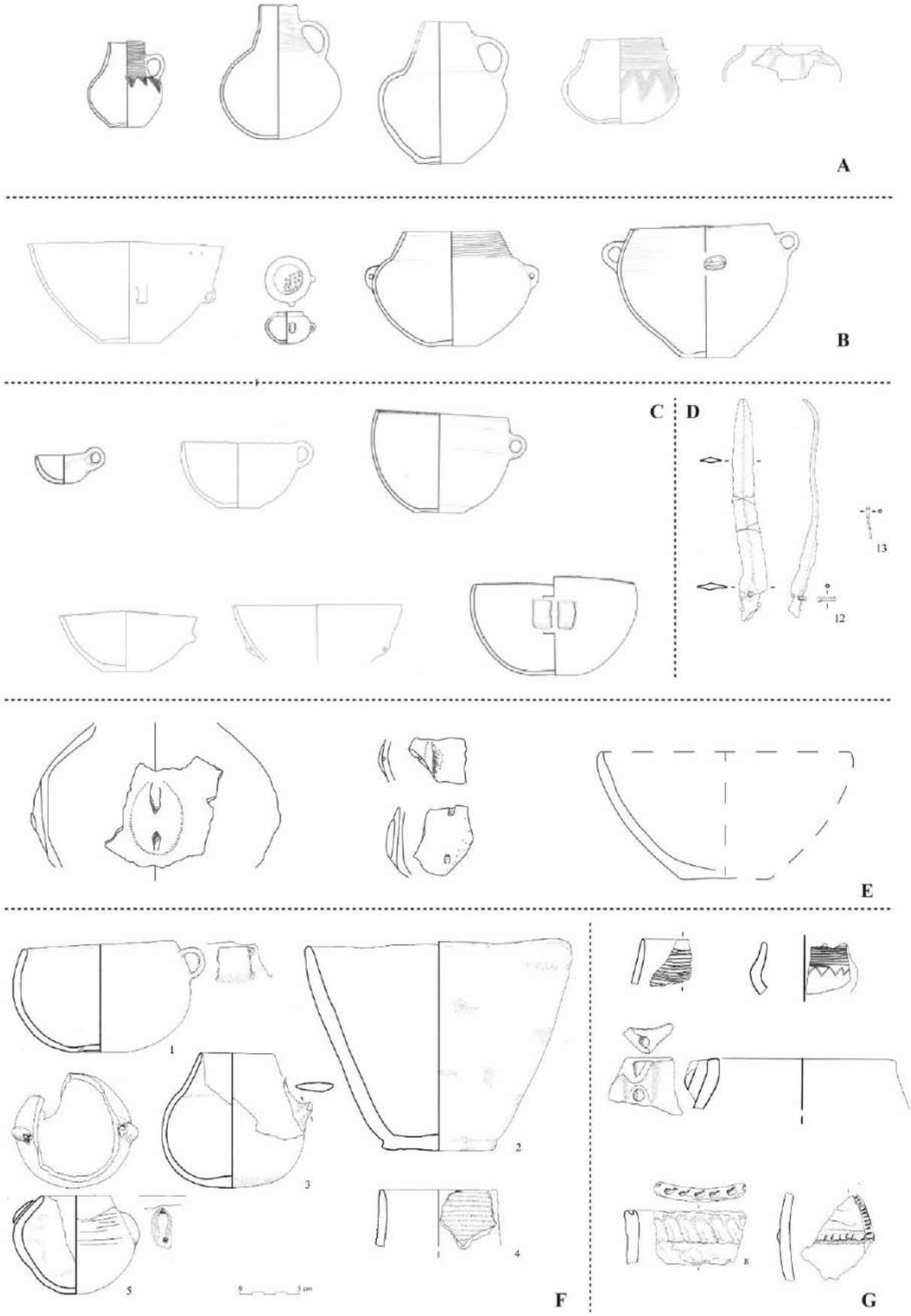


Figure 2.12. Examples of the ceramic repertoire from cremation burial sites attributed to the Taurasi cultural tradition. A-D: Cremation cemetery of Taurasi, A) jugs; B) jars and incense burner; C) cups, small and deep bowls; D) metal dagger (after Talamo 2004).
E) Casalbore, locality St. Maria dei Bossi; F) 1-3. Fontanarosa, Fievo; 4. Torre le Nocelle, Felette; 5. Ariano Irpino, La Starza. G) Alife, via Vernelle (after Talamo 2008a).

The evidence for collective rock-cut tombs is much more widespread and extends over the entire Campania region, from the northern mountainous areas of Irpinia to the southern Sele Plain (Figure 2.11). The site of Paestum is the largest cemetery and was in use for the longest timespan, lasting for almost one millennium. Other Copper Age rock-cut tombs are dated mainly to the 3rd millennium BC. These collective rock-cut tombs are always characterised by a specific ritual involving the fragmentation of pottery and the placement of secondary deposits, and by typical products left as grave goods, especially as far as pottery and lithics are concerned. A selection of the material culture attested at these sites is illustrated in Figure 2.13 and further detailed in the following sections (2.4.2 and 2.4.3), along with descriptions of the burial practices.

For this period, the only settlement areas that are preserved, albeit poorly, are the abovementioned sites of Caivano and Afragola. In Caivano, various structures were revealed: a pit for the uptake of water (IV Sottotratta, lotto 9), two ritual pits (zona ASI – lotto 7), a settlement area (IV Sottotratta, lotto 10, Figure 2.14A) with circular structures with outer hearths and an oval structure with a central row of posts, and a cemetery (IV Sottotratta, lotto 1) of eight rock-cut tombs with entrance shafts. Despite the proximity of the settlement and burial area, no major correspondence could be found in their respective material culture, even though the stratigraphy of the settlement and the characteristics of the cemetery point towards a coexistence, or at least to the attribution of both settlement and cemetery to the Early/Middle Copper Age (Laforgia and Boenzi 2011: 252).

At Afragola, four structures were detected but not fully investigated (Figure 2.14B). One sub-rectangular structure had an apse and a burial on the western side. Its first phase of occupation was on the 'paleo-soil B' (beneath the eruption of Agnano 3, see Table 2.3). This was modified during and after Agnano 3 eruption (>4757 cal BP, Di Vito *et al.* 2021), and was then abandoned at the time of the Paleoastroni 2 eruption (4712–4757 cal BP, Di Vito *et al.* 2021).

Figure 2.13. Example of the material culture typical of rock cut tombs attributed to the Gaudo cultural tradition: 1-20. Caivano cemetery (after Laforgia and Boenzi 2009); 18. bronze butt-axe, Mirabella Eclano, Tomb of the Chieftain; 19. metal blade with a hafting tang, Pontecagnano, t. 6589 (after Iaia and Dolfini 2021).

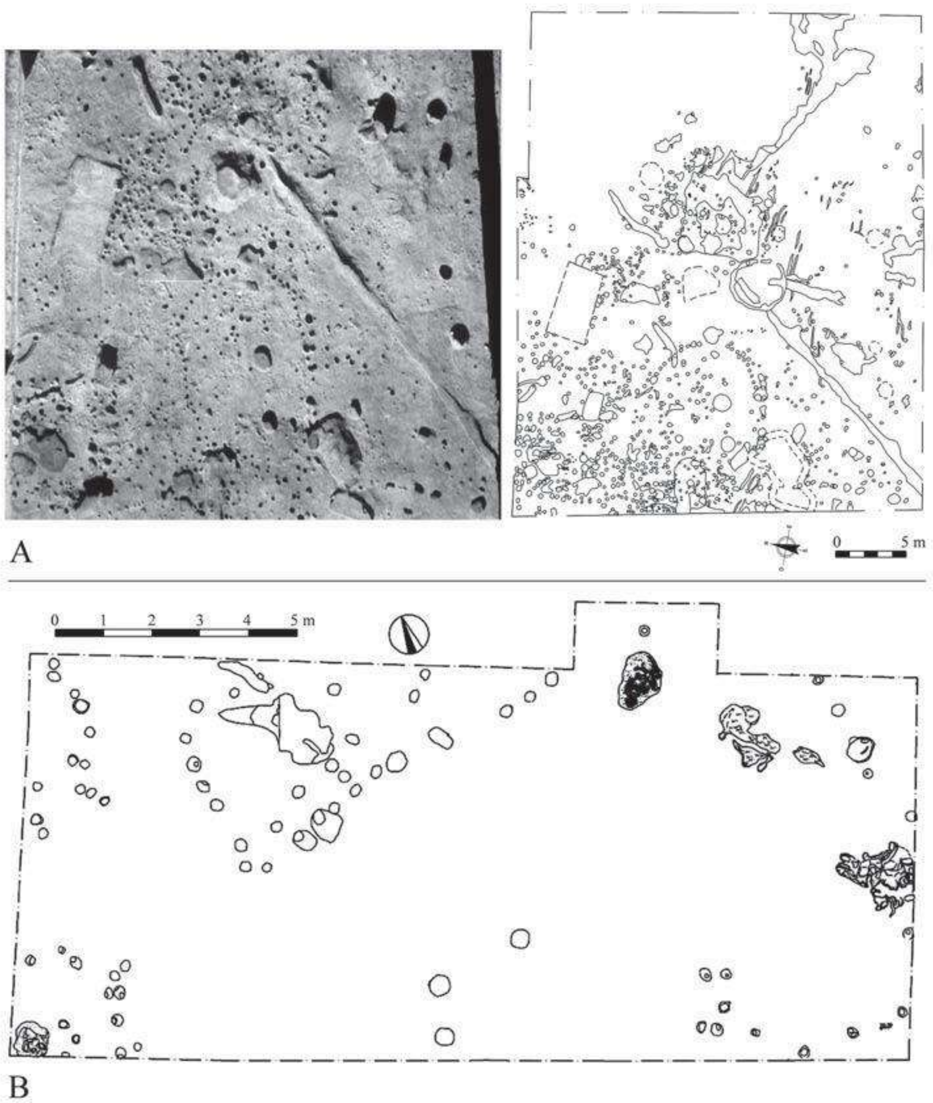


Figure 2.14. A) Caivano: aerial photo and plan of the settlement on top of Agnano 3 eruption material. B) Afragola: plan of the structures on top of Agnano 3 eruption material (Laforgia *et al.* 2007).

From the middle of the 4th millennium, the regional settlement pattern is homogeneous and structured, encompassing all the major plains and communication routes (Figure 2.11). Major works of synthesis on site distribution (Bailo Modesti and Salerno 1998; Talamo 2008a and b) show that the number of sites traditionally attributed to the Taurasi culture is consistently lower than those of the Gaudo tradition, and they appear concentrated in the inner areas of Campania (Talamo 2008a). The distribution is influenced by the geomorphology of the region and is, in some cases, constant through time, as exemplified by several multi-phase sites (Caivano, Afragola, Paestum, Pontecagnano, Gricignano). No preferred areas or communication routes can be detected; on the contrary, there is a diffuse presence that involves all the communication arteries and the most favourable environments to settlement and agriculture (Talamo 2008a: 191–2). The only area that appears to be less intensely inhabited at this time is the southern part of the region, around the Cilento and Vallo di Diano, where only a few sites are attested, also due to a less intense archaeological research (e.g., Sala Consilina I, Grotta S. Angelo in Olevano sul Tusciano).

The coastal areas have a high density of occupation sites, just a few kilometres apart, both directly near the present-day coast and in the immediate surroundings, allowing easy access to coastal and plain areas. Beyond the plains, towards the hilly and mountainous hinterland, the distribution of settlements follows the major river valleys. These were moderately occupied, probably due to their connections with both regional and wider communication routes towards central Italy (along the Garigliano and Volturno river valleys), Apulia (along the Calore and Ufita River valleys) and Basilicata (via the Sele River).

Towards the end of the 4th millennium, the first evidence appears of a further funerary practice and settlement pattern attributed to the Laterza culture, mostly characterised by single, flat graves. The site of Castel Baronia in the area of Avellino provides the only radiocarbon date in the 4th millennium BC, between 3339 and 2896 BC (cal 2σ, Table 2.2, Gangemi 1988) while the majority of these burials are dated to the 3rd millennium BC. The site of Gricignano d'Aversa, Caserta is clearly dated by the volcanic stratigraphy to between the Agnano-Monte Spina and Flegrea 1 eruptions, confirmed by radiocarbon dating at between 2574 and 2468 cal BC (cal. 2σ, Table 2.2, Talamo *et al.* 2011). A slightly earlier date-range is available for Foglianise, loc. S. Maria a' Peccerella, between 2890 and 2578 cal BC (2σ, Table 2.2, Langella *et al.* 2008: 172). Further dating comes from the site of Torre le Nocelle loc. Felette, at 2570–2485 cal BC (2σ, Table 2.2, Talamo *et al.* 2011), and from the site of Afragola, with Late Copper Age levels (V sottotratta, lotti 12 and 13) at 2865–2350 cal BC (2σ, Table 2.2, Sampaolo 2005). The second phase of Sala Consilina, loc. Capo la Piazza, where a cemetery of flat graves was found, can also be radiocarbon dated to the Middle Copper Age between 2851 and 2573 cal. BC (2σ, Table 2.2, Talamo *et al.* 2011).

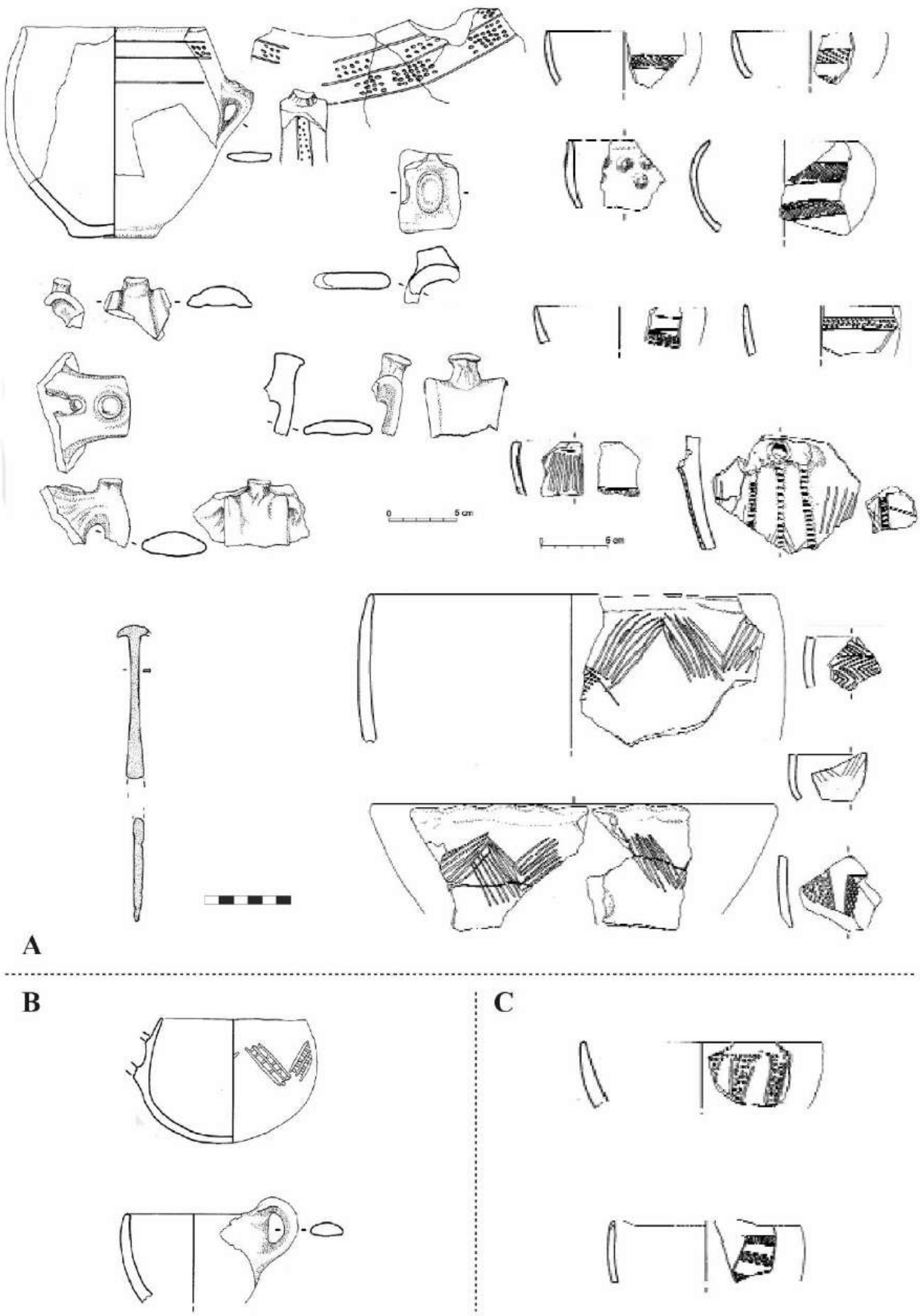


Figure 2.15. Examples of the ceramic repertoire in Campania during the Late Copper Age from cemeteries and villages attributed to the Laterza cultural tradition (after Talamo 2008b):
A) Ceramic and metal finds from the flat grave cemetery of Felette, Torre le Nocelle.
B) Cups from Foglianise, S. Maria ‘a Peccerella (above) and Taurasi Porta S. Angelo (below).
C) Small bowls from Taurasi, Macchia dei Goti (above) and Montemiletto, Casale S. Nicola (below).

During the 3rd millennium BC, as well as the large, collective rock-cut tomb cemeteries, there is evidence of substantial settlements with connected burial grounds, in some cases with depositions also made inside the settlement area and even inside some of the houses (Fugazzola Delpino *et al.* 2003, 2007). Burial practices range from rock-cut tombs to the more frequent trench graves (Salerno and Marino 2011). Grave goods are generally quite limited, and most depositions are single, but in a few cases, double. Few examples of collective burials are documented in Campania, compared to the wider Apulian trend. One example is at Paestum, with partially rock-cut collective tombs located near the 'Temple of Cerere' (Albore Livadie *et al.* 2011). These sites also show a connection with the wider Bell Beaker phenomenon, with either imported or locally made Bell Beakers attested (see Section 2.4.3). A sample of the material culture related to these villages and cemeteries is displayed in Figure 2.15, with the ceramics characterised by recurring stylistic features, though with a certain variability in shapes and decoration.

No major changes appear in the occupation patterns of the region in this period. On the contrary, in many cases, there is clear continuity (e.g., Paestum and Acerra) with a distribution that continues to follow the main communication routes (Figure 2.11, yellow dots). There are slightly fewer sites currently known compared to the Gaudo culture, but several concentrations can be detected. The inner area of Irpinia (central-east Campania), which has been intensely surveyed, yields the most settlements currently known (Talamo 2008b). The settlement pattern comprises at least three site location types: a) sites on wide river terraces in river valleys rich in fertile soils; b) sites on the hill slopes at a slightly higher position with respect to the valleys, but lower than 600m asl; and c) sites on hill slopes at about 600-700m asl connected to mountain passes (Talamo 2005).

Another intensely occupied area is the Campana Plain, where evidence indicates settlement alongside a strong agricultural exploitation of the area. The volcanic eruptions of the Vesuvio and Phlegrean Fields interrupted the occupation of this area but also ensured a high fertility of the soils (Di Vito *et al.* 2013: 9). Some disruption can be detected in the passage from the Middle to Late Copper Age due to the eruption of Agnano-Monte Spina. In the areas of both Caivano and Afragola and around Naples, there is a gap in human occupation. In the area of Caivano and Afragola, this is probably due to hydrogeologic disorder in the proximity of the River Clanis following the eruption (Laforgia and Boenzi 2011: 254–5). Settlements shifted by about 2km from the river sides (Laforgia *et al.* 2013), as shown by the settlement of Gricignano di Aversa, US Navy area (Fugazzola Delpino *et al.* 2003). In the area of Naples, traces of ploughing have been detected between the eruptions of Agnano 3 and Paleoastroni 2, but all human activity appears to end after the Agnano-Monte Spina eruption (4420 ± 58 BP, 3335-2913 cal. BC, 2σ, Zanchetta et al, 2019). A different picture is presented by the sites of Gricignano and Carinaro, in the north-west of the plain, and at Acerra, where the major phase of occupation follows the Agnano-Monte Spina eruption (Fugazzola Delpino *et al.* 2003, 2007; Laforgia *et al.* 2007). The fertile Campana Plain largely shows a degree of continuity in human occupation from the Late Neolithic. A possible system of villages that were periodically relocated in relation to the exhaustion and regeneration of soils, has been suggested, (Nava *et al*. 2007: 122–3).

The major settlements currently known for the 3rd millennium are located in the Campana plain on the Agnano-Monte Spina eruption deposits, in the Sele Plain (the site of Paestum), and in the inland areas of Castel Baronia, Felette and Foglianise. The settlements of Gricignano, Carinaro and Acerra are more extensive areas with houses and substructures and, in the cases of Gricignano and Acerra, with connected burial grounds. At present, the extensively excavated site of Gricignano undoubtedly provides the most outstanding evidence for this period. It yielded two probably contemporaneous, main settlement areas characterised by the same stratigraphic position, only 300m apart: the ‘Forum’ area (12 houses) and the ‘Centro Commerciale-Bowling’ (50 houses). Figure 2.16 shows the structure of the houses in each area.

The typology of the houses is quite homogeneous: an elliptical plan delimited by post-holes, a south-east to north-west orientation, in some cases with foundation ditches. More complex structures are also attested (e.g., houses 11 and 12 in the ‘Forum’) with a ring-shaped corridor alongside the north-west apse and the long sides. A diachronic development of the settlement determined from the overlapping of the structures, suggests that the larger structures were probably of later date (Fugazzola Delpino *et al.* 2003: 204). Outer structures are also recognised, including silos, pits, fireplaces, and fences that probably delimit compounds. Both settlement areas are associated with extensive burial grounds: 39 burials in the case of the ‘Forum’ site, plus four pit burials in the apse of four houses; 155 burials in ‘Centro Commerciale’ and 20 in the area of ‘Bowling’. Similar structures and stratigraphic positions are attested at Carinaro, Polo Calzaturiero (Laforgia *et al.* 2007; Boenzi 2022).

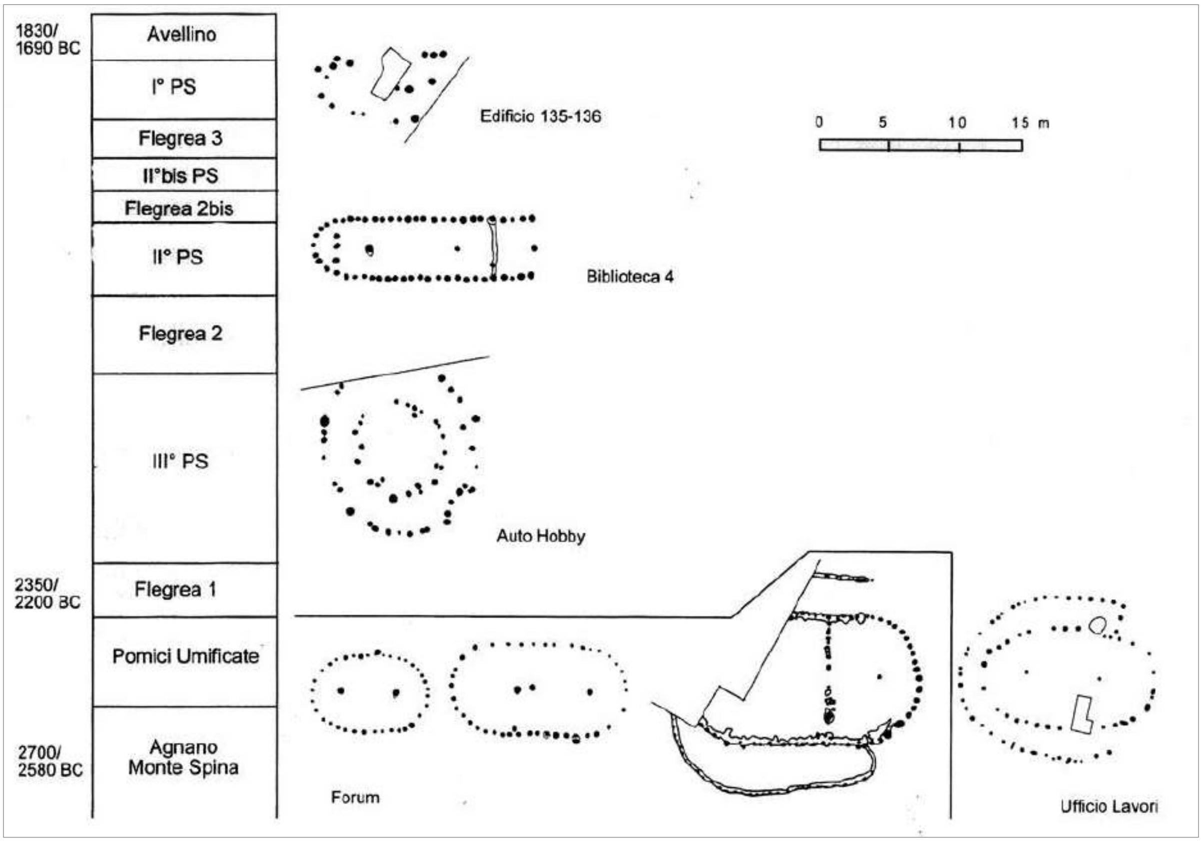


Figure 2.16. Types of houses excavated in Gricignano, in the 'Forum' and the 'Centro Commerciale-Bowling' (Fugazzola Delpino *et al*. 2003).

A further remarkable piece of evidence was recently discovered at the site of Acerra, loc. Gaudello, in the eastern part of the plain, where a large village and burial ground was set on the Agnano Monte-Spina eruptive layer (4420±58 BP, Lirer *et al.* 2013; Zanchetta *et al.* 2019; 3335–2913 cal BC, 2σ, calibrated with IntCal 20). The site is still under investigation and publications are in press (a first review can be found in Aurino and De Falco 2022). The village was excavated to an extent of 7500m^2 and yielded several dwellings, all with two apses on the short sides and, in some cases, also with a concentric outer corridor, a building type also attested at the site of Gricignano (Fugazzola Delpino *et al*. 2003: 201). The organisation and material culture of the settlement point towards the Laterza tradition. The pottery (Figure 2.17A) has parallels both with south-eastern Italy (Biancofiore 1967), at the relatively close Campanian settlements of Gricignano (Fugazzola Delpino *et al*. 2003, 2007) and Carinaro (Laforgia *et al.* 2007), and with the Laterza and Ortucchio/Dragged Comb phases detected in the area of Rome (Anzidei and Carboni 2020: 203–52).

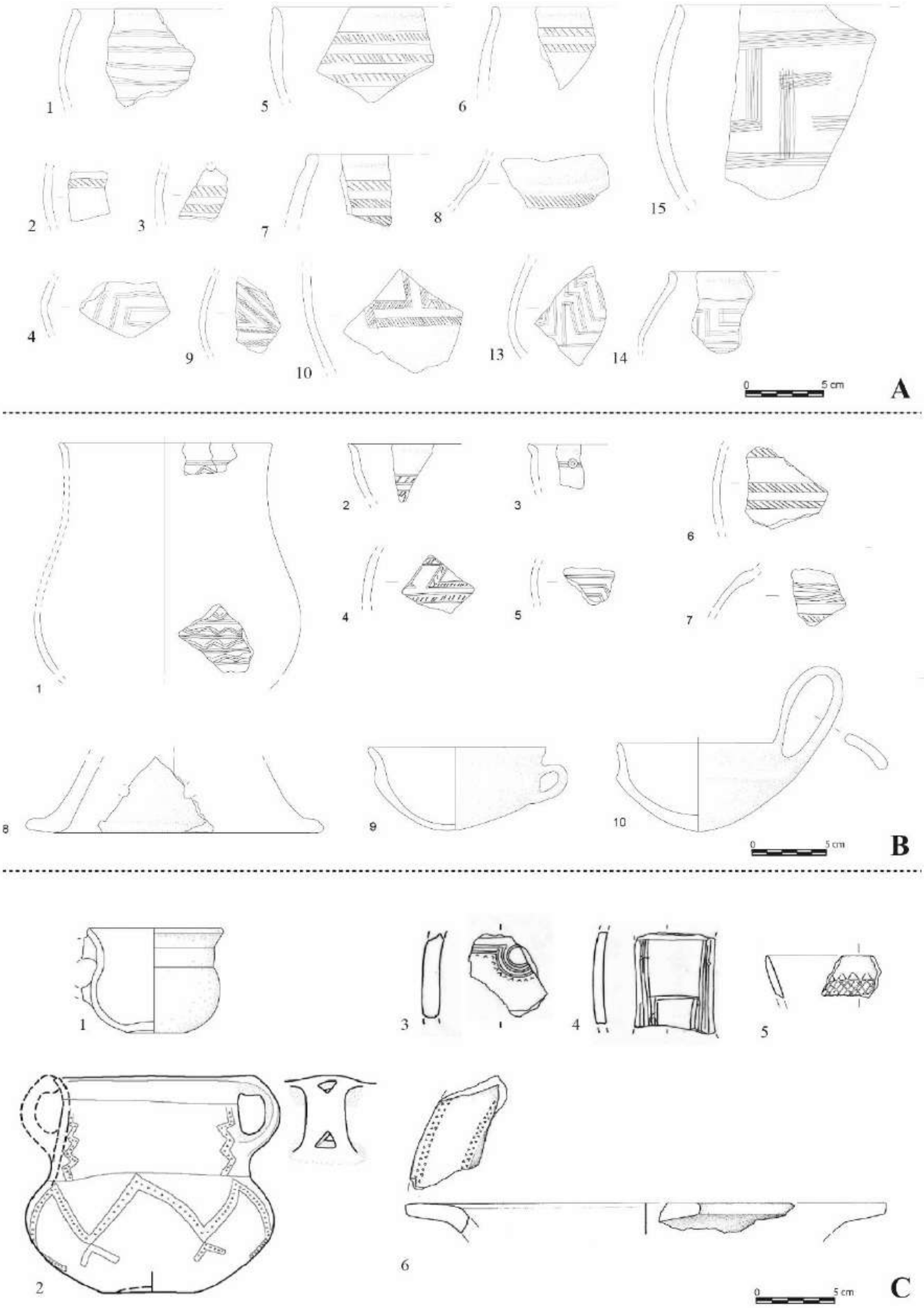


Figure 2.17. Examples of the ceramic repertoire in Campania during the Late and Final Copper Age from cemeteries and villages: A) Late Copper Age village, Acerra Gaudello AC3_600; B) Final Copper Age flat grave cemetery of Acerra Gaudello AC3_620 (after Aurino and De Falco 2022).
C) 1. Agerola - Loc. Pianello/Rossa Villani; 2. Amphora unknown provenance, MANN; 3. Oliva Torricella (after Arcuri et al. 2016).

Further structures have been detected also at Caivano and Afragola (Nava *et al.* 2007: 110) and in the inland area of Campania, e.g., Felette (Palermo Rossetti and Talamo 2011), Castel Baronia (Gangemi 1988), and Foglianise (Langella *et al.* 2008) either in connection with isolated burials (Castel Baronia and Foglianise) or more extensive cemeteries (Felette).

2.4.1.3. Final Copper Age (2300–2200 BC)

The final stages of the Copper Age only recently started to emerge in the archaeological record. Most of these contexts have been published only partially and they are not always extensively dated. One of the main sites in this regard is the burial ground of Acerra (AC3_620) in the Gaudello locality next to the Late Copper Age Laterza village previously mentioned. The study of the site is still ongoing. The large adjoining cemetery of over 100 tombs is dated to between the end of the Copper Age and the beginning of the Bronze Age (Mancusi and Bonifacio 2020; Aurino and De Falco 2022). It largely consists of single inhumations inside large sub-rectangular pit-graves. The tombs are organised in a regular pattern with a north-west to south-east orientation and sometimes retain traces of a possible covering of stones and pebbles. Grave goods, when present, generally include ceramic vessels, often fragmented, or personal ornaments of metal or bone, or weapons such as daggers and halberds. The material culture and the typology of the graves show similarities with Final Copper Age contexts from the area of Rome (Carboni 2020), particularly with their Ortucchio phases, characterised by Bell Beaker or 'Pseudo-Bell Beaker' influences (Figure 2.17B). Pseudo-Bell Beaker pottery is characterised by the same decorative motifs as Bell Beaker pottery but made with a slightly different technique and on different vessel forms. In Acerra, it is often associated with pottery typical of the subsequent culture of Palma Campania (2376–1829 cal BC, 2σ, Lanos *et al.* 2020: 75, 81–2) and with metal objects having parallels with the European Bronze Age 1, further addressed in Section 2.4.3. Objects from the same period are recorded from Afragola (Nava *et al*. 2007: 111, fig. 5C) and Gricignano (Salerno and Marino 2011: 325, fig. 1.4).

This period remains under-investigated, with too few radiocarbon dates to allow a comprehensive picture of the cultural traditions and occupation of Campania. The material culture and settlements in some cases suggest the continuation of the Laterza tradition with some external influences, particularly Bell Beaker and Cetina. Connections with the Dalmatian culture of Cetina have been suggested for several sites in Southern Italy, based on the presence of specific ceramic styles and metal artefacts (Arcuri *et al.* 2016; Recchia 2020; Figure 2.17C). The true extent of the influence and penetration into Campania of this culture is still to be determined, as are both its chronological attribution to either the Late Copper Age or Early Bronze Age, and its interaction with the Laterza and Palma Campania cultures (Gori *et al.* 2018; Arcuri *et al.* 2016; Pacciarelli *et al.* 2015; Cazzella *et al.* 2007). Currently, the only site with well contextualised Cetina influences in Campania is the settlement of Atena Lucana, dated to 2250–2210 cal BC (2σ, Table 2.2, Talamo *et al.* 2011), further analysed in Chapter 4.5.

2.4.1.4. Land use and subsistence economy

The settlement pattern for Copper Age Campania was closely related to the exploitation of the landscape in various ways. Proximity to water courses is a constant feature from the Early to the Late Copper Age. These were used both as water sources and as communication routes at a regional and super-regional level. Agricultural exploitation is clear, particularly in the plains, from several discoveries of plough marks, in some cases associated with other traces of human activities, such as scattered fireplaces, pits for water procurement and small functional structures not identifiable as houses (e.g., Caivano, IV Sottotratta, lotto 9; Laforgia and Boenzi 2011: 250). Traces of ploughing are common, such as at Afragola, where the land appears to have been worked in a system of ridges and furrows at some time prior to the Agnano-Monte Spina eruption (Laforgia and Boenzi 2011: 253). Substantial traces of ploughing have also been detected around Naples (Giampaola and Boenzi 2013). In the area of Gricignano, recent studies highlighted a long sequence of land exploitation interspersed by volcanic activity. This is particularly evident and structured in the Early Bronze Age, before and after the Avellino Pumices eruption, but earlier Late and Final Copper Age evidence has also been detected (Vanzetti *et al.* 2019). Specifically, plough marks were detected on top of the Agnano Monte Spina eruptive layer, although no traces of field orientation could be defined. A further settlement and field system has been recognised between the Phlegrean eruptions (Paleoastroni 1 and 3), not clearly culturally defined but probably set in the last centuries of the 3rd millennium, corresponding to the Final Copper Age–Early Bronze Age. The field system runs in an almost east-west direction, orthogonal to a cart-track which seems to lead in the direction of the settlement and which was displaced more than once by the eruptive events (Vanzetti *et al.* 2019). Further south in the Campana Plain, agricultural traces were also detected between the eruptive layers, such as in the area of the River Clanis (Di Vito *et al.* 2021).

Few archaeobotanical data are currently available for Campania. The few studies published (Albore Livadie 1999; Vivent and Albore Livadie 2001) indicate that the Campana plain underwent a progressive deforestation that began before the Agnano Monte Spina eruption (4420 ± 58 BP, 3335-2913 cal. BC, 2σ, Zanchetta et al, 2019), possibly indicating the start of extensive agrarian activities in the area - a consequence of both the arrival of plough agriculture and eruptions burying low vegetation and contributing to the addition of suitable new soil parent materials (Vanzetti *et al.* 2019: 158). Pollen data points to a slight recovery of wooded environments but only after the Avellino Pumices eruption (3546±17 BP; 1944-1779 cal. BC 2σ, Passariello *et al.* 2020).

Given the predominantly funerary nature of the archaeological record in Campania, understanding the subsistence economy of these Copper Age communities is challenging, especially for the Early and Middle Copper Age. Some information can be detected for Late-Final Copper Age communities, such as in the large villages of the Campana Plain. Preliminary analyses on faunal remains from the sites of the Gricignano 'Forum' area and Foglianise, loc. S. Maria a'Peccerella provide some information on the diet and husbandry of these Late Copper Age communities. As in the Neolithic, four main domesticated animals were used for meat: sheep, goat, cattle and pigs; occasional deer hunting and tortoise gathering is also attested. According to the age-at-death data and cut-marks on the animal remains, pigs were mainly used for meat, oxen both for meat and for traction, and sheep and goats mainly for secondary products, particularly milk and wool (Fugazzola Delpino *et al.* 2003: 211–2; Langella *et al.* 2008).

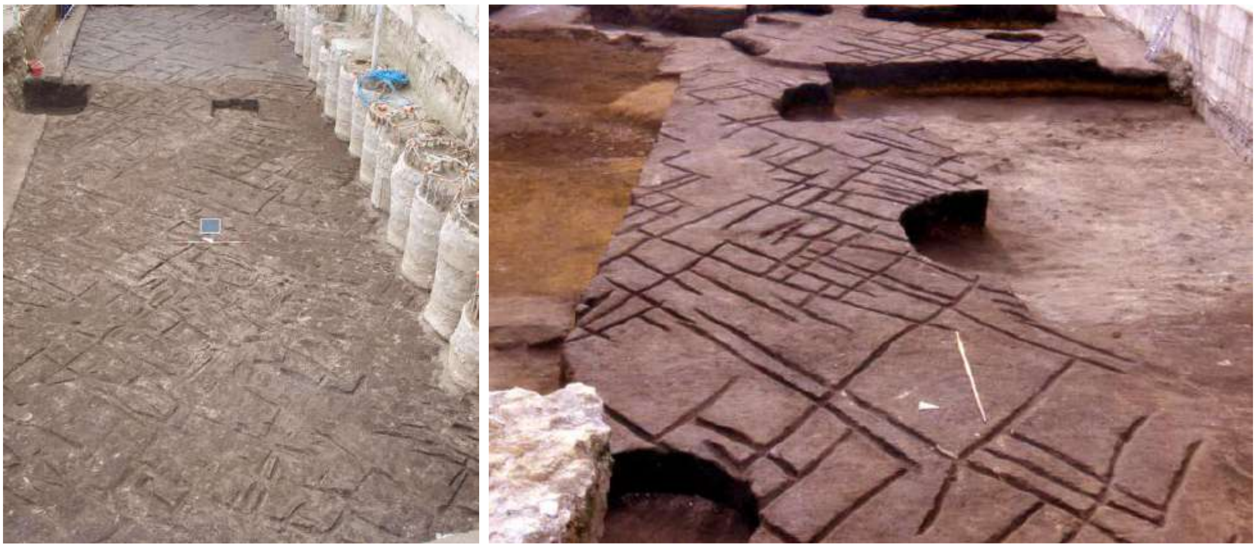


Figure 2.18. Plough marks on the 'Paleosuolo B' in Naples, Piazza S. Maria degli Angeli (left), Via Diaz (right), (after Giampaola and Boenzi 2013: 42, figs. 4 and 5).

2.4.2. People, rituals and social relations

The attention of Copper Age communities to the world of the dead is undeniable; spaces dedicated to the dead are often not only the main archaeological record available for this period but also the most visible form of evidence. This section will define the major trends and changes through time and space in mortuary practices in Copper Age Campania, set within the broader south Italian context.

Spatially defined cemeteries become common between the middle of the 4th and the middle of the 3rd millennia BC, with quite strictly encoded ritual practices for both the Taurasi and Gaudo traditions. A more varied approach to the dead starts to appear with the Laterza tradition in the first centuries of the 3rd millennium BC and flourishes by the middle. Three main trends in funerary practices can be recognised:

1) Cremation burials, with cremated remains placed in pottery vessels or pits connected to house-like structures dated to the Middle Copper Age and associated with the Taurasi cultural tradition. Key examples are: Taurasi (Talamo 2008a), Succivo (Marzocchella 1998), Casalbore (Albore Livadie and Gangemi 1988) and Sala Consilina (Talamo 2008a).
2) Structured cemeteries of rock-cut tombs (*a grotticella artificiale*) with an entrance shaft, one or two funerary chambers and highly encoded ritual. Tombs generally contain collective burials dating to the Early and Middle Copper Age, and are associated with the Gaudo cultural tradition. Key examples are: Paestum (Sestieri 1951-52; Voza 1962a, 1964, 1974, 1975), Pontecagnano (Bailo Modesti and Salerno 1998), Eboli (Bailo Modesti and Salerno 1995), Buccino (Holloway 1969, 1970, 1973, 1974), Piano di Sorrento (Albore Livadie 1990), Mirabella Eclano (Onorato 1960; Bailo Modesti and Salerno 1998), Napoli, loc. Materdei (Marzocchella 1980), and Caivano (Laforgia and Boenzi 2009).
3) Rock-cut and flat graves, either in cemeteries or close to settlements, with single or collective burials, dating to the Middle, Late and Final Copper Age and associated with the Laterza cultural tradition. Key examples are: Gricignano d'Aversa (Fugazzola Delpino *et al.* 2003, 2007), Paestum (Albore Livadie *et al.* 2011), Carinaro (Laforgia *et al.* 2007), Acerra (Mancusi and Bonifacio 2020), Foglianise (Langella *et al.* 2008), Felette (Palermo Rossetti and Talamo 2011) and Castel Baronia (Gangemi 1988).

As noted above (Section 2.4.1.1), cremation burials from Taurasi and the rock-cut tombs from the Gaudo locality in Paestum are essentially synchronic. In his detailed evaluation of Gaudo ritual practices, Bailo

Modesti suggested that these could represent two complementary aspects of the ritual world of the same society (Bailo Modesti 2003, 2006). Although the criteria for includion in both rituals appear similar (no major age and sex distinctions can be detected among cremated and inhumated individuals), they might reflect two different temporal and symbolic spheres: one concerned with preserving the bodies of distinct individuals as a community of dead, the other with destroying the individuality within a community of the dead (Dolfini 2015). The evidence emerging from Apulia in recent years, such as the above-mentioned cemetery of Salve (Ingravallo *et al*. 2007; Aprile *et al*. 2018) and the ritual stone structures with cremation burials of Giardinetto, Orsara di Puglia (Tunzi *et al*. 2014) demonstrate a more widespread practicing of cremation ritual in Southern Italy. In Campania, the most striking (and more fully published) evidence of cremation burials is provided by the site of Taurasi, S. Martino, where five house-like structures containing several cremation burials were discovered (Figure 2.19a; Talamo 2004, 2008a).

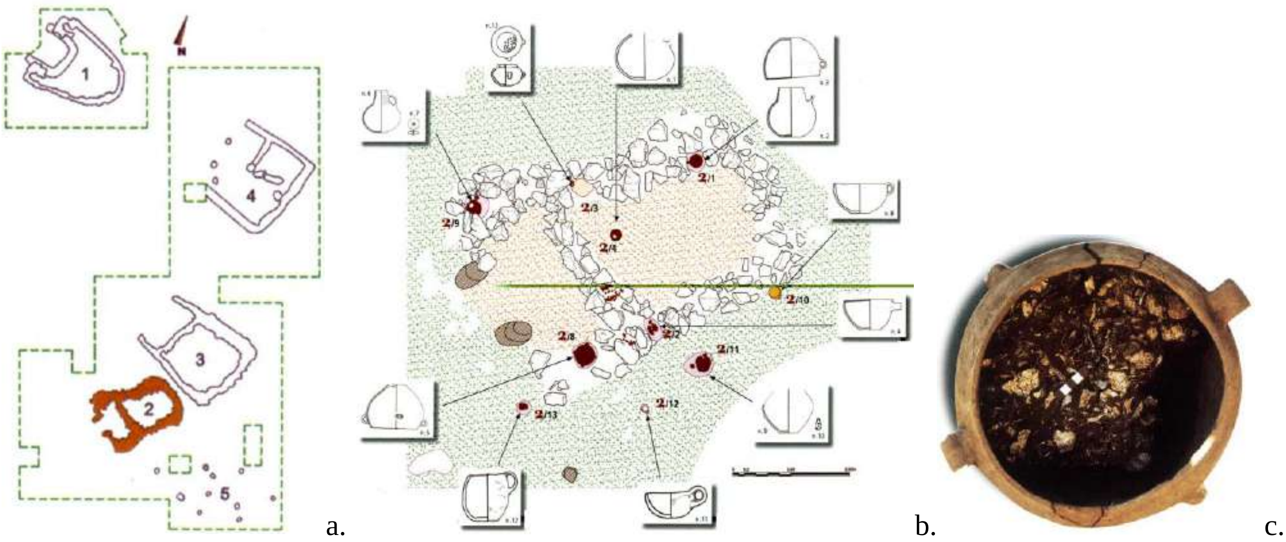


Figure 2.19. a) General plan of the five structures; b) plan of structure no. 2, and c) one of the cremation burials found within it (2/8) (Talamo 2004).

The structures are located close together and are either drystone walled with an apse (Figure 2.19a.1–2) or are structures with foundation ditches and post-holes with a quadrangular (no. 4) or unclear (no. 5) plan. Each house-like structure contains several cremations (up to 13 in no. 2) deposited either in vessels or in pits, often with a carbonised wooden cover. The cremations are generally placed either near the house-like structure, inserted into the walls, hanging from them, or just set on the floor. The burials are generally single and rarely double (e.g., burial 3/1), and are in some cases accompanied by animal remains, possibly burned together with the deceased.

Despite the relatively large number of burials, these structures do not appear to be simply ‘containers’ for the human remains but are also places where specific actions were performed. These were surely of a ritual nature and dedicated to the dead (Talamo 2008a). A large number of pottery fragments and other artefacts has been found inside and outside the house-like structures. Among these, a peculiar vessel known as a ‘perfume burner’ was found placed over a cremation in house no. 2 (Figure 2.19b, 2/3). It seems clear that the cremation process happened elsewhere, often with goods or personal ornaments also burned, and that the cremated remains were then gathered (it remains unclear whether they were partially selected) and deposited in the ‘houses’, either in urns or in pits and sometimes accompanied by the grave goods.

Figure 2.20. The excavation of tomb 4 from the rock-cut cemetery at Eboli (Bailo Modesti and Salerno 1995).

The second form of mortuary practice, involving spatially organised cemeteries of rock-cut tombs (Figure 2.20), has been closely investigated thanks to the careful excavation of one of the most recently discovered burial grounds, atPontecagnano (Bailo Modesti and Salerno 1998). The comparative analysis of all the contexts currently known has revealed a complex ritual process that took place both in the funerary chamber and in the vertical entrance shaft. The tombs are ‘oven shaped’, comprising a vertical access shaft leading to a funerary chamber that was closed by a stone slab. The chamber is usually single, but two-chambered tombs are also common (Bailo Modesti and Salerno 1998); only one three-chambered tomb is recorded, at Caivano tomb 10 (Laforgia and Boenzi 2009), with each chamber having a similar use.

The ritual practices carried out in the entrance shaft appear closely linked to the type of interment and manipulation of human remains in the chamber (Dolfini 2015: 29, table 2.1). The most common situations found in the shaft chamber are summarised in Figure 2.21.

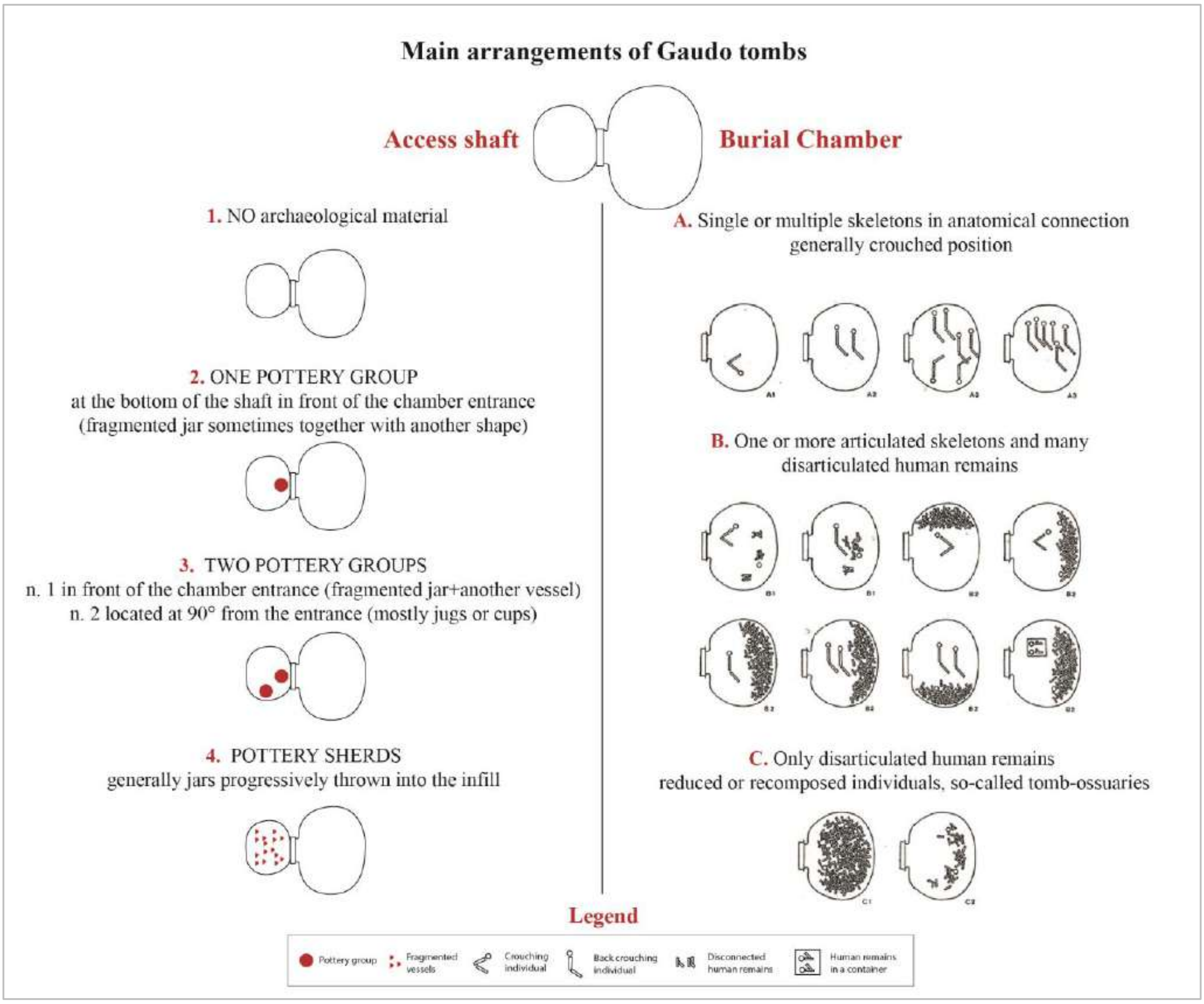


Figure 2.21. The most common arrangements of Gaudo tombs (after Bailo Modesti and Salerno 1998: fig. 71).

The relationship between the arrangement in the shaft and in the chamber is not standardised, but some trends can be recognised: in tombs with articulated human remains there is a general lack of materials in the shaft; one or two pottery groups in the shaft are more common in burials with both articulated and disarticulated human remains; and tomb-ossuaries generally have highly fragmented pots.

The grave goods deposed in the chamber vary from very abundant to scarce. They generally comprise pottery, tools or weapons and occasionally ornaments. The pottery is usually fine ware and, when found in the chamber, coarser pottery is always fragmentary. Distinctive forms include twin vessels (*saliere), askoi* and *pyxides* (small vessels with lids and vertical holes for hanging). Jugs and handled bowls are the most common vessels, both in the chambers and in the shafts where they occur together with jars. Weapons such as flint arrowheads, trapezoidal microliths and flint daggers are also common grave goods. These include the styloid form typical of the Gaudo tradition (Figure 2.13 n. 18). Metals are uncommon but present, mainly as copper daggers, e.g., from Buccino, Napoli and Paestum (Figure 2.13 n. 21; Bailo Modesti and Salerno 1998: 130–1) and isolated axes (Figure 2.13 n. 22). Ornaments are scarce, but the T-headed bone pins from Paestum are remarkable examples and are further addressed in Section 2.4.3 (Figure 2.28, Bailo Modesti and Salerno 1998: 139–40; Aurino 2016).

Figure 2.22. Jug deposited on top of an inhumed individual at Pontecagnano, tomb 6517, chamber a (Bailo Modesti and Salerno 1998: pl. 15.1).

It is difficult to connect grave goods to individuals in the tombs. However, almost all the weapons, tools and ornaments that were placed directly on top of or mixed with the human remains could potentially be interpreted as personal, as could pottery located beside or on top of the deceased, is cases where individual has remains in anatomical connection (Figure 2.22). In other cases, vessels are located along the walls of the chamber or mixed with the human remains. One particular ritual involved placing a jug, a dagger and animal remains at the feet of the deceased (in anatomical connection), e.g., in chambers 6517A and 6589 in Pontecagnano (Bailo Modesti and Salerno 1998: 190). Grave goods deposited in tomb-ossuaries cannot be related to individuals and may never have been intended to be.

At the site of Paestum, in addition to the larger Gaudo burial ground, five other tombs were excavated that are partially rock-cut and also take advantage of rocky niches in a travertine depression. These tombs are part of the cemetery near the structure known as the 'Temple of Cerere' (Voza 1962; Arcuri and Albore Livadie 1988; Albore Livadie *et al.* 2011) which was investigated in the present study and is discussed further in Chapter 4.2. The significance of these tombs relates to their grave goods, which are of the Late Copper Age Laterza tradition, and to their structure and collective burial practice which are similar to tomb types in Apulia, where the cultural tradition of Laterza was first defined (Biancofiore 1967).

Figure 2.23. Flat grave no. 3 from Gricignano d'Aversa, 'Forum', cutting the foundation ditch of house no. 7 (Fugazzola Delpino *et al.* 2003).

Except for this rare example, the Laterza culture is associated with the third category of Copper Age funerary practices that developed during the 3rd millennium BC. It is represented by flat grave cemeteries which show a less encoded rituality in the burial organisation, types of depositions and grave goods. The graves are either organised in structured cemeteries or in isolated burials inside or near settlements. The burials are mainly single and rarely double, with limited grave goods (Fugazzola Delpino *et al.* 2003, 2007; Salerno and Marino 2011). Particularly striking is the site of Gricignano d'Aversa where two main cemeteries have been detected: one in the 'Forum' area with 54 burials, the other in the 'Centro Commerciale' area with 155 burials, plus 20 more in an adjoining 'Bowling' area. Some of the burials are located close to houses, sometimes surrounding them, for example in the 'Bowling' area (Fugazzola Delpino *et al.* 2007: 534) or cutting into a former house, e.g., in the 'Forum' area (Figure 2.23; Fugazzola Delpino *et al.* 2007: 534). This indicates contemporaneity between the burials and the houses in some cases, and, in other cases, the abandonment of the house and its subsequent reuse for the burial.

The main kinds of funerary structures are: a) rectangular flat graves (70 percent of the total; Figure 2.23); b) rare, partially rock-cut burials; c) circular or subcircular pit graves; and d) shallow sub-elliptical pits. The deceased was generally deposited in a crouched position facing right (rarely left), and usually in single (occasionally double) burials. The grave goods are not particularly abundant and are generally located near the deceased. They usually consist of a fragmented bowl placed near the foot of the deceased and a closed vessel placed near the head (Figure 2.24). Flint tools are also found close to the head, while metal objects are particularly rare, except for a few copper daggers (e.g., the so-called 'Montebradoni dagger' in Figure 2.24). Female burials generally lack grave goods, and often take the form of disarticulated secondary burials in shallow pits (Salerno and Marino 2011: 324). A further ritual practice possibly involved food offerings, suggested by burnt animal remains often found in the filling of the graves or on the burial floor, near the fragmented pot or close to the deceased (Fugazzola Delpino *et al.* 2003; 2007).

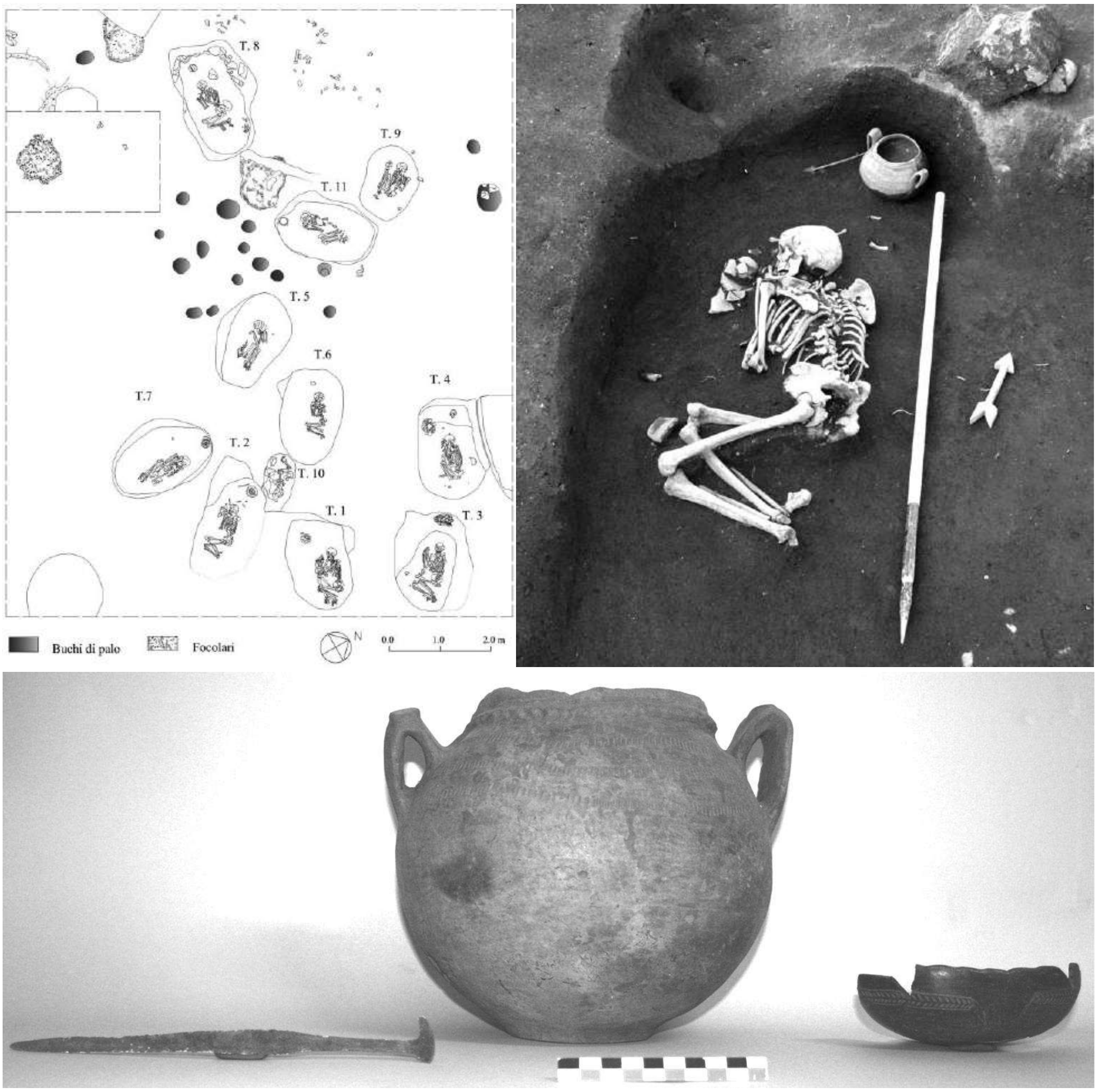


Figure 2.24. Torre Le Nocelle, loc. Felette, map of the burial ground; detail of the excavation of burial 2 and its grave goods (Palermo Rossetti and Talamo 2011).

A site similar to Gricignano d'Aversa has recently been uncovered at Acerra, Gaudello locality: a large settlement of seven houses with an adjoining burial ground containing over 100 burials probably dates to the Final Copper Age (Aurino and De Falco 2022). The excavation revealed a complex arrangement of burials close to the houses, in addition to a more extensive, slightly later cemetery (see Section 2.4.1.3). Still under study, this site shows analogous ritual practices, with flat graves and single or double depositions and limited grave goods, but with uncommon metal ornaments and tools (Mancusi and Bonifacio 2020; Aurino and De Falco 2022).

In addition to rituals specifically related to the mortuary sphere, evidence of practices that were probably not strictly linked to the disposal of the dead but had a more votive purpose have also been documented. At the sites of both Caivano and Gricignano, the deposition in pits of animal remains, generally bovid skulls or dogs and potsherds, appears to have been a common practice; in the case of Caivano, there is also evidence of firing at the top of the pits (Caivano zona ASI – lotto 7, Laforgia and Boenzi 2011; Gricignano d'Aversa, area D, pits 6211 and 5217, Fugazzola Delpino *et al.* 2007). The deposition of animal remains (often just the cranium) together with disarticulated human remains is also documented at Gricignano d'Aversa, 'Centro Commerciale' (Fugazzola Delpino *et al.* 2007).

2.4.3. Circulation of goods and ideas: connections and exchange networks

Thinking about cultural contacts, exchange networks and the circulation of ideas is central to the debate about the Copper Age throughout Europe and the Mediterranean. In this broader frame, Campania lies at the centre of the Mediterranean region and was involved in diverse cultural trajectories and connections, including the circulation of goods and ideas. This section will outline the main exchange routes and related evidence during this period in Campania and more broadly in Southern Italy.

Mobility, interaction and exchange have always been regarded as particularly important for understanding the major Copper Age cultures of Italy, such as the Rinaldone and Gaudo cultures, because their origin has for a long time been interpreted from a diffusionist point of view, linked to the introduction of metals (Laviosa Zambotti 1943; Puglisi 1959; Trump 1966; Bernabò Brea 1968–69, 1985; and a moderate position in Cazzella 1992: 551–9). A more deeply theorised approach is now accepted, which takes into account more complex processes, especially concerning the development of metallurgy, with influences from different areas (Skeates 1993; Dolfini 2014). Similarities with the eastern Mediterranean region have also been identified through material culture, especially pottery styles. The origin of the Gaudo culture has traditionally been placed in the Aegean area, on the basis of similarities in both pottery and funerary practices, primarily at the cemetery of Manika in Euboea, characterised by similar rituals and burials, even though no matches can be found between the artefacts (Bailo Modesti and Salerno 1998: 154–5). Cutting-edge anthropological analyses, including isotope and aDNA studies, are currently ongoing; these are essential to gaining a better understanding of the mobility of the Gaudo peoples.

2.4.3.1. Pottery

The wider Copper Age pottery record of Campania shows clearly innovative forms with respect to previous traditions, such as flask-vessels, twin vases, *askoi* and pyxides. These shapes are typical in the Aegean region, Central and Southern Italy and Sicily, albeit with local variations, and have traditionally been linked to Aegean/Anatolian types of the Early Minoan/Early Helladic I and II phases. An example of a parallel claimed with the Aegean is provided by the flask-vases, e.g., some sporadic vessels and a *pyxis* from tomb *f*, Paestum (Figure 2.25A), traditionally compared to the pear-shaped bottle of the Kampos Group, dated to the Early Cycladic I-IIa period (Figure 2.25B, Sestieri 1946–48; Cazzella 1972; Voza 1975). Another form commonly linked either to Anatolian (Sestieri 1946–48; Barich 1971) or Greek (Voza 1975; Bailo Modesti and Salerno 1998: 103, 155) prototypes is the typical askoid vessel, found widely in Early and Middle Copper Age Gaudo burials. Their derivation from Aegean models, even though hinted at by their form, remains highly controversial, and we must consider biases in the traditional interpretations by Italian scholars, whose perspective was often informed by Greek studies (for a critical review see Cultraro 2001).

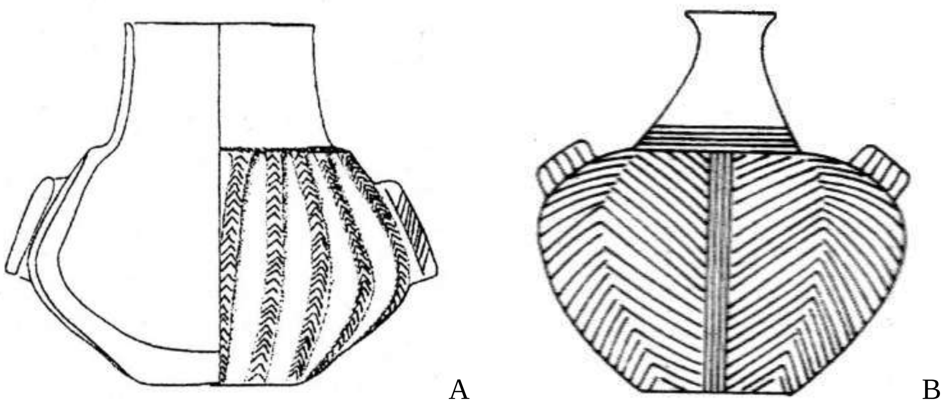


Figure 2.25. A) Pyxis from Paestum, tomb f (drawing by P. Aurino); B) comparison with a flask-vase of the so-called 'Kampos Group' (Barber 1987: fig. 58).

In terms of ceramic production between the end of the 4th and beginning of the 3rd millennia BC, it is probably more accurate to talk about a wide range of circulating models throughout the Mediterranean region that underwent a great deal of local elaboration, and possibly, in some cases, instances of autonomous development similar to that detected for the 'Rinaldone' flask vase typical of Copper Age Central Italy (for a review, see Cultraro 2006 and Broodbank 2013). Nevertheless, some ceramic vessel forms and decorations within the Gaudo repertoire seem particularly unusual, and hint at external influences.

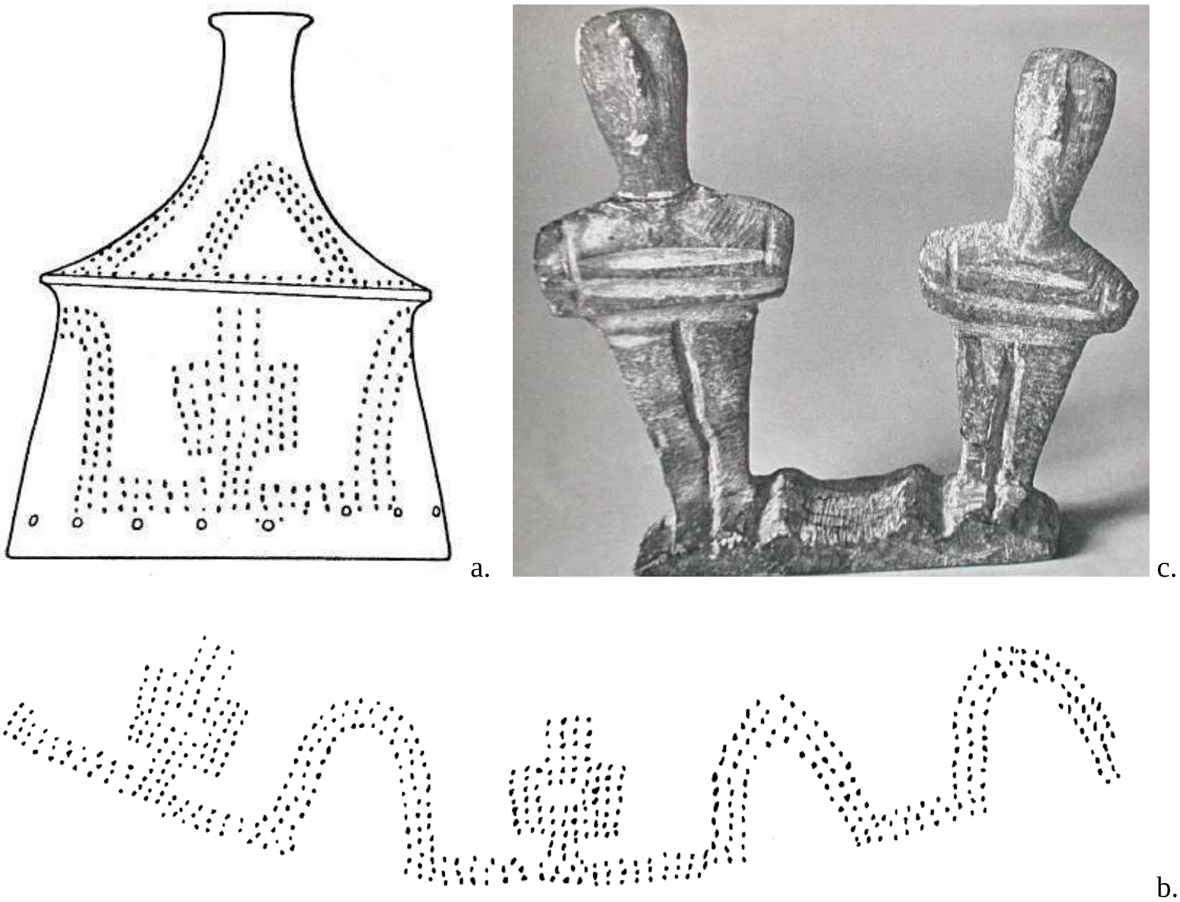


Figure 2.26. a–b) Pyxis lid from Paestum, tomb XIVa, with anthropomorphic decoration; b) Cycladic idols from Teke, Hiraklion (Aurino 2004).

One of the most striking examples is a conical pyxis lid from Paestum (Tomb XIVA, Figure 2.26a and c) decorated with abstract anthropomorphic figures. The stylisation of the human figure is reminiscent of the geometric designs of Cycladic idols fashioned from stone (Figure 2.26b) and of similar Sardinian figurines (Melis 2020). Of course, there are differences in the materials and methods but the depictions on the lid from Paestum have been claimed to recall the canonical Early Cycladic II idols, also widespread in Crete, e.g., type IV from Dokathismata, Chalandriani and Spedos, (Aurino 2004). Other anthropomorphic figures with Early Cycladic I parallels (3200–2800/2700 BC) can be found at Casetta Mistici near Rome (Anzidei and Carboni 2011: 318, fig. 6.2) and at Camaro, near Messina, Sicily (Bacci 1993–1994: 171–9; Bacci Spigo *et al.* 2003: 839–42).

In the Late and Final Copper Age, clearer external connections can be established for the Campania region based on the pottery repertoire. Of particular value in this respect are two Bell Beakers in the Maritime style, one from the cave of Olevano sul Tusciano and the other from the Late Copper Age site of Paestum, Tempio di Cerere (Figure 2.27), both in southern Campania.

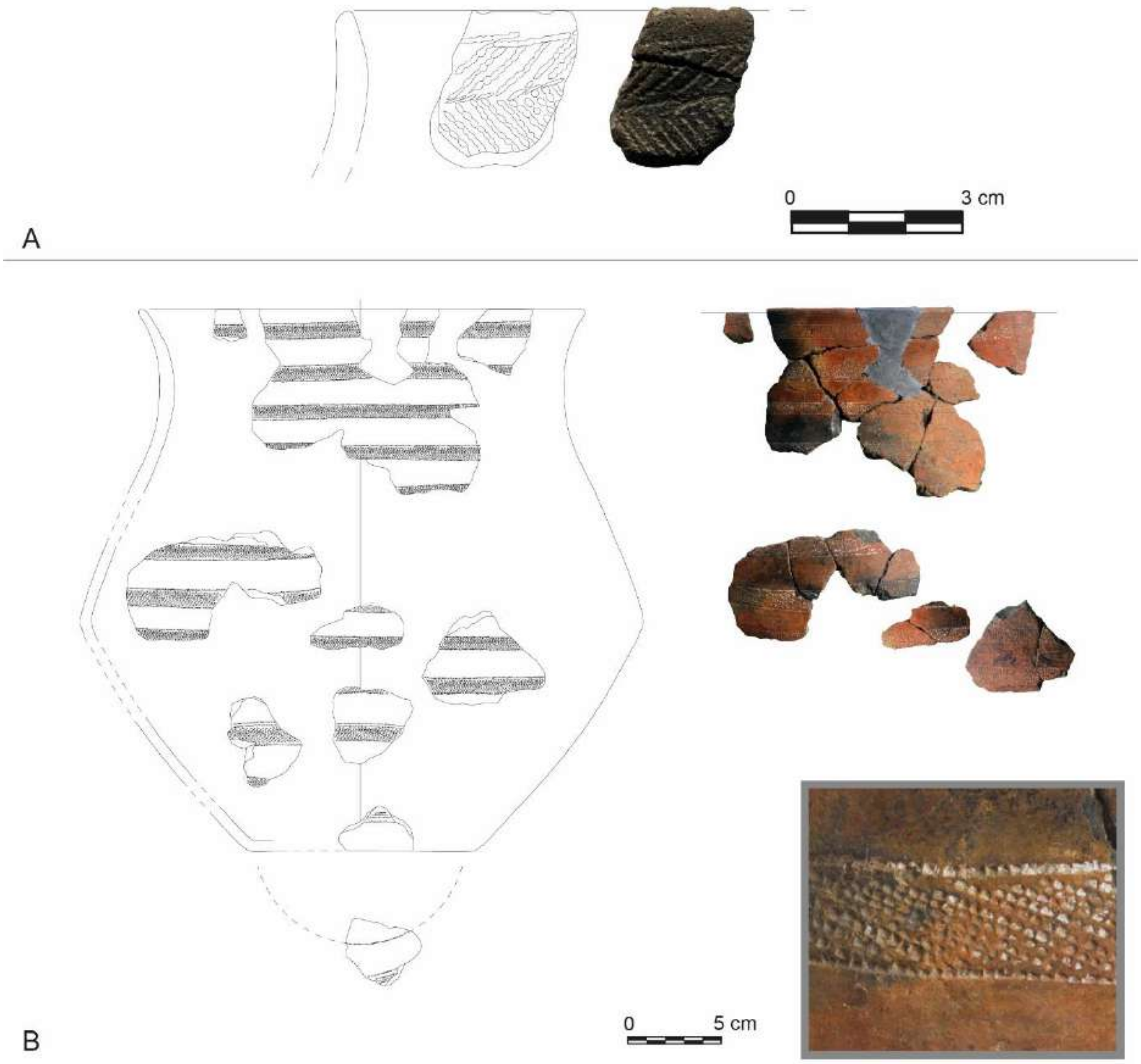


Figure 2.27. Bell Beaker style fragments: (A) from Paestum, Temple of Cerere, zone A, and (B) from Olevano Sul Tusciano Cave (after Aurino and De Falco 2022).

The ceramic fragment from Paestum displays the typical International style widely attested in Central-Northern Italy and the Mediterranean region (Leonini and Sarti 2008a: 90–1, figs. 3.2 and 4.2–3; Fugazzola Delpino and Pellegrini 1998: fig. 49.30). The almost completely reconstructed beaker from Olevano sul Tusciano displays a Maritime style also common at some sites in Calabria and in Central-Northern Italy (Fugazzola Delpino and Pellegrini 1998; Lo Torto *et al.* 2001; Pacciarelli 2011: fig. 13; Gallay 2001: 46). In both cases, the fragments were found in a context attributed to the Laterza tradition. These styles are generally dated to around 2670–2470 cal BC in the area of Rome, in Phase I and II of the Ortucchio culture (Anzidei and Carboni 2020: 229), to between 2550–2500 and 2400–2350 cal BC in France (Lemercier 2018: 79) and to around 2500–2440 cal BC in the Danube area (Heyd 2007: 333–4).

Further Bell Beaker influences have been detected in the Campana Plain, where pottery in the Bell Beaker or 'Pseudo-Bell Beaker' style are attested at Gricignano (Salerno and Marino 2011: 325, fig. 1.4), Afragola (Nava *et al.* 2007: 111, fig. 5C) and at the above-mentioned Late and Final Copper Age site of Acerra (Aurino and De Falco 2022). These ceramics are characterised by a reworking and adaptation of Bell Beaker decorative motifs and techniques within a local ceramic repertoire, widely recognised in the area of Rome in the Late and Final Copper Age (Anzidei and Carboni 2020). Therefore, besides a few examples, Bell Beaker influences in the Campania region cannot be considered as direct imports, but rather as representing the adoption of a style (and probably of other practices less evident in the archaeological record) that was widely circulating in late 3rd millennium BC Europe.

Balkan influences from the Dalmatian culture of Cetina can also be dated to the Final Copper Age. These especially impacted the Adriatic coast of the Italian Peninsula, particularly in the south-east (Recchia 2020). Ceramic artefacts in the Cetina style combined with local stylistical features are attested at sites attributed to the Laterza tradition and to the Early Bronze Age (Gori *et al.* 2018). As mentioned above, these influences cannot be adequately assessed in Campania due to the incomplete nature of the data, as Cetina-style vessels often come from rescue excavations or museum collections (Arcuri *et al.* 2016; Recchia et al. 2020). The only clear contextual evidence comes from the village of Fosso Aimone, Atena Lucana, where Cetina-style pottery has been found in a settlement. The site has currently been subject only to a preliminarily assessment in the present research; a full analysis will allow a better understanding of the Cetina influences in relation to local communities.

2.4.3.2. Other materials

In addition to the connections indicated by these broad similarities in the ceramic repertoire, other kinds of smaller-scale contacts can also be detected across the Italian Peninsula, especially for lithics and metal ores. Building on the exchange networks established and active since the Neolithic (e.g., for the site of Paestum, Aurino *et al.* 2017), Copper Age communities supplied lithic raw materials both from local outcrops, such as Campana flint sources (Bailo Modesti and Salerno 1998; Mancusi 2015), and from the renowned flint mines of the Gargano, in northern Apulia (Mancusi 2015). Metal objects remained uncommon throughout the Copper Age, although preliminary provenance analyses suggest outcrops in Sardinia or Tuscany as possible sources of copper ore (Giardino 1998; Dolfini *et al.* 2020). More accurate analyses of lead isotopes would allow better sourcing of the raw materials.

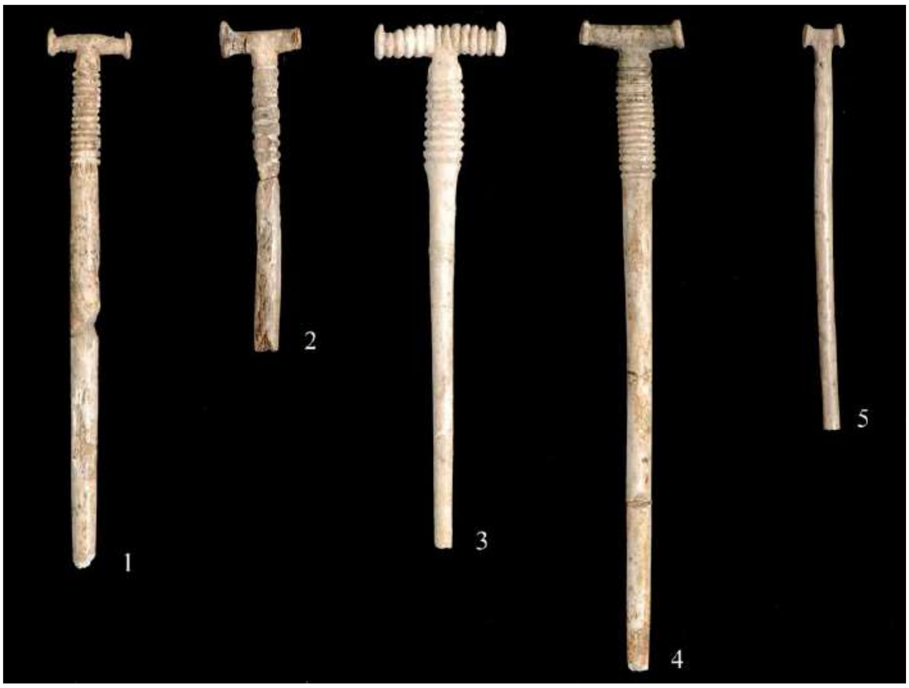


Figure 2.28. T-headed bone pins from Paestum, Gaudo burial ground (after Aurino 2016: fig. 3).

Alongside the circulation of local artefacts and raw materials, extra-regional, long-distance influences can be detected in other material classes such as ornaments and weapons. A striking example is a group of four T-headed bone pins from Paestum (Figure 2.28, Aurino 2016). This type of artefact is very rare in the Italian Peninsula, especially when made of bone. Parallels can be found in metal or mixed-material pins from Central and Northern Italy, e.g., from the Remedello cemetery, Tomb BSII, Cornaggia (Castiglioni 1971: 62); from the Buca di Spaccasasso (Pellegrini 2007: figs. 3 and 4), often associated with the 'Yamnaya set' or 'package' identified in Northern Italy and the western Alpine region (de Marinis 2013: 333) or with Corded Ware; and in a silver pinhead from the Rinaldone culture cemetery of Sette Miglia, probably mounted on a bone or wooden stem (Anzidei *et al*. 2007: 554, fig. A).

Hammer-headed pins made of bone, deer antler or pig tooth, especially undecorated examples, are mainly found outside the Italian Peninsula in the area of the Corded Ware in Western and Central Europe (Strahm 1979: 44–66) dated between 3300 and 2600 BC (Shislina *et al.* 2011). The bone pins from Paestum have uncertain dates since the burial contexts were used for several centuries between *c.* 3550 and 2500 BC (Aurino 2013) and the association between the artefacts and individuals is not clearly documented. These external models suggest a system of relationships, most likely related to the procurement of metal raw materials, absent in Campania, which perhaps brought Gaudo people into contact with groups in Central Italy and in the Alps. These contacts with the broader Central European world and the acquisition of extra-regional objects or forms might also be at the root of the Bell Beaker evidence from Campanian sites, and might have continued into the Final Copper Age, when metal objects displaying clearly extra-regional styles or provenance were still circulating. An example of these contacts in a later Final Copper Age or Early Bronze Age phase are the disk headed bronze pins and other weapons yielded by the cemetery of Gaudello, Acerra, rarely attested elsewhere in Campania (Aurino and De Falco 2022).

In conclusion, the connections operating in Campania and the central Mediterranean region during the Copper Age indicate a complex mixture of different routes, influences and trends. On one hand, the pottery evidence suggests the presence of classic Bell Beaker forms in some funerary and cave contexts (Paestum and Olevano sul Tusciano). On the other hand, Pseudo-Bell Beaker and Cetina pottery show local adaptation of wider influences, especially towards the end of the 3rd millennium BC. Similar patterns can be also detected in other classes of artefacts suggesting a broad circulation of ideas, technologies, raw materials and finished objects between communities in line with the movement of people across Europe during the 3rd millennium BC recently highlighted by aDNA and isotopic analyses (recently reviewed by Lemercier 2020: 123).

2.5. Sites selected

Building on the broader research questions and issues outlined in this overview of the Campanian Copper Age, four sites were selected for detailed and holistic ceramic and contextual analysis:

- Paestum: Early, Middle and Late Copper Age contexts;
- Pontecagnano: Early, Middle and Late Copper Age contexts;
- Sala Consilina: Middle and Late Copper Age contexts;
- Atena Lucana: Final Copper Age context.

These sites represent some of the best evidence currently available for Copper Age Campania due to their extensive excavations, the ceramic assemblages yielded, and the quality of the documentation produced. They also encompass the main trends outlined in this chapter: the Early Copper Age, , the Taurasi, Gaudo and Laterza cultural traditions, and Final Copper Age Cetina influences. Each site and the contexts considered are detailed in Chapter 4.

2.6. Rethinking the ceramic record

Looking more specifically at the ceramics, several broad trends can be detected in relation to the broader regional patterns outlined above. The whole of Copper Age pottery production in Italy, especially in the south, follows a fairly homogeneous aesthetic, very different from the previous, finer, Late Neolithic tradition. Within this general trend, there is a fragmentation into local styles and products that is very different to the widespread shared styles of the Neolithic. Following the Neolithic-Copper Age transitional phase, which is marked by a poorly defined pottery style in the Early Copper Age, the highly coded Gaudo repertoire starts to emerge, showing close analogies, albeit with some variations, with the pottery record found at Taurasi cremation sites. Indeed, some very complex shapes peculiar to this tradition are restricted to the rock-cut burials with their specific ritual practices. In the 3rd millennium BC this ceramic homogeneity seems to dissolve in contexts other than the rock-cut cemeteries. In particular, a wider variety of styles (generally simpler) and decorations are found in the Laterza settlements with their connected cemeteries.

There have been few investigations that have sought to connect this framework of changing styles to continuities and changes in the production of pottery. The aim of this study, then, has been to fill this gap by investigating connections between ceramic style, technology and social practices among the communities inhabiting Copper Age Campania. The theoretical perspectives and methodological approaches used in this task will be clarified in the following Chapter.

Chapter 3 – Current approaches in ceramic analysis

3.1. Aims of this chapter

This chapter aims to outline the theoretical background and approaches to the ceramic material examined in the present study. From the Neolithic period onwards, ceramics are the most common type of artefact in ancient archaeological records worldwide. Their ubiquity and abundance has resulted in the development in archaeology of a variety of theoretical approaches and analytical methods since the late 19th century. From largely classificatory approaches, ceramic analysis has evolved to include much more sophisticated multidisciplinary methods, following different trends and preferences that often depend on the archaeological traditions of the country where they are employed. Here, I will present an initial assessment of the main approaches currently applied to archaeological pottery at both an international and an Italian level, before outlining the theoretically informed approach adopted in the present study.

3.2. Multifaceted approaches to ceramics

The scientific literature on pottery studies in archaeology is vast and multifaceted and has followed the major trends and 'paradigm shifts' of archaeological thought (Khun 1962). In the second edition of one of the keystone publications for ceramic studies, *Pottery Analysis: A Sourcebook*, Prudence Rice summarises the current main themes in archaeological ceramic studies as: classification and dating, style/decoration, composition, and function/behaviour (Rice 2015: 205). The first two are defined as traditional, while the second two are relatively recent. This definition corresponds with the main waves in the history of archaeological thought that alternately privileged one approach and aspect of ceramics over another. 21st century approaches to pottery draw on lines of thought and methods from each of the 20th century theoretically-informed movements, as outlined in the next section, and generally combine more than one methodology.

3.2.1. Ceramics and the development of archaeological thought

As pointed out by Oliver Harris and Craig Cipolla in their review of ‘*Archaeological theory in the previous and new millennia*’, the so-called ‘paradigm shifts’ that occurred during the 20th century never completely rejected and replaced previous archaeological assumptions (Harris and Cipolla 2017: 3). This is particularly evident in relation to pottery analysis. Typology, though used in different ways and for various purposes, is a product of the taxonomical origins of archaeological thought and the related culture- historical approach (e.g., Childe 1936, 1942; Piggott 1954). Archaeometric analyses owe their success to the positivist and ‘processual’ approach of ‘New Archaeology’ (among others, Matson 1965; Clarke 1968; Binford 1962, 1968, 1983; Flannery 1967; Renfrew 1973), which represented a quantitative turn with advanced analytical methods borrowed from other material sciences and their application to archaeological pottery. The work of Anne Shepard (1956) provided the foundations for every interdisciplinary approach that developed later, highlighting the need for close collaboration between the material sciences and archaeology. The current focus on human gestures originated out of the ‘functionalist’ and ‘behavioural’ aspects of processual archaeology, which were further enriched by deeper considerations of context and subjectivity by post-processual (Hodder 1982b, 1986; Miller and Tilley 1984; Shanks and Tilley 1987a, 1987b) and extensive field programmes in ethnoarchaeology (e.g., Hodder 1982; Creswell 1983, 1996; Arnold 1985; Longacre 1991; Gallay 1992; Gosselain 1992; Dietler and Herbich 1994; Lemonnier 1992, 1993), leading to theoretical advances that informed innovative analyses and interpretations. These broad trends in archaeological thought are, of course, simplified here, but they exemplify how current approaches to pottery analysis are built upon a variety of data, methods and theoretical trends. In recent decades, theoretical approaches have developed further, offering diverse perspectives and interpretations on pottery and other elements of material culture.

The attention paid to the broad engagement of humans with their environment, as provided by the sub-discipline of ceramic ecology (Matson 1965; Arnold 1985), has become more informed and contextualised (see a recent review in Arnold 2011), in order to counter the critique of environmental determinism and over-generalisation (Gosselain 1998: 80). The underlying implication of this approach is that technological choices made by potters might be more dependent on environmental issues, such as raw material availability and properties, than on social factors (e.g., Arnold 1985, 1993; Kolb 1988; Matson 1965b, 1995; Rice 1996; Rye

1976, 1981). Related to this, a variety of ethnographic (e.g., Gosselain 1992, 2008; Gosselain and Livingstone-Smith 2005; Gosselain *et al.* 1996; Sillar 1997) and ethnoarchaeometric studies (e.g., Arnold 2000; Cruz 1996; Livingstone-Smith 2000; Stark *et al.* 1996; Sillar 1997) have demonstrated the importance of social, cultural, symbolic, ideological, and/or political parameters in relation to access to and selection of raw material in the environment. In its more recent form, ceramic ecology primarily advocates considering the role of the environment in order to overcome cultural determinism rather than interpreting the relationship between pottery production and the environment in a mono-causal or deterministic sense (Arnold 2011; Santacreu 2014: 129). In trying to keep a balance between culture and nature, and in assuming that one cannot be understood as opposed to the other, this approach generated its best results in combination with experimental, functionalist and evolutionary approaches (e.g., Arnold 1985; Braun 1983; Hoard *et al.* 1995; O'Brien *et al.* 1994; Rye 1976; Schiffer 1990b; Schiffer and Skibo 1987).

From the same processual roots of ceramic ecology stemmed another approach mostly focused on the relationship between the vessel's function and the potter's behaviour (e.g., Braun 1983; Rice 1990; Schiffer and Skibo 1987, 1997). Here, specific attention has been paid to the identification of the intended function of the pottery and its actual use, which could be practical (e.g., everyday activities such as storing or cooking) but could also be symbolic at the same time (e.g., as grave goods, Banning 2005; Calvo 1999; Hally 1986; Sullivan 1989; Vidal 2008). The investigation of pottery function and use can be undertaken through different approaches, for example using material sciences, residue analysis, macro traces, etc. (Schiffer and Skibo 1987; Braun, 1983; Sillar and Tite 2000; Skibo 1992; Tite 2008; Van As 1984). By addressing the physical properties of the materials, as well as the techniques and tools used in manufacturing processes, it is possible to address the potter's technological choices and behaviour (Schiffer 2011). Ultimately, by analysing the physical traits of materiality (Santacreu 2014: 151; Tite 2008) the needs resulting from the lifestyle of individuals can be also indirectly determined (Arnold 2005; Christakis 1999; Maniatis 2002). An unquestionable benefit of ceramic ecology and of functionalism is that they encouraged significant methodological development in archaeological studies, through the use of multiple archaeometric techniques. Despite the recognition within most functionalist approaches of the importance of social and cultural issues in orienting the potter's behaviour and technological choices (e.g., Tite and Kilikoglou 2002), these aspects tended to be regarded as subordinate to materialistic perspectives (Hodder 1991). In other words, ceramic properties do not always correspond to a principle of functional optimisation, are not always intentional, and can respond to cultural traditions and transmitted unconscious practices (Rice 1996).

These aspects of learning strategies, *habitus* and cultural transmission have been explored in particular through experimental archaeology and ethnoarchaeology (e.g., Crown 2014; Dobres 2000; Peacock 1981; Piaget 1972; Van der Leew 1977; Wallaert-Petre 1998; Wenger 1999) and supported by the development of a social theory of technology (e.g., Lemonnier 1986, 1992; Pfaffenberger 1988, 1992; Stark 1998; Roux 2010). This approach owes much to the pioneering work of anthropologically-informed archaeologists like Leroi-Gourhan (1964, 1965) and Lechtman (1977, 1984). Thanks to several ethnoarchaeological studies—above all the founding works of Longacre (1991) and Longacre and Skibo (1994)—a large corpus of theoretical and procedural frameworks has developed (e.g., Gelbert 2005; Roux 2019; Livingstone Smith 2000) informing the broad current concern with technology and technological choices (van der Leeuw 1993; Lemmonier 1993; Sillar and Tite 2000) evident in the concept and study of *chaîne opératoire* (Leroi Gourhan 1964; Cresswel 1976; Roux 2019). This interest has been particularly pursued by members of the French school, building upon the 'French School of Anthropology of Techniques' (Mauss 1947; Leroi-Gourhan 1964; Latour and Lemonnier 1994) and has been recently systematically organised by Roux (2019) leading to the construction of a clear protocol and methods. This facilitated a wide range of studies on the 'technical gesture' through macroscopic observation (e.g., Ard 2013; Gomart et al. 2017; Bajeot and Roux 2019; Manem 2020; Forte 2020).

Within this framework, the concept of information and transmission assumes a particular importance. The functionalist school acknowledges that information flows are not only the product of ecological and functional adaptation (Arnold 1985) but they also depend on cultural factors (Rye 1976). Therefore, in the study of ceramic production, the information flows between people, contexts and artefacts should be considered in addition to the natural environment; technological choices and technical procedures assume meaning only within their social and symbolic context, which impacts the way in which material culture is manufactured, used and deposited (Dietler and Herbich 1998; Dobres 2000; Dobres and Hoffman 1994; Lemonnier 1986; Pfaffenberger 1992). Hence, the social and cultural contexts in which potters operated might also have conditioned the adoption or rejection of certain manufacturing procedures (Balfet 1984; Roux 2003). This approach aims, then, to situate the ecological and functional features of ceramic production in their historical and cultural contexts. Nevertheless, since the ceramic record is only part of the material expression of a given society, it is important to consider the material culture as a whole in any attempt to interpret and understand that society (Santacreu 2014: 197).

Several methodologies and lines of enquiry were inspired by the social theory of technology, with two key perspectives highlighted in relation to material culture. Firstly, and in contrast to functionalist interpretations, there are the unconscious repetitions and choices made by the potters depending on a certain way of doing things, i.e., the *habitus* (Bourdieu 1977, 1990). Alongside these is the reciprocal impact that certain *savoir faire* and objects —produced by a particular cultural and social structure— themselves have on the social and cultural structure, and therefore on the *agency* of individual choices and of technical procedures (Dobres and Hoffman 1994; Dobres and Robb 2000; Robb 2007). Building on these concepts, a biographical approach also developed, considering objects' biographies and life histories (Appadurai 1986; Lillios 1999; Gosden and Marshall 1999; Hoskins 2006).

The anthropology of technology also emphasises the socially organised nature of learning and the transmission of knowledge— topics that lie at the core of archaeological research on material culture (Stark *et al.* 2008). Within archaeology, theories of social learning and cultural transmission have recently developed in two major and somewhat contrasting directions: (1) 'situated learning theory' (Lave and Wenger 1991; Wenger 1998) and the related notion of 'communities of practice' (e.g., Sassman and Rudolphi 2001; Eckert 2008; Huntley 2008), and (2) neo-Darwinian, cultural evolutionary approaches such as the 'dual-inheritance theory' and phylogenetics (e.g., Cavalli-Sforza and Feldman 1981; Boyd and Richerson 1985; Mesoudi and O'Brien 2008; Shennan 2008; Manem 2020). From this dual perspective, *chaînes opératoires* as 'socially transmitted information' (Mesoudi 2016) can be viewed as ways of doing things transmitted from one generation to the next, resulting in technical traditions that reflect the community in which they developed as well as the history of its culture (Shennan 2013).

Technical traditions that are well established in spatial and chronological terms are the result of the processes of knowledge transfer contributing to the generation of a community of practice; they might be part of the process or the result of the cohesion of social groups with strong identity ties (Albero Santacreu 2011; LeCron 1994; Livingstone-Smith 2000; Miller 1994). In this concept lies the strong link between technology and identity (Tilley 2006; Gosselain and Livingstone Smith 2005; Gosselain 2011), which depends both on the identity of the group responsible for the learning process and practice, and on the shared models created through material culture, which might be similar to or different from those of neighbouring groups (Gosselain 1992, 2000, 2008; Livingstone-Smith 2000; Pool 2000; Stilborg 2003).

For the production sequences of ceramic vessels, considering the transmission of information and the community of practice within which the potter operates can enable the investigation, on a larger scale, of how production was organised within past societies (Van der Leeuw 1977; Peacock 1981; Arnold 1985). Modes of production, distribution and consumption are directly related to the structure of that production, the role of the potters in the society and possibly also to the complexity of the society itself (Vaughn and Neff 2004; Costin 1991, 2005; Arnold 2000; Longacre 1999; Sillar 1997). In evaluating the variability of pottery production, which is often taken as an indicator of its degree of specialisation (e.g., van der Leeuw and Pritchard 1984), further aspects of the productive process to consider are the potter's skills (Arthur 2003, Blackman et al. 1993; Budden 2008; Budden and Sofaer 2009; Costin and Hagstrum 1995; Roux, 2003) and individual creativity with its potential for innovative impact on ceramic traditions (Sofaer 2017; Shennan and Wilkinson 2001).

As highlighted in this brief overview, there are many fundamental aspects of pottery making which should be addressed in order to build a theoretically informed and holistic interpretation of a given archaeological ceramic record. Theoretical approaches are varied and draw on diverse lines of thought. Putting aside, for one moment, the personal interests of the scholar and their theoretical background and preferred methodology, when approaching a ceramic assemblage there is inevitably a broad array of features, aspects and interpretations to consider; they are never exclusive or all-encompassing and, in some cases, are in conflict with each other. In this respect, when evaluating which theoretical frameworks and analytical approaches to employ, the most relevant considerations are probably the type of site to be analysed, the history of the research (i.e., the quality of data already available), and the archaeological research questions being considered.

3.2.2. Selected theoretical frameworks currently applied to prehistoric Europe and the Mediterranean

In approaching the heterogeneous and extensive theoretical framework outlined above, the present study started by drawing on key research into pottery production and its relation to broader cultural and historical processes currently being carried out in Europe and the Mediterranean. This led to the organisation of a workshop (*Across Technologies: what is left to explore in the concept of technological variability? Choices, traditions, identities and ideologies in prehistoric pottery production in Europe and the Mediterranean,* *Durham University, 19th January 2022.* Programme and list of contributors in Appendix 2), aimed at bringing together some of the main researchers and case studies that could inform the interpretation of the data collected here for Copper Age Campania.

The projects presented in the workshop focussed on regions from Iberia to the Levant and from central to southern Europe, and a variety of approaches emerged, all variously influenced by the theoretical trends summarised in the previous section. Specific attention was paid to the context of each investigation, the sampling and collection of the data, the methods applied and the research questions underpinning the research programmes. In most cases these addressed variability and change in ceramic production on a regional scale within or across specific cultural traditions (Manem, Badreshany, Burke, Amicone, Kreiter, Forte, Prieto-Martinez, Muntoni and Eramo). The analysis of the ceramic production of a single site implied either a long duration of production, such as at Arslantepe (Fragnoli) or a complex site such as the monumental funerary site of Petit Chasseur (Derenne and Carloni). On a larger scale, a ceramic forming tradition was investigated across the whole of southern Europe during the Neolithic transition (Gomart).

In most cases, the research questions addressed the organisation of pottery production, its variability and change in the long term either within (Burke, Amicone) or across different cultural traditions (Kreiter *et al.*, Badreshany, Forte, Manem, Muntoni and Eramo), mostly on a regional or site scale, and in one case in relation to an iconic monumental cemetery frequented by different human groups over time (Petit Chasseur, Derenne and Carloni). Further themes addressed were the specialisation and standardisation of pottery production in relation to increasing cultural complexity (Prieto-Martinez) and to the centralisation of production (Fragnoli), and the spread of specific technologies, in one case of ceramic technology itself in relation to large-scale Neolithisation (Gomart), and, in another, the adoption and spread of the potter's wheel in Iberia (de Groot).

The theoretical approaches informing the research were varied, but seldom restricted to a single line of thought. All the methods adopted, to varying degrees, the *chaîne opératoire* approach, addressing either the whole manufacturing process or a particular stage of it such as raw material procurement and processing (Badreshany, Amicone, Muntoni and Eramo), in some cases also considering the subsequent use of the ceramic vessels (de Groot, Burke, Forte). The most commonly adopted was the *chaîne opératoire* of the French school

(Roux 2019) mostly combined with compositional and provenance analysis, and behavioural observations, in some cases with the support of experimental archaeology (Forte *et al.*) or evolutionary theory (Manem). Overall, all the current methodologies represented in this workshop drew from the whole history of pottery studies, rarely using a single approach exclusively either in the analysis or the interpretation. In all cases, the combined methods allowed the researchers to answer more effectively their research questions, revealing important insights into pottery production and its social, economic and cultural context, as demonstrated by the following examples (which refer only to published research).

- The different degrees of skills and levels of specialisation in ceramic production in the area of Rome during the Copper Age, and the emergence of differentiated productions between settlements and cemeteries (Forte 2020). This research is particularly significant for the present work, being the only comprehensive study on ceramic production on a larger scale in Italy during the Copper Age.
- The detection of specific pottery traditions, especially related to fabric recipes and in some cases to specialised products, and their continuation or disappearance over time in relation to broader cultural phenomena, such as the disappearance of chaff tempering typical of Starčevo ceramics in later chronological phases (Marton *et al.* 2020).
- The definition of diverse communities of practice and regional technological traits within the broader Vinča ceramic tradition, characterised by a possible reduced attention to firing techniques, despite the development of advanced pyrotechnology related to the spread of metalworking (Amicone *et al*. 2020; Amicone *et al.* 2020).
- The social, cultural and mobility implications of the presence of two distinct shaping and potting traditions spreading in southern Europe in parallel with the Neolithic transition, including the spread of the first Impressed Ware ceramics compared to cultural and genetic data (Gomart *et al.* 2017).
- The merging of a detailed *chaîne opératoire* approach with architectural, archaeological, and genetic data to detect discontinuities in the production of ceramics deposited at the monumental funerary site of Petit Chasseur at the time of the Bell Beaker transition (Derenne *et al.* 2022).
- The use of cladistics and evolutionary theory combined with the *chaîne opératoire* approach to highlight the different stages involved in a gradual technological change (Manem 2020).

- The combined use of typological, morphometric and archaeometric data to detect variability in pottery productions over the *longue durée* in relation to pottery standardisation, production specialisation and socio-economic centralisation (Fragnoli 2021).
- The combined use of high-resolution radiocarbon dating, the *chaîne opératoire* approach and analysis of use-wear traces to track the diffusion of the potter's wheel within the Iberian Peninsula in relation to previous and contemporaneous traditions (de Groot 2022).

These recent research projects clearly exemplify some of the current trends in ceramic studies and the progress that can be achieved by combining several approaches in different contexts. The selection of a methodology, especially in the 20th century, often depended on the country of provenance of the researchers, the location the analysis was undertaken, and on the most common approach traditionally used. This can be still seen in the attention paid to specific aspects of ceramic research in some regions, e.g., typology in Hungary (Marton *et al.* 2020) and Spain (Prieto Martinez 2019), or the *chaîne opératoire* characteristic of the French school (e.g., Manem 2020; Gomart *et al.* 2017). This trend has lessened in recent years, thanks to the internationalisation of research and increased mobility of scholars but can still be detected in the Italian tradition of pottery studies as detailed in the following section.

3.2.3. Current Italian approaches

The typological approach, rooted in culture-historical thinking, still constitutes in Italy the basis of any research on a ceramic assemblage and on other artefacts. Indeed, Italian debate on typology and chrono-typology has reached a high level of refinement and reflection thanks to focussed meetings and conferences (e.g., Cocchi Genick 1998).

Although in some cases excessively focused on taxonomic and terminological aspects, the reflection of Italian scholars on typology has led to interesting attempts to free the typological approach from its original, culture-history purpose of merely distinguishing between different cultures (Guidi 2020). It is particularly striking that Peroni, a pioneer of the Italian typological approach, considered the concept of archaeological culture as erroneous (Peroni 1994: 22–4), deeming it impossible to effectively reconstruct ancient cultures, including through typology, since what we can infer from the archaeological record is extremely partial. In fact, as has been noted 'It almost never happens that the geographical distribution of two coeval cultural elements coincide, just as it almost never happens that the geographical distribution of a single cultural element respects the boundaries of a given "culture"' (De Marinis 2020: 34, personal translation). From this critique, derives the term *archaeological facies,* widely adopted in Italian prehistory literature (for a full explanation see Appendix 1), describing 'The totality of the archaeological evidence relating to a given chronological horizon in a given territory, aggregated by typological connections that allow to link together archaeological sources belonging to heterogeneous classes' (Peroni 1994: 24, personal translation). Several reflections on the value and significance of typology developed over time, either following or in conflict with Peroni's reflection, e.g., in relation to its emic and etic value in Cazzella (1999).

Overall, the continued attention to typology as an key tool for archaeological research is mostly rooted in the need to organise often vast archaeological assemblages and to build relative chronologies, without the illusion of them being absolute or fixed. The continued use of the typological approach does not imply an underestimation of its biases and theoretical problems (Cocchi Genick 2011, 2013; Guidi 2020; De Marinis 2020). This is particularly evident in analyses of the ceramic repertoire of the Copper Age, which is characterised by ceramic types of long duration, poorly stratified sites, and a high degree of typological variability.

Alongside the classic typological approach developed by Peroni, three main variants have developed in Italy in recent years:

- The use of statistical techniques (in particular Bietti 1982) and computer-based approaches (Cassano *et al.* 1999).
- The use of the concept of the 'function' of artefacts as an alternative or complementary fundamental parameter to consideration of their form, especially using morphometrics (e.g., Recchia 1997).
- The redefining and updating of the typological method based on broader categories (e.g. necked vessels, plates etc.) especially applied to the Copper Age (Cocchi Genick 2008; 2011).

Despite these developments, in some cases the Italian typological approach still risks detaching pottery (or other objects) from their archaeological context and from other material classes, with the creation of typo-chronologies that do not always consider the whole archaeological record and give a biased picture of the cultural contexts, as in the Copper Age case (Pacciarelli 2008; Pacciarelli and Talamo 2011).

Alongside extensions of the typological approach, an archaeometric approach started to be applied to prehistoric pottery in Italy during the second half of the 20th century (for a recent review see Levi and Muntoni 2014). In its earlier stages, the compositional characterisation of ceramic assemblages was minimally integrated with relevant archaeological contexts and associated research questions (de Angelis 1956–1957; Mariani *et al.* 1956–57; de Angelis *et al.* 1960). It was only in 1967, with the work of John Williams on 350 samples of prehistoric pottery from the Aeolian Islands, that an archaeologically informed archaeometric analysis was carried out on Italian ceramics, which dated to between the Neolithic and Final Bronze Age (Levi and Muntoni 2015). This work was unfortunately published only years later (Williams 1980, 1991) and only in English, with little impact on subsequent Italian studies. While the use of 'subsidiary sciences' (mostly material sciences, Donato 1969) was still debated in Italy, other research groups started developing studies on historic and prehistoric sites (Mannoni 1994; Capelli and Mannoni 1996, 1998). From the 1980s onwards, more comprehensive archaeometric studies, especially based on chemical analyses, began to be applied in Italy to Mycenaean ceramics with a wider Mediterranean perspective (Bettelli *et al.* 2006; Guglielmino *et al.* 2010; Jones *et al.* 2002, 2005, 2014; Levi *et al.* 2006; Vagnetti *et al.* 2006, 2009). From this moment onwards, and with the publication in 1985 by Cuomo di Caprio of *La ceramica in Archeologia*, the first handbook on interdisciplinary ceramic analysis, there was a greater diversification of research, as well as an increased interest in and sensitivity to methodological aspects (AA.VV. 1993; Martini *et al.* 1996), leading to the organisation of workshops and conferences (Burragato *et al.* 1994; Fabbri 1995) and to the founding of the Italian Archaeometry Association (*Associazione Italiana di Archeometria*).

In recent years, the most significant studies in this field have been carried out by Sara Levi and by Italo Muntoni and collaborators, mostly working on Bronze Age and Neolithic ceramics respectively. In both cases, archaeometric analyses are driven by well-defined archaeological questions, reflecting the archaeological background of both scholars. Their studies have generated high resolution data on the raw materials, technological choices, organisation of production, ceramic circulation and imports on a regional scale, relating to the Bronze Age (e.g., Levi 1999, 2010; Levi *et al.* 2006), and to Neolithic south-east Italy (e.g., Muntoni 2002, 2003, 2004; Laviano and Muntoni 2011). Starting from a coherent analytical protocol involving petrographic analysis, mineralogical and geochemical classification, the methodologies applied have varied from a *chaîne opératoire* oriented approach (Levi 2010) to an ecological one (Cassano *et al.* 1995).

Alongside archaeometric analyses, interest also developed in Italy in pottery shaping techniques and in a broader *chaîne opératoire* approach (Roux 2019), together with a few other studies mostly using X-ray analysis (Levi 1999) and experimental archaeology (Manfredini *et al.* 2003; Brodà *et al.* 2009). These were only fully developed recently through the work of Forte on the ceramic production of Copper Age communities in Rome area (Forte 2012, 2019, 2020; Forte and Medeghini 2017). This work represents not only the first large-scale technological analysis of Italian Copper Age ceramics, but also the first comprehensive application of technological macroscopic observations and macro-traces analyses supported by experimental replication and accompanied by compositional analysis (Forte 2020). This paved the way for further applications of this technological method (e.g., Latorre *et al.* 2020), which was previously not represented in traditional Italian prehistoric studies.

A further aspect of ceramic analysis developed through the characterisation of Copper Age ceramics in Rome area: the possible use of the vessels, determined through a combination of scientific methods such as use wear analysis, residue analysis and experimental archaeology (Forte *et al.* 2018). This approach has been applied only marginally to prehistoric ceramics in Italy, mostly on a site scale (e.g., Evans and Recchia 2003; Vidale 2007; Capriglione *et al.* 2012; Savino *et al.* 2017).

This variety of broader, combinatory, approaches to pottery has been adopted more frequently in Italian ceramic studies in the last decades, leading to several studies on particular time periods and regions (e.g., Forte 2020; La Torre 2020; La Marca *et al.* 2017). Yet, despite these recent developments, the potential of combining archaeometric, functional, and *chaîne opératoire* studies with detailed typological observation is still not fully exploited. Despite the acknowledgement of typological aspects within the above-mentioned examples, especially during the sampling and interpretation of the data, reflection on related typological and technological developments through time on broader, regional or inter-regional, scales is still mostly lacking. Ceramic studies often appear trapped between two opposing lines of analysis. On one side are traditional studies focusing mostly on typology, in some cases with archaeometric analyses carried out mainly for compositional purposes and without much integration between archaeometric and archaeological data. On the other side are interdisciplinary and high-resolution technological studies in which typology is routinely used without critical reconsideration of the concept and its application in relation to technological studies.

3.2.4. Ceramic typology and technology: an analytical dualism

As occurred in other fields of archaeological theory, approaches to ceramics suffered from the kind of dualisms characterising the history of research during the last century, which in some cases endured until the present. Harris and Cipolla (2017) note that dualisms such as this still risk hindering archaeological research and interpretation. In other words, the dualism between technological/archaeometric and typological approaches remains strong in Italy, and risks the loss or underestimation of the potential of an integrated, comprehensive study, as further revealed in the following section. As outlined above in the overview of Italian approaches to ceramic analysis, the dualistic, and at times even mutually exclusive, relationship between typological and technological studies is not ideal. The normative and uncritical use of typology within technological studies risks ignoring changes in the morphology and occurrence of specific vessel forms, especially over the *longue durée*, which might hint at changes in everyday practices in the use of ceramic objects. Conversely, typo-chronologies that do not take into consideration the productive dimensions of ceramics risk focussing on style to the exclusion of features relating to the organisation of production, and therefore to the social and cultural context. In each case, the picture drawn by ceramic analysis tends to be partial and the potential of each specific approach is compromised.

A recent reflection by Marie-Louise Stig Sørensen (2015) is particularly relevant here. She highlights the common tendency to overlook typology or to use it acritically in current approaches to pottery and in archaeology more broadly. This does not imply an intrinsic validity of the typological approach (recently critically assessed for the Roman period by Boozer 2015), but the need to integrate it with current methods and to verify, test and even enhance its application. It must not be forgotten that 'two dimensions are central to typologies, and they demonstrate that the concept relates to more than merely sorting objects. These are the interrelated dimensions of time and change; typology is essentially about change and being so it is also automatically about time' (Stig Sørensen 2015).

Of course, detecting change exclusively through vessel forms and style is extremely reductive, considering that these attributes might be more easily visually influenced since they do not necessarily require a specific transmission of knowledge (Gosselain 2000). Technological changes in those phases of the productive process which require a longer learning process have wider implications since they are more strictly interlinked to the transmission process at the basis of the construction of a technical tradition within a certain social group (Roux 2019: 4; Stark *et al.* 2008). A possible approach is to consider types as dynamic and relational, with archaeological typologies acknowledging this (Fowler 2017: 99). In the *chaîne opératoire* approach detailed by Roux (2019), typology is proposed as a final step in the classification of the pottery record, which is first analysed in relation to its technology and raw materials, deemed to be more relevant markers of different technical, and therefore social, traditions. Nevertheless, besides superficial changes, variations over time in the occurrence of specific types, in the morphology of the vessels, and even the decorative style can also highlight changes in practices, habits and social identities or dealing with funerary and ritual concerns (e.g., Fragnoli 2021; Prieto-Martinez 2019). Understanding the scale of occurrence of types through time (*longue durée* vs. short-term) and space (site-specific, regional, long distance), together with the degree of their internal variability (Needham 2005), might represent a further aspect to consider with important relational implications (Fowler 2017: 101).

As stated by Stig Sørensen (2015: 92), ‘If similarities between objects are neither recognised as a quality nor problematized in terms of how they were produced then archaeology’s ability to wonder about “how the world is” may be at risk’. Typological variability should not be understood as a purely taxonomic or classificatory system but should be used to make interpretations beyond exclusively functionalist concerns (Santacreu 2014: 184). Typologies coupled with technical traditions can be a powerful chrono-cultural marker, nevertheless, even the absence of recognisable types and traditions can be important, indicating a weak process of forming a type of practice (Fowler 2017). Types as much as technological traditions ‘arose from a similar iterative process in the past, from which that type, as well as each object, was co-emergent’ (Fowler 2017: 102).

The combined use of archaeometric analysis and technological observations with the study of the typology and morphology of vessels might contribute to the detection and understanding of the overall technological choices made by the potters to create pots with certain physical properties and forms (Santacreu 2014: 177). Specific technological and morphological choices might be linked to specific activities (Capel *et al.* 1982; Hally 1986; Schiffer and Skibo 1987; Spataro 2002; Tite *et al.* 2001). By identifying shared practice on varied and changing scales, inferences can also be made relating to group identities on certain scales and/or to social networks of varying kinds. To this extent, the integration between large-scale trends (e.g., Needham 2005; Wilkin 2013; Wilkin and Vander Linden 2015) and local histories in relation to and as part of those trends (Curtis and Wilkin 2012; Fowler and Wilkin 2016; Millson 2016; Wilkin 2011; 2013) appears fundamental.

3.3. The approach of this study

Starting from the overview presented above, the approach adopted in the present research was oriented by two main factors: the complete lack of comprehensive archaeometric and technological data for southern Italy during the Copper Age, and a desire to combine the traditional Italian typological approach with some of the key current methodological trends in international pottery studies.

As mentioned in the previous section, despite the widespread use of typology as a 'cultural' and chronological marker, a typological approach to the Italian Copper Age failed to become established due to the variability and irregularity of the pottery (Cocchi Genick 2013). In addition, large-scale projects using archaeometric, technological or *chaîne opératoire* methodologies have only recently been carried out in a few Copper Age contexts (Levi *et al.* 2019; Forte 2020). Thus, the objective of this study has been to address and overcome the paradox of ceramics being accorded great importance as a chronogical and cultural marker despite this framework using a loose typological and stylistic approach that does not consider in-depth data on the technological and production processes involved.

By producing a new, comprehensive dataset, the aim of this study has been to rehabilitate the typological approach by integrating it with extensive archaeometric and technological analyses in order to understand the technological choices and *chaîne opératoire* behind pottery production. This aim was addressed using different methods and taking into consideration all the steps of the ceramic production process:

- Raw material selection. This was addressed through archaeometric analyses including petrography in thin section, XRD, XRF and SEM to characterise the petrography, mineralogy and geochemistry of the samples. No sampling campaign of local clay and mineral resources was undertaken due to time and funding constraints. Nevertheless, the data obtained were compared with the local geology through existing literature and geological maps and some inferences on the raw materials used for pottery making were addressed thanks to data already published for the Sele River plain (De Bonis 2018; De Bonis and Gassner 2018).

- Preparation of the ceramic paste. This was addressed through petrography in thin section to detect different paste recipes (Amicone *et al.* 2019, 2020; Quinn 2022) and their occurrence in different archaeological phases and contexts, and the eventual correspondence between recipes and vessel types (Santacreu 2014).
- Fashioning and vessel types. Traces of forming methods were macroscopically observed, when possible, on the whole ceramic assemblage yielded by the sites (Roux 2019; Forte 2020). The typological approach was critically assessed (based on the whole published evidence of Copper Age Campania) understand taking into consideration only two broader levels of the typological classification: vessel categories and vessel types (Rice 2015 and see Chapter 5).
- Firing conditions and temperature. These were observed through XRD analysis and observation of the clay matrix and colour through thin section petrography and macroscopic analysis (Gliozzo 2020).
- Deposition context. Specific attention was given to the contexts where the ceramics were found (including living vs. funerary) and also in comparison to other known sites in Campania region and south-central Italy.

As further clarified in Chapter 5, several analytical approaches were used to address common issues in order to more efficiently define key aspects to be taken into account when considering the role of pottery in society.

While these analyses were performed separately (e.g., typology, petrography, geochemistry, etc.) they are ultimately interconnected by the objects themselves, where all the features recorded appear simultaneously (Santacreu 2014: 177) and in the multiproxy interpretation of the ceramic production (Quinn 2022). The interpretation of the data was informed by different theoretical perspectives drawing especially on the *chaîne opératoire* approach (Roux 2019; Forte 2020) and the social anthropology of technology (e.g., Lemonnier 1986, 1992; Pfaffenberger 1988, 1992; Dobres and Hoffman 1994, 1999; Stark 1998; Roux 2010), with specific attention paid to the concept of identity (Tilley 2006; Gosselain and Livingstone Smith 2005; Gosselain 2011), transmission of information (Lave and Wenger 1991; Wenger 1998; Sassman and Rudolphi

2001; Eckert 2008, 2012; Huntley 2008) and organisation of production (Van der Leeuw 1977; Peacock 1981; Arnold 1985), but with inputs from all the above-mentioned lines of enquiry, as displayed in Figure 3.1.

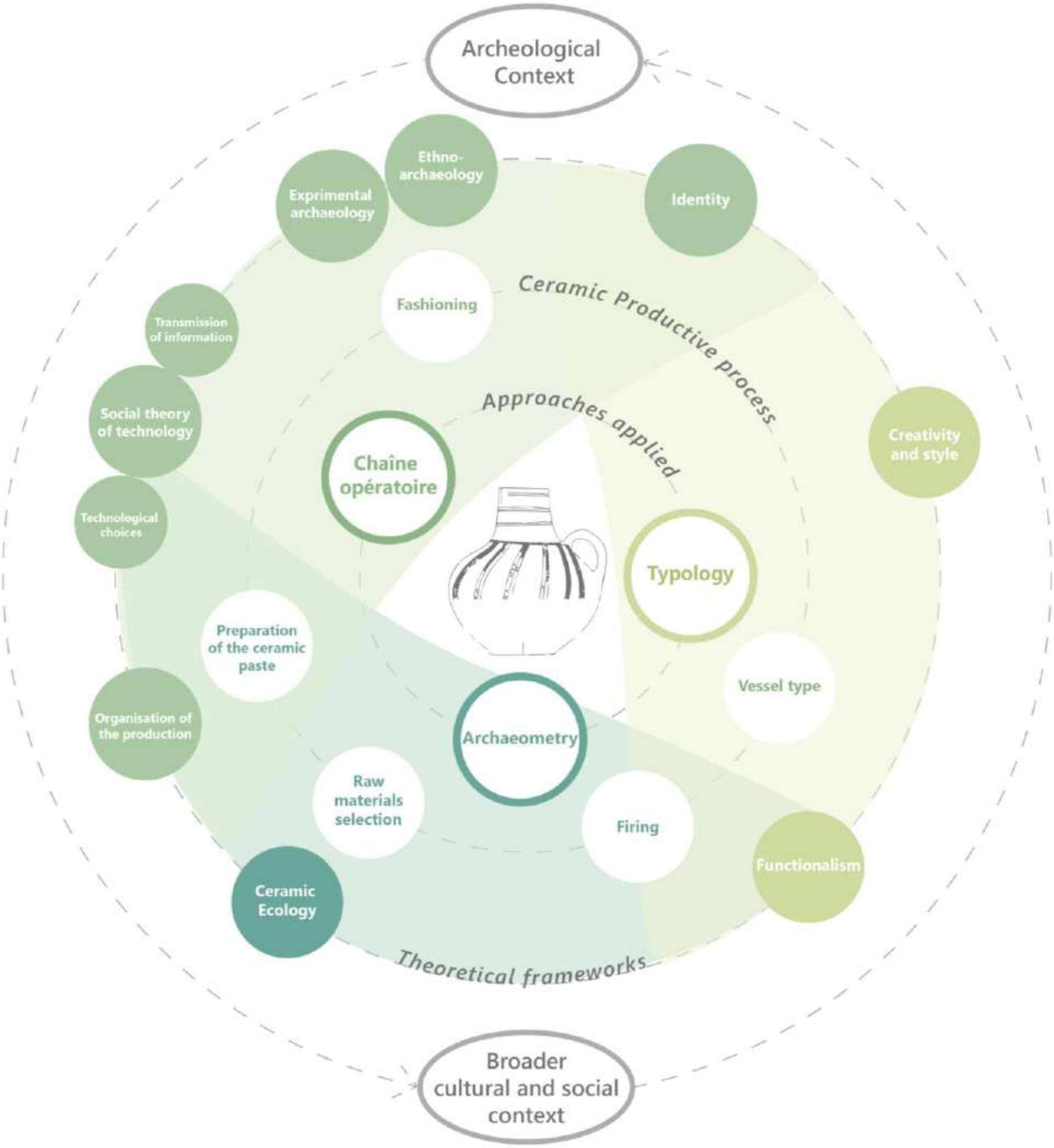


Figure 3.1. Visual representation of the main methodological approaches applied in the present dissertation, the steps of the ceramic productive process investigated, the theoretical frameworks informing the interpretation.

The combination of all the steps of ceramic *chaîne opératoire* were interpreted in terms of their functional (i.e., suitability of the vessel to perform specific functions) and behavioural implications, in relation to the transmission of recipes and technological choices through time and space, and in a synchronic and diachronic perspective between contexts traditionally attributed to the same or different cultural traditions. Seen over the *longue durée*, these aspects allow investigation of the relations between raw materials, techniques and fabrics according to their production and use processes (Braun 1983; O'Brien *et al.* 1994; Rice 1990; Schiffer 2004; Schiffer and Skibo 1987, 1997; Sillar 2000; Sillar and Tite 2000; Van As 1984; Van der Leeuw 1984) and the detection of specific technological choices and traditions in relation to functional and/or symbolic needs.

The sampling strategy adopted was of fundamental importance. A key aim was to ensure the selection of specimens that were representative of all specific deposition contexts (tombs, living deposits, etc.), vessel forms and macroscopic ware/fabric (Chapter 5.3). For cemeteries, where possible the samples were taken from each tomb to ensure that the link between type, context and technology could be assessed. This was particularly important for large burial sites such as the Gaudo cemetery of Paestum where, given its long history of burial practices, technological changes could potentially be expressed between burials and burial groups.

The cultural entities (or *facies*) traditionally recognised in Campania were initially reconsidered critically and the typological distinctions re-assessed, by combining Italian typology with broader functional and morphological considerations (Rice 1987). The raw materials and technological choices were first analysed by site and context (Chapters 6 and 7) and then combined according to the revised cultural traditions and chronological phases (Chapter 8). In this way, continuities and discontinuities in typology and technology of different cultural traditions could be highlighted, contextualised, and interpreted.

The final aim of the study has been to situate the ceramic production of this period and region within a broader archaeological context, including in relation to historical processes taking place during the Copper Age on a European scale. To achieve this, a multi-scalar perspective has been necessary. At the micro end of the scale, the internal structural aspects of the vessels and the practices of ceramic production can be understood as linked to everyday phenomena and agency, while the technological variability of the artefacts can be directly connected to human groups involved in specific activities in a given area and time period. However, as demonstrated by some of the current research reviewed (Section 3.2.4), the social dynamics prevailing at the micro- level interacted with other multi-dimensional phenomena that occurred simultaneously on the macro-scale, where *long durée* processes are more evident (Dobres and Hoffman 1994; Dornan 2002; Lemonnier 1986).

Chapter 4 - Environments, sites and archaeological contexts

4.1. Aims of this chapter

This chapter provides an overview of the archaeological sites and contexts analysed in the present research, situating them within the geographical, geological and environmental setting of the Campania region between 3900 and 2200 BC. The geology of the area is reviewed with a focus on identifying potential prehistoric clay sources, prior to the archaeometric compositional analysis of the pottery. The main features of the sampled archaeological sites and contexts are described, but as the main aspects of the region's settlement pattern, burial practices and exchange networks have been outlined in Chapter 2 the emphasis here is on the history of excavation, current state of research and available data for each site. The ceramics are only briefly introduced since they are addressed in in depth in Chapter 6.

4.2. Environmental setting

The Campania region includes a variety of geological landscape, dominated by several volcanic complexes, three of which still partially active. Successive eruptions have strongly impacted human activities in the area (e.g., Di Vito *et al.* 2013; Talamo 2013). The resulting stratigraphy of volcanic deposits is also important in enhancing archaeological chronology, as explained in Chapter 2.3.

The Tyrrhenian Sea borders the region to the west and the mountain chain of the Southern Apennines frame it to the east (Figure 4.1). Most of Campania consists of hills flanking the two main coastal plains: the Piana Campana to the north, overlooked by the Somma-Vesuvio complex, and the Piana del Sele to the south, dominated by the Sele River. An extension of the Apennines, the Monti Lattari, divides these two plains. To the north-east, the Apennine Mountains border Campania, while numerous river valleys form communication routes that ultimately reach the coast.

In the following section, the main geological and geomorphological features of the region are outlined, the main volcanic complexes reviewed, and the key clay sources described. Specific attention is given to the south of the region where the main sites analysed are located, in particular the Sele River Plain with the sites of Paestum and Pontecagnano, and the Vallo di Diano depression with the sites of Sala Consilina and Atena Lucana (circled in red in Figure 4.1).

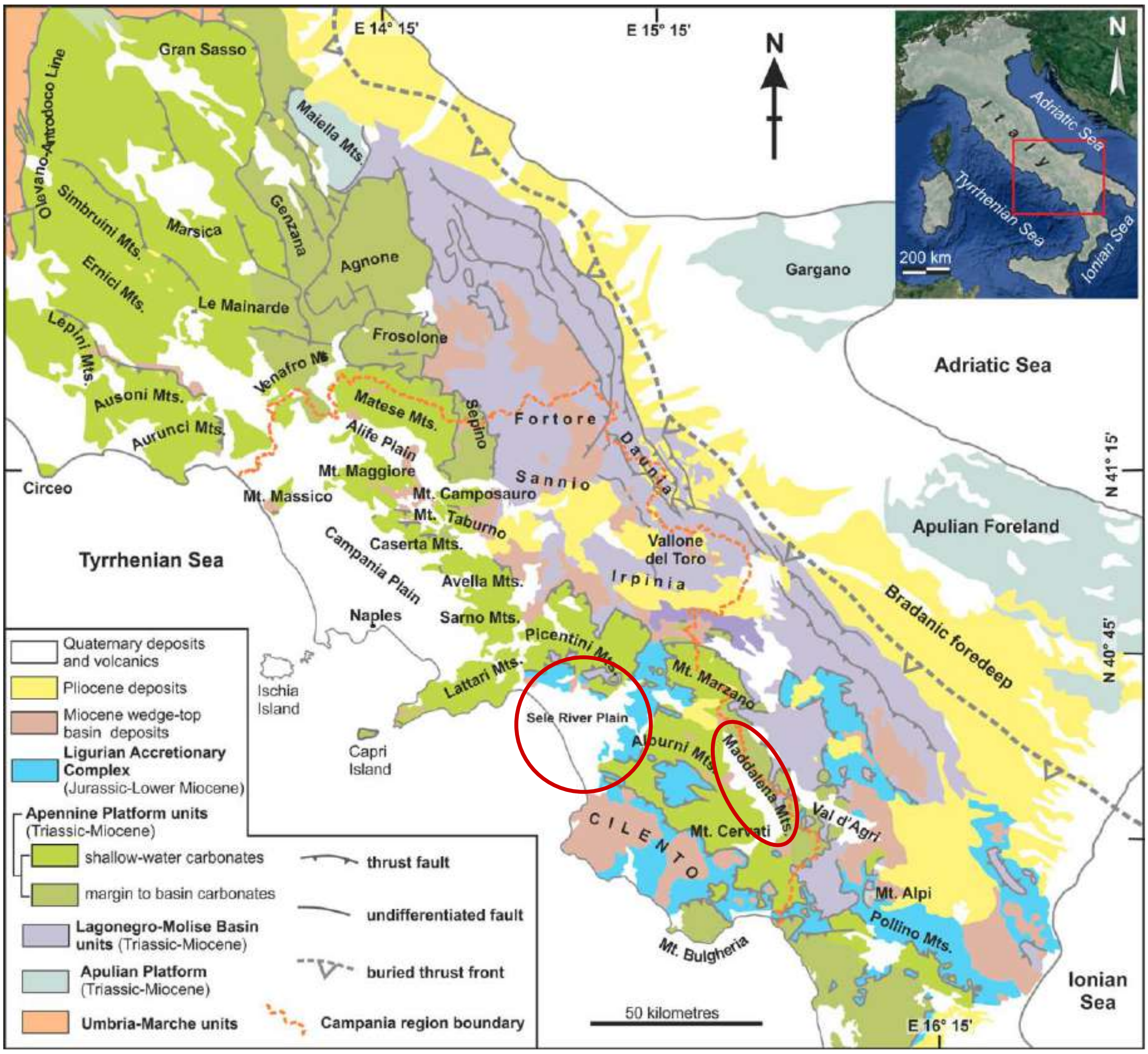


Figure 4.1. Schematic geological map of the southern Apennines (Vitale and Ciarcia 2018).

4.2.1 Geology, geomorphology, volcanism and environment

The geology of Campania is dominated by the Southern Apennine chain (Figure 4.1, Bonardi *et al.*, 2009). It is a segment of the circum-Mediterranean orogenic system between the central Apennines to the north and the Calabria-Peloritani arc to the south. Several overlying tectonic faults form the orogenic structure and can be grouped into three main tectonic complexes: the Ligurian Accretionary Complex (LAC), the Apennine Platform (AP) units and the Lagonegro-Molise Basin (LMB) units. The tectonic pile is unconformably covered by Mio-Pliocene wedge-top basin deposits and Quaternary post-orogenic sediments and volcanic material. The LAC occupies the highest tectonic positions, covering the AP units, which in turn overthrust the LMB units. The foreland is represented by the carbonatic Apulian Platform which does not outcrop in the Campania region (Vitale and Ciarcia 2018: 10). Its present structural setting is the result both of mainly compressive tectonic events, related to the subduction followed by the roll-back of the Adria plate, and of the extensional tectonics related to the opening, since the Late Miocene, of the Tyrrhenian Sea (Bonardi *et al.* 2009: 47 and references).

There are two main lithologies in the Southern Apennines, one carbonatic and the other siliciclastic. Both can be connected to a model of sedimentary basins and carbonatic platforms which characterised the Mesozoic paleogeography (D’Argenio *et al.* 1973). The rock types characteristic of the tectonic units of the region (Sicilide, Liguride, Verbicaro-San Donato, Alburno-Cervati, Lagonegro, etc.; Ippolito *et al.* 1975; Grasso 2001) vary widely: limestones, dolostones, flysch sequences, sandstones, marls, ophiolitic rocks, etc. They range in age from Upper Triassic to Miocene. They mostly represent basinal sequences formed on the border of the African plate, which were delaminated and superimposed over the Apulia foreland (Peccerillo 2005: 131).

The Mio-Pliocene orogenic evolution was marked by the sedimentation of thick sequences of turbiditic calcic and siliciclastic deposits both in foredeep and wedge-top basins (e.g., Ascione *et al.* 2012). During the Pleistocene, extensional tectonics affected the Campania margin and the western flank of the Southern Apennines, producing several basins: the Campana Plain, the Gulf of Salerno, the Gulf of Naples, the Auletta Valley, and the environs of the main sites analysed here: the Sele River plain and the Vallo di Diano (Figure 4.1). In these basins, several intermontane depressions contained thick lacustrine-marine deposits, often alternating with coverings of volcanic rocks, formed especially in the Late Pleistocene–Holocene (Vitale and Ciarcia 2018: 11).

4.2.1.1. Volcanism of Campania

The volcanism of Campania the southernmost sector of the Plio-Quaternary volcanic belt which occurs along a north-west to south-east trending extensional zone on the Tyrrhenian border of the Italian peninsula, in western Sicily, in the Sicily Channel, on the Tyrrhenian Sea floor and in Sardinia. The so-called 'Campania volcanic (or magmatic) province' comprises the active volcanoes of Somma-Vesuvio, Ischia and Campi Flegrei (Phlegraean Fields), and by the islands of Procida and Vivara (while the Pontine Islands are sometimes also included, Peccerillo 2005: 129). In this case, a 'magmatic province' is defined as a relatively limited zone within which igneous rocks have been emplaced over a relatively short period, where the rocks show particular compositional characteristics such as petrochemical affinity, geochemical signatures, or even a particular association of magma types, which make them distinct from rock associations occurring in other zones (Peccerillo 2005: 9). In the northern part of Campania, another inactive volcanic complex, the Roccamonfina, is part of the Ernici-Roccamonfina volcanic province.

The volcanic complexes of Lazio and Campania are characterised by an alkaline potassic (KS) and ultrapotassic (HKS) magmatism (Conticelli *et al.* 2002; 2004). The main volcanic complexes, their age, volcanology and petrology are summarised in Table 4.1.

Volcano	Volcanic Province	Age	Volcanology and Petrology
Somma-Vesuvio	Campania	30 ka BP to 78 BP	Stratovolcano (Mount Somma) with multiple caldera and an intracaldera cone (Vesuvio) formed of slightly to strongly silica undersaturated trachybasalt and leucite-tephrite to trachyte and phonolite.
Campi Flegrei	Campania	About 0.2 Ma BP to 484 BP. Buried volcanism 2 Ma old	Multicentre volcanic complex with two nested calderas and several monogenetic cones and maars, formed of prevailingly pyroclastic rocks with trachybasalt to trachyte- phonolite composition.
Ischia Island	Campania	Ischia island 150 ka BP to 720 BP AD	Volcano-tectonic horst formed of prevailing pyroclastic rocks with trachybasaltic to dominant trachytic composition.
Roccamonfina	Ernici Roccamonfina	0.58 BP to 0.1 (Ma) BP Potassic rocks generally younger than ultrapotassic rocks	Stravolcano with a main central caldera and eccentric cones, formed of alternating lava flows and pyroclastic products with a mafic to felsic subalkaline to alkaline potassic (KS) and ultrapotassic (HKS) composition.

Table 4.1. Age and composition of volcanism of the main volcanic complexes affecting the Campania region (after Peccerillo 2005: 132, tab. 6.1, 111 tab. 5.1).

The volcanic complexes which most affected the southern part of Campania and, more generally Campania's prehistoric populations, are the Campi Flegrei and the Somma-Vesuvio. The Campi Flegrei caldera is partially submerged below sea level, forming the bay west of Naples (Smith *et al.* 2011). Activity at the centre commenced more than 60ka BP (Scandone *et al.* 1991) and it continues today. The Campi Flegrei volcano generated two large caldera-collapse events. The first was the Campanian Ignimbrite (CI) super-eruption (39ka BP; De Vivo *et al.* 2001; Fedele *et al.* 2003 and references therein); corresponding to Y5 in the Ionian and Aegean Seas' distal tephra nomenclature developed by Keller *et al.* (1978), which was the largest explosive eruption in the Mediterranean in the last 200ka (Barberi *et al.* 1978). The eruption produced multiple trachytic pyroclastic flows with rare phonolites (Di Girolamo 1970; Fowler *et al.* 2007). The CI tephra occurs as a visible ash layer as far away as southern Russia (Pyle *et al.* 2006). The second major eruptive event was the Neapolitan Yellow Tuff (NYT) eruption (15ka BP; Deino *et al.* 2004). The composition of the resulting material varies from latitic to trachytic and it also covered a large area, with 10cm-thick tephra layers found also in Croatia in the Eastern Adriatic (Radic *et al.* 2008). Between these two major events, a further eruption with a wide dispersal can be detected: the so-called 'Y-3' (Di Vito *et al.* 2008; Zanchetta *et al.* 2008) dated to 30–31ka BP, the trachytic tephra layers of which are also found in southern Campania (Amato *et al.* 2012). After the NYT eruption, over 60 further eruptions occurred during three epochs of volcanic activity with some periods of quiescence (De Vita *et al.* 1999; Smith *et al.* 2011). During the Copper Age, the major event was the Agnano-Monte Spina eruption (De Vita *et al.* 1999). The age of the resulting tephra is still debated (De Vita *et al.* 1999; Wulf *et al.* 2008; Blockley *et al.* 2008; Orsi *et al.* 2009; Smith *et al.* 2011) but was recently re-dated to 4420 ± 58 BP, which, when calibrated at 2σ using IntCal 20, spans 3335-2913 cal. BC (Lirer *et al.* 2013; Zanchetta *et al.* 2019). The products of this eruption are potassic alkaline products, ranging in composition from trachyte to alkali-trachyte (De Vita *et al.* 1999: 292). Related tephra layers have been identified in southern Italy and in the Adriatic Sea (Zanchetta *et al.* 2011).

The Somma-Vesuvius volcanic complex consists of an older volcano dissected by a summit caldera, Monte Somma, together with a recent cone, Vesuvius, which grew within the caldera after the AD79 'Pompeii' eruption (Santacroce 1987; Cioni *et al.* 1999). This volcanic complex has been active for at least 400ka years, as indicated by marine cores (Santacroce 1987; Brocchini *et al.* 2001; Di Renzo *et al.* 2007). The volcanic activity of Somma-Vesuvio is characterised by four major Plinian events: the Pomici di Base (Santacroce *et* *al.* 2008), the Mercato pumices (8.9ka BP; Santacroce *et al.* 2008), the Avellino pumices (4.3ka Sulpizio *et al.* 2008) and Pompeii (AD79) eruptions. Each of these events caused a collapse of the structure contributing to the formation of the present caldera (Cioni *et al.* 1999). Two main magmatic series characterise the petrology of the Somma-Vesuvio volcanic products: a slightly silica-undersaturated (shostonitic), corresponding to the KS series (Conticelli *et al.* 2002; 2004), and varying from k-basalt and latite to trachyte, and a second that is strongly undersaturated with rocks belonging to the HKS series, and varies from tephrite to phonolite (Peccerillo 2005). Leucite and garnet are characteristic minerals of the Somma-Vesuvio eruptions (Conticelli *et al.* 2004).

The volcanic tephra of some of the eruptions of these main volcanic complexes can be detected, only in some cases, in the southern part of Campania in the two areas studied: the Sele River plain and the Vallo di Diano.

4.2.1.2. Geology of areas analysed

The Sele River plain is a large tectonic depression located in the south of Campania, dominated by the Sele River and other smaller watercourses (Figure 4.2). It is filled by alluvial sediments, starting from the Pleistocene. The area is bordered by Meso-Cenozoic carbonate mountains to the north (Monti Picentini) and to the south-east (Monti Alburni). Terrigenous hills resulting from the sedimentary aggradation of the 'Eboli Conglomerates' border the plain to the east, while the predominantly siliciclastic-pelitic Miocenic formations of the Cilento mountains outcrop further south. The entire plain was covered in the Quaternary period by pyroclastic products from the Campanian volcanoes, especially in the northern sector. Alluvial sediments (gravel and sands) and lagoon and lacustrine/marsh (silt and clays) deposits fill the plain (De Bonis and Gassner 2018). Aeolian and coastal sands characterise the seaward portion, where three orders of beach-dune ridges interfinger landward with lagoon and fluvio-palustrine deposits (Amato *et al.* 2012). Travertine deposits began forming in the environs of Paestum and Pontecagnano in the upper Pleistocene; their emplacement probably ended in around 5500–5000 BP, during the Early Copper Age, when a warm-arid climatic phase encompassed the whole Mediterranean (Amato 2011: 248).

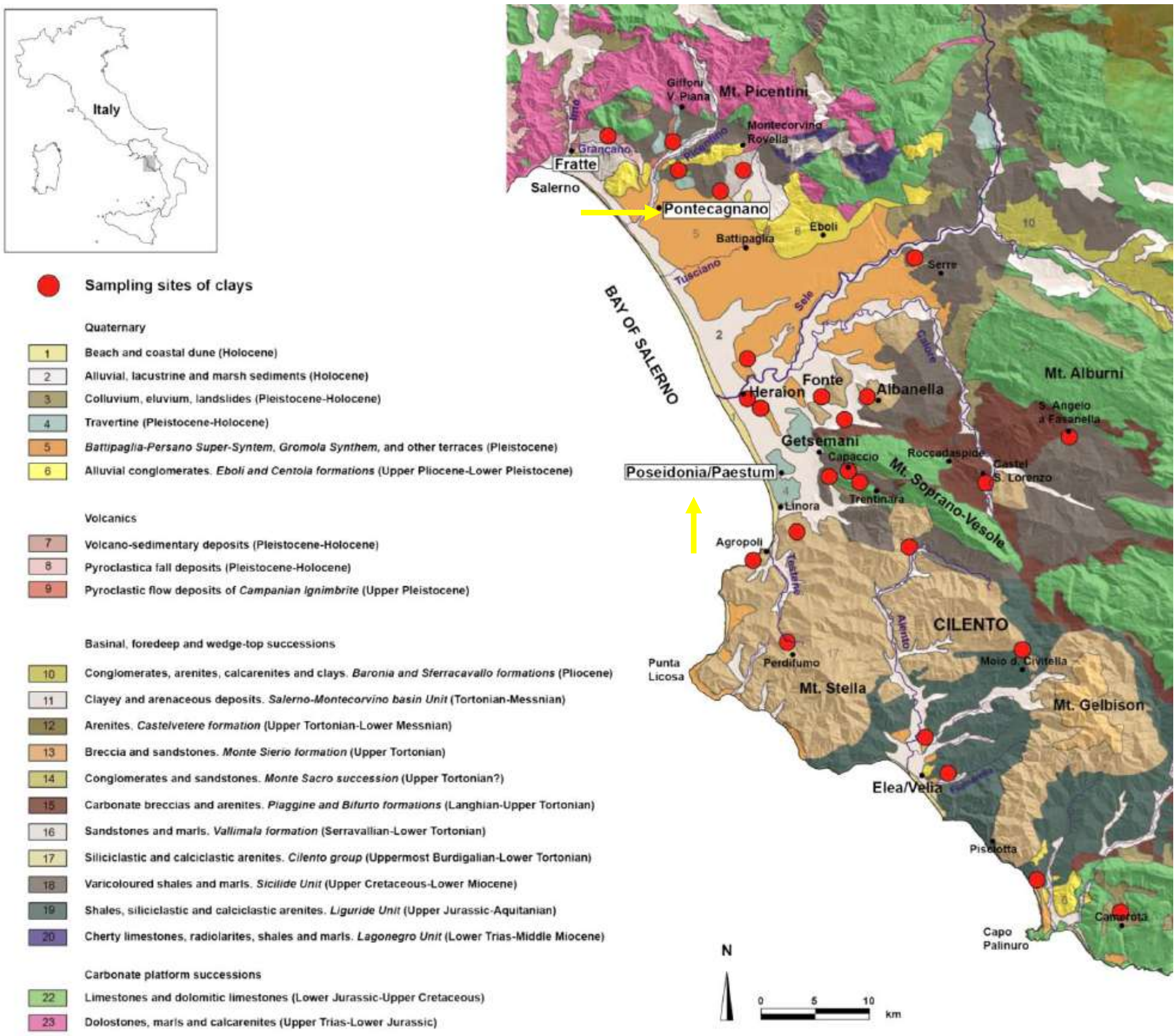


Figure 4.2. Geological map of the Sele River plain and surroundings. The yellow arrows point to the archaeological sites analysed: Pontecagnano and Paestum. The red dots are the clays sampled and reported in De Bonis and Gassner 2018.

Pontecagnano

The site of Pontecagnano is in the northern portion of the Sele Plain, near the Gulf of Salerno, (Figure 4.2), and occupies an area that extends from the piedmont of the Monti Picentini to the sea. The site's territory is bordered to the north-west by the Picentino River and to the south-east by the Tusciano River; it is crossed by several smaller watercourses. Excavations in 2010 for the construction of a highway at the north-eastern border of the site allowed a more accurate reconstruction of the geology and past environment of the area, especially for the Copper Age (Amato 2011). Pontecagnano is set on a travertine plateau that is crossed by grooves worn by several watercourses. Between the end of the Neolithic and the beginning of the Copper Age (4000-3650

BC), several paleochannels were filled by silty clay sediments and clayey weathered pyroclasts. Paleosols comprise mainly sandy clay with a high mineral and glassy fraction. The prehistoric palesol is poorly preserved due to the presence of an Early Iron Age settlement, but in some areas it is commingled with a tephra layer from the Agnano Monte Spina eruption, attributable to the Late Copper Age (2900-2300 BC). Pollen analyses carried out after the highway excavation also indicate the environmental situation during the Copper Age before the Agnano-Monte Spina eruption (Russo Ermolli *et al.* 2011). The data point towards a local wetland environment with aquatic and marsh plants. In the surrounding area the vegetation included deciduous woods, especially oaks (*Quercus*), while fir trees (*Abies*) probably grew on the hills bordering the plain.

Paestum

The site of Paestum lies in the southern sector of the Sele River plain, to the south of the river's mouth, and is also set on a travertine formation called 'Travertini di Paestum'. Several investigations and coring in the area close to the Greek-Roman city and towards the sea allow a detailed reconstruction of the geology and environment of the area during the Copper Age (Amato *et al.* 2012). An important chronological marker is provided by the Agnano Monte Spina tephra (3335–2913 cal BC 2σ, Zanchetta *et al.* 2019). The soils before and after this eruption are generally dark-grey silty clays with thin peat layers and brown-yellow silty sands. This points to the presence, before and after the eruption, of an open and sheltered marine lagoon environment undergoing fluvial influence. This barrier–lagoon coastal system remained until the 6^{th} century BC. In addition to tephra from the Agnano Monte Spina eruption, two more tephra are reported in the area, associated with the NYT and the Y-3 eruptions respectively (Amato *et al.* 2012: 54), testifying to the diffusion across this area of the volcanic products of the Campi Flegrei volcanic complex.

Vallo di Diano

The Vallo di Diano is located south-east of the Sele River plain at the foot of the Monti Alburni and Cilento mountains. On the eastern slope of this basin are the sites of Sala Consilina and Atena Lucana (yellow arrows in Figure 4.3). The Vallo di Diano is a large upland tectonic basin (37 × 7km) with a flat base. It lies at about 475m asl, close to the border of Calabria and Basilicata (Figure 4.3). It is bordered by the mountain of Maddalena to the east and the mountain chain of Cilento (Cervati-Alburni) to the south-west. The River Tanagro, an affluent of the River Sele, crosses and drains the entire basin. The basin was filled by a lake during part of the Pleistocene (Karner *et al.* 1999: 1). Geomorphological reconstruction and evolution of the area surrounding the basin suggests that the paleolake existed between the end of the early Late Pleistocene and the end of the Middle Pleistocene (about 0.781Ma-0.0117Ma BP Karner *et al.* 1999: 6; Santangelo 1991). A swamp environment on the valley bottom lasted until historic times, as testified by drainage activities in the area initiated by the Romans and ending around the middle of the 14th century AD (Giano *et al.* 2014: 165). The surrounding mountain peaks reach 1500–2000m asl.

As shown in Figure 4.3, the geology of the Vallo di Diano is characterised, in the central area of the basin, by alluvial, lacustrine and coastal lake sediments with outcrops of siliciclastic marine and continental deposits to the south. Cilento and undifferentiated Flysch are located on the side slopes, especially in the area of Atena Lucana, while ophiolites and deep-water shales of the Sicilidi–Liguridi Unit outcrop further south-east. The carbonatic and siliciclastic Apennine Platform Unit dominates the slopes of the basin with carbonates, limestone and dolomitic limestone, while deep water cherts, calcilutites and shales of the Lagonegrese Unit outcrop in the vicinity of Sala Consilina (Amicucci *et al.* 2008: 476; Karner *et al.* 1999: 3).

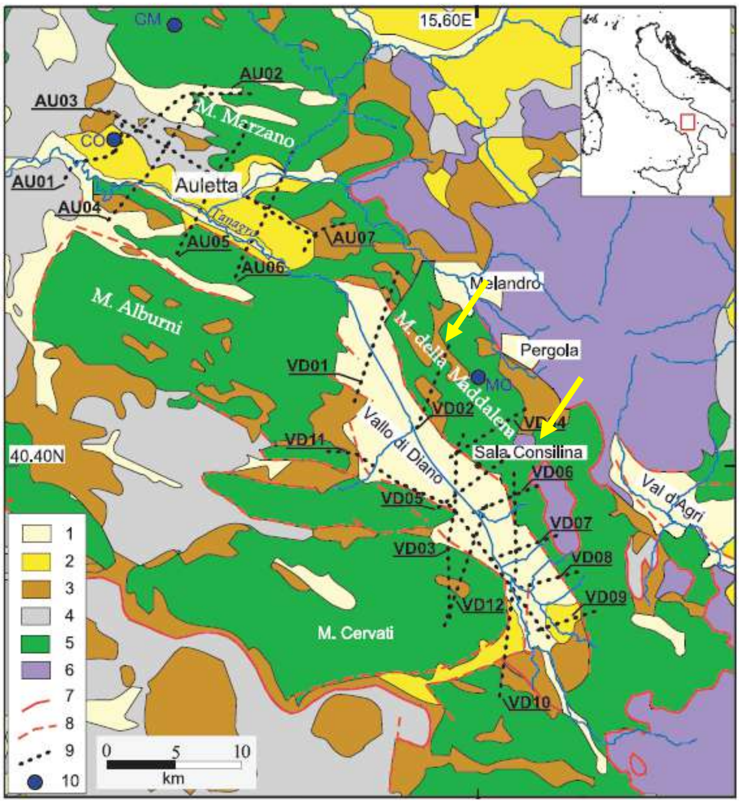


Figure 4.3. Location and main structural units of the Vallo di Diano. (1) Alluvial, lacustrine and coastal lake sediments (Middle Pleistocene–Present); (2) marine and continental deposits (Pliocene–Early Pleistocene); (3) Cilento and undifferentiated Flysch; (4) Sicilidi–Liguridi Unit (Late Jurassic–Early Miocene); (5) Apennine Platform Unit (Late Triassic–Late Miocene); (6) Lagonegrese Unit (Triassic Early–Late Cretaceous); (7) main thrusts; (8) main faults; (9) analysed seismic lines; (10) public wells. (Amicucci *et al.* 2008).

4.2.2 Clay resources

Clays in the Campania region can be divided into three types based on their geological origin: marine-basinal clays, clays formed in alluvial sedimentary deposits, and clays formed in gravitational deposits or by the alteration of pyroclastic flows (De Bonis *et al.* 2013).

The basinal clays are the most common and are mainly associated with siliciclastic and/or carbonate basinal sedimentary formations of marine origin. They outcrop mostly alongside the Apennine ridge and have various dates of formation. The older sediments (e.g., Liguride, Sicilide, Parasicilide, Fortore, and Vallone del Toro units) are from the pre-orogenic/foredeep basinal domains of the Lower Cretaceous to the Upper Miocene (Bonardi *et al*. 2009; Vitale *et al.* 2011; De Bonis *et al.* 2013). Clay sediments associated with these successions generally outcrop as shales or over-consolidated clays (e.g., Argille Varicolori; De Bonis *et al.* 2013). They are also commonly found as plastic clayey masses in landslides (Di Pierro and Moresi 1985). These clays are generally low in calcareous content (CaO <6%). More recent (Miocene-Pliocene) clayey deposits are also located in syn-orogenic foredeep and post-orogenic wedge-top basin domains (e.g., Argille grigio-azzurre, Bonardi *et al.* 2009; Vitale and Ciarcia 2013). These clays are generally characterised by a higher calcareous content (CaO >6%, De Bonis *et al.* 2013).

The second type of clays can be found in Quaternary alluvial/lacustrine sediments of the main watercourses of the region, such as those of the flood plains of rivers such as the Volturno, Sele and Sarno. Minor deposits may also be found in the sediments of smaller water bodies or active river valleys. These sediments reflect the composition of the lithologies eroded by rivers within their catchments (De Bonis *et al.* 2013).

The third type of clays found in the Campania region derives from the mixed gravitational deposits at the foot of slopes. These are often reworked and contain variable amounts of the clay fraction, frequently with larger lithic fragments (cobbles and gravel). These clayey soils are generally brown in colour and filled with organic matter and plant remains. Clay deposits can also originate from intensive weathering of pyroclastic deposits associated with the volcanic centres of Campi Flegrei (including the islands of Ischia and Procida), Somma-Vesuvius, and Roccamonfina. These types of deposits are more common in the Vesuvian area and in the northern part of Campania.

In the Sele River plain, clay raw materials suitable for pottery making can be found in geological formations of alluvial and marine origin. Clayey deposits are located on the northern margin of the plain with marine sediments outcropping in the Picentine area, around the site of Pontecagnano, e.g., at San Cipriano Picentino, Montecrovino Rovella and Pugliano, Giffoni Valle Piana, as well as in Rufoli (Salerno) near the Greek-Roman pottery production centre of Fratte. Marine clays also outcrop on the eastern margin of the plain in the Serre-Persano area, and in the piedmont area of the Monte Soprano-Vesole ridge next to the towns of Capaccio and Trentinara, near the site of Paestum. Alluvial/lacustrine clays are found in the sedimentary layers of the alluvial plain of the Sele River, in Albanella, in the area of Fonte di Roccadaspide, and Agropoli (De Bonis and Gassner 2018). Despite the publication of several geological maps and associated literature, the highly variable geology of the area has not yet been surveyed sufficiently for a more precise identification of likely Copper Age clay deposits. It is worth adding, however, that a recent research project, still partly unpublished, involved a more systematic survey of the plain to locate raw materials used to make pottery in Greek-Roman times (De Bonis and Gassner 2018).

In the Vallo di Diano, the main clay raw materials are found in the alluvial basin, in the 'argille varicolori' formation and in Flysch deposits. The Quaternary alluvial deposits of the basin have been divided into two depositional fluvio-lacustrine cycles (Santangelo 1991; Russo Ermolli *et al.* 1995; Karner *et al.* 1999) broadly corresponding to the synthems of Buonabitacolo and Padula (Sgrosso *et al.* 2010). The Buonabitacolo synthem is concentrated in the southern part of the basin and consists of Pleistocene grey clays with some pyroclastic, shell, sand, and gravel layers. The Flysch deposits are located in the Lagonegro tectonic unit and consist of Rhaetian-Jurassic radiolarites and reddish, greenish and violet silicified argillites (*Scisti Silicei*) and Lower Cretaceous dark silicified argillites with intercalated calcilutites, marly limestones and marls (*Flysch Galestrino*). The succession passes to slope deposits and then to basin deposits of the Late Cretaceous period, to Burdigalian Flysch Rosso consisting, at the base, of calcarenites and calcirudites with nummulitids and alveolinids, marls, and greenish and reddish argillites, covered by varicoloured clays. These units are rich in clays and argillites (Vitale and Ciarcia 2018). The so-called 'varicoloured clays' (*Argille varicolori*), outcropping on the western slopes of the Vallo di Diano, are greyish clays and argillites with additional layers of marly clays and dark red clays in the upper part (Sgrosso *et al.* 2010).

These diverse potential clay sources are further considered in Chapters 7 and 8 in relation to the raw materials used for ceramic production.

4.3. Sites and archaeological contexts

This section provides an overview of the archaeological sites and contexts focussed on in this study. Some of the main Copper Age sites in Campania were selected based on three key criteria: archaeological period defined by absolute and/or relative chronology, the site type, and the size of their ceramic assemblage. The core study covered three sites: Paestum, Pontecagnano and Sala Consilina, each of which are each multi-phased, and the shorter-lived site of Atena Lucana. They cover a time span extending from the early 4th millennium BC to the final centuries of the 3rd millennium BC. Below, the discovery of each site is described, followed by a detailed account of its main features and a summary of the current state of archaeological knowledge on it. Figure 4.4 shows the location of these (and other) sites in the Campania region.

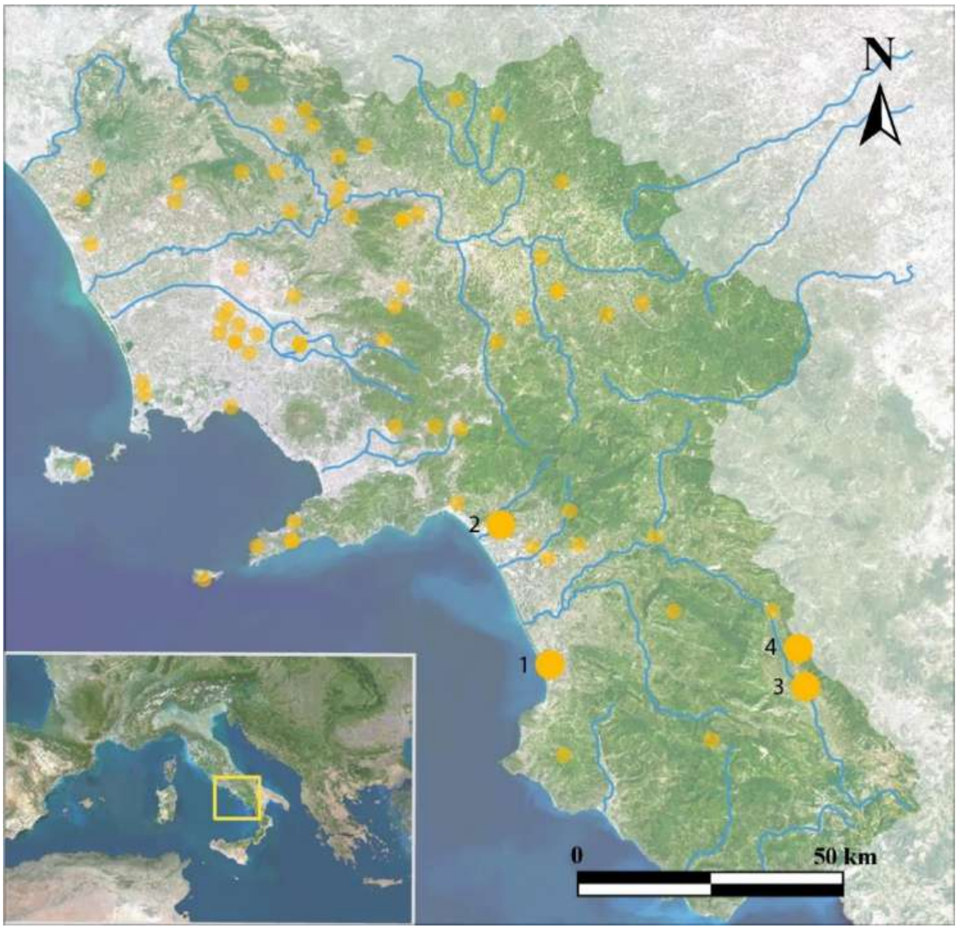


Figure 4.4. Map of Campania region showing the sites taken into detailed consideration: 1) Paestum, 2) Pontecagnano, 3) Sala Consilina; 4) Atena Lucana.

4.3.1. Paestum (Salerno)

The first occupation of the site of Paestum is dated to the Middle Palaeolithic by a Mousterian lithic industry (Aurino *et al.* 2017). Between the Middle and Late Neolithic, a large settlement with associated production areas was established on the travertine plateau where the Greek-Roman city later developed. More substantial occupation of the site started during the Copper Age (Aurino *et al.* 2017; Aurino 2019), with three main locales discovered in different areas of Paestum, each dating to different phases of the period. These discoveries, made mainly in the second half of the 20th century, were originally fundamental to the cultural and chronological definition of the Copper Age in southern Italy. The earliest discovery was made during the Second World War in the locality named 'Gaudo', where an important burial site was unearthed, and its name given to the 'Gaudo culture'. As shown in Figure 4.5, two other Copper Age sites are located within the walls of the Greek city, one near the Temple of Cerere and the other beneath the Greek *Agorà.*

Figure 4.5. Location of the Copper Age sites of Paestum. 1) Burial ground at Gaudo; 2) burial site near the Temple of Cerere; 3) settlement and burial evidence in the Agorà.

Excavation of the three locations highlighted three different phases of activity: a Middle-Late Neolithic phase (5^{th} millennium BC) in the area of the Temple of Cerere, an Early Copper Age (3900-3650 BC) occupation in the same place and in the area of the Agorà, and 2km north the Gaudo cemetery, radiocarbon dated to between the middle of the 4th and middle of the 3rd millennia BC. During the Middle–Late Copper Age (3650-2300 BC), another occupation of the area of the Agorà and Temple of Cerere is attested, generally ascribed to the Laterza cultural tradition. The lack of radiocarbon dates for this occupation prevents clarification of its chronological relationship to the Gaudo cemetery; nevertheless, the dates available from other sites for their cultural traditions suggest at least partial contemporaneity.

4.3.1.1. Paestum – the burial site at Gaudo

The recent history of the Gaudo necropolis is complex, with various archaeological investigations undertaken at different times, leading to successive reassessments of its archaeologicalrecord. The burial area underwent three main phases of excavation and a long phase of analysis aimed at reconstructing its complex history. This resulted in an extensive reorganisation and revision of the excavation archive, including written reports, drawn plans, archaeological materials, and inventories. This work, initially carried out by Gianni Bailo Modesti and Antonio Salerno (1998), and later by Paola Aurino and colleagues, remains ongoing. Here, a critical synthesis of the background to and current state of knowledge regarding the Gaudo burial ground is provided, based on both published and unpublished data, which are further detailed in Appendix 3.

The discovery of the Gaudo culture in Campania is closely interlinked with historical operations during World War II (Aurino 2015). In 1943, during *Operation Avalanche*, US and British allies landed on the coast of Campania and started the construction of a military airport (Figure 4.6). The mechanical excavation caused the destruction of several burials. It is reported that Major Lawrence Cook of the US Army presented about 50 ceramic vessels—without any specific indication of provenance—to the Superintendent of Antiquities for Campania, Amedeo Maiuri. This first collection is today held at the Museo Archeologico Nazionale di Napoli, and comprises 39 vessels, three flint daggers, one spearhead and one copper dagger (Aurino 2015: 438). In 1944, during manual operations of tuff extraction, one whole burial was discovered and, thanks to Lieutenant John Brinson, Director of the B.P Mobile Archaeological Unit[1], it was carefully excavated and documented

[1] Based on the current state of the research (Aurino 2015) the meaning of the abbreviation B.P could not be clarified with certainty.

together with a topographic survey of the nine previously destroyed burials, and the findings stored at Paestum Archaeological Museum (Brinson 1945).

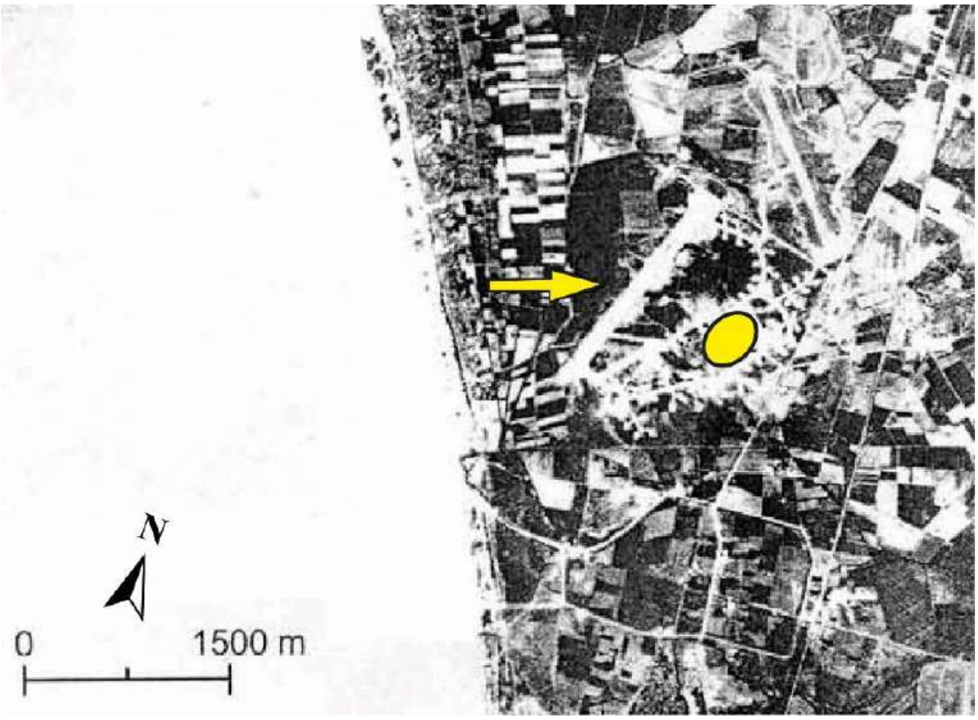


Figure 4.6. Aerial photo of the Allied British Army runway (white arrow) and the Gaudo burial site (white circle), (after Aurino 2015: 439, fig. 1a).

A second phase of fieldwork took place one year after the first discovery, after the war, when Pellegrino Claudio Sestieri surveyed the area of the cemetery highlighted by Brinson. This new work led to further excavations undertaken in two campaigns, in 1945 and between 1946 and 1947 (Sestieri 1946; 1946–48). These yielded 19 tombs, materials from which are currently preserved at the Museo Archeologico di Paestum.

The third main phase of excavation dates to 1962, when Giuseppe Voza, an employee of the Soprintendenza di Salerno, uncovered 14 new tombs and re-examined those previously excavated (Voza 1964, 1974, 1975).

One further discovery in the area was made in 1969, when an emergency excavation was carried out by the Museo Archeologico di Paestum, leading to the identification of one last tomb, partially destroyed, designated ‘tomb 00’ (Bailo Modesti and Salerno 1998: 16).

The long history of the excavations and the different approaches used at each stage resulted in the inconsistent documentation of the archaeological record, and in dispersed collections that are still stored in two different museums, the Museo Archeologico Nazionale di Napoli and the Museo Archeologico Nazionale di Paestum. Thanks to archival work carried out in recent years, it is now possible to interpret the plan of the cemetery and to reassign the collected grave goods more accurately to the burials.

The final cemetery plan, shown in Figure 4.7 combines the plans from the various excavations. The different phases of excavation are summarised in Table 4.2, while the full description of each phase and corresponding tombs can be found in Appendix 3.

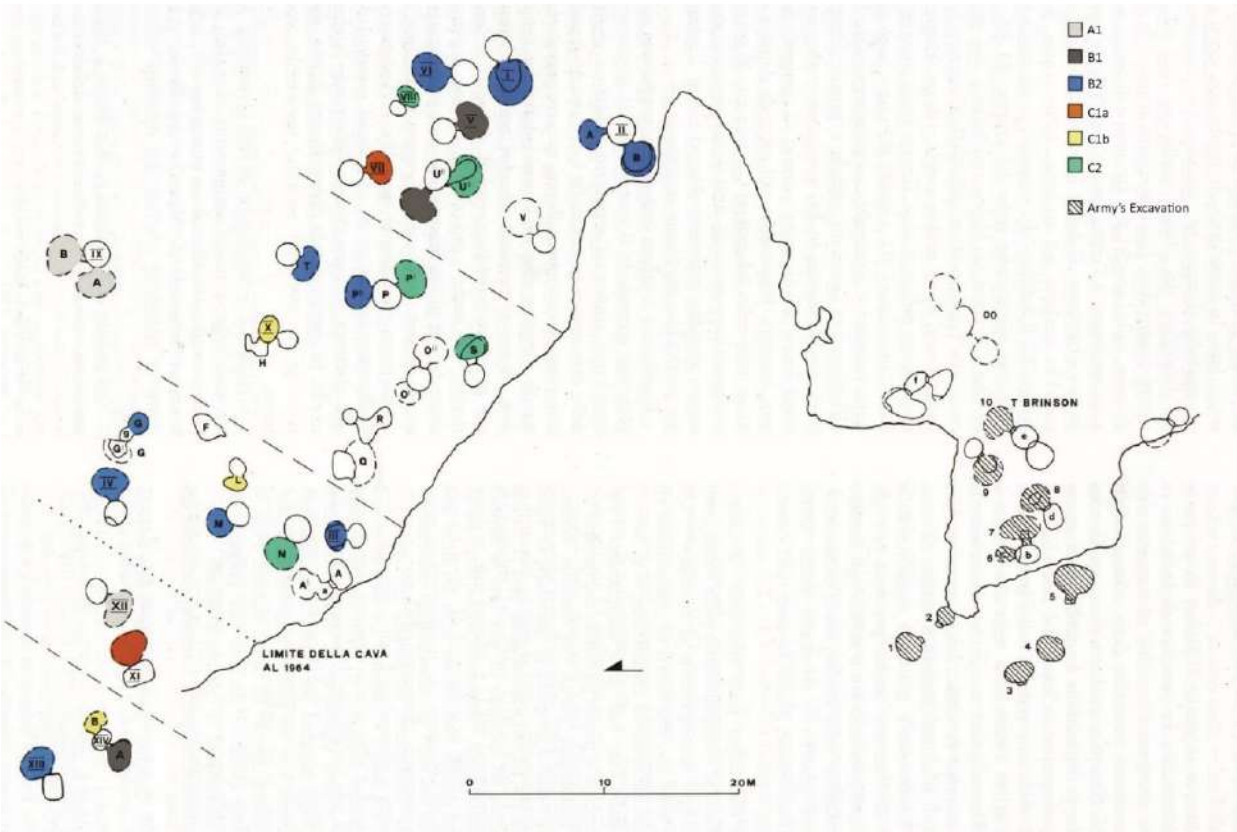


Figure 4.7. Updated plan of Gaudo burial ground (Aurino 2015) with distribution of the burial layouts and possible grouping: A1) only individuals in anatomical connection; B1) individuals in anatomical connection and a few disarticulated bones; B2) individuals in anatomical connection and abundant disarticulated bones; C1a) only secondary depositions with disarticulated bones, covering the whole floor; C1b) small chamber with only secondary depositions with disarticulated bones, covering the whole floor; C2) only secondary depositions with disarticulated bones gathered in small groups. (After Bailo Modesti and Salerno 1998: fig. 76: 184).

Excavations	**Tombs**	**State of preservation and documentation**	**References**
1. Excavations by the BP Archaeological Unit, 1943–1944.	10 tombs	Tombs 1–5 destroyed. Shafts not excavated; only burial chambers were detected.	Brinson 1945 Aurino 2015 Salerno 1993; 1995
2. Excavations by Sestieri, 1945–1947.	19 tombs	Tombs A–V. Shafts not excavated; only burial chambers were detected.	Sestieri 1946; 1946–48
3. Excavations by Voza, 1962.	14 new tombs, and other tombs re-excavated	Tombs I–XIV. Shafts and chambers excavated. Re-examination and excavation of some of the shafts and chambers from the previous phases (indicated with small alphabetical letters).	Voza 1964; 1974; 1975
4. Excavations by the Museum of Paestum, 1969.	1 tomb	Tomb 00. Rescue excavation.	Bailo Modesti and Salerno 1998

Table 4.2. Summary table of the main phases of excavation in the Gaudo cemetery of Paestum.

Overall, at Paestum, 57 burial chambers have been detected within a maximum of 45 structures, 20 of which are single-chambered, 11 two-chambered and 14 uncertain. Paestum cemetery is currently the largest known for the Gaudo culture. The site has recently been included in a radiocarbon dating campaign with the two first burials yielding the following results (Aurino 2013):

1. Tomb IX chamber *a*, human bone sample from individual no. 5: (LTL-13376A) 4593±45 BP, 3520–3310 cal. BC (67.2%), 3300-3260 cal. BC (1.5%), 3240–3100 cal. BC (26.7%) 2σ;
2. Tomb IX chamber *b,* human bone sample from individual no. 13: (LTL-3338A) 4478±45 BP, 3360–3010 cal. BC (95.4%, 2σ).

Additional radiocarbon dates are currently in press and testify to a lengthy period of use of the burial site extending from the middle of the 4th millennium to the late 3rd millennium BC.

The different excavation methods and degrees of preservation of the archaeological material have resulted in a complex overall assemblage which is difficult to consider in its entirety. The better-excavated and better-preserved burials are undoubtedly those investigated by Voza, who maintained a record of the whole tomb, including both the entrance shaft and burial chambers. Nevertheless, the materials yielded by the other excavations have made a significant contribution to the present study due to the large number of tombs and variety of the evidence.

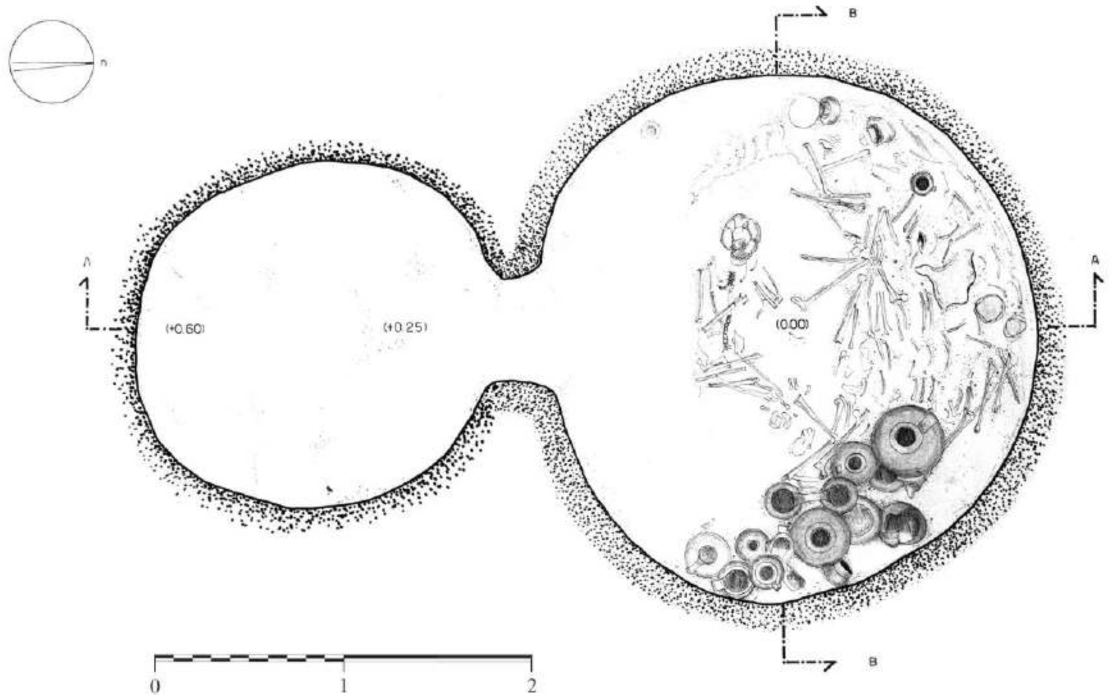


Figure 4.8. Plan of tomb VI, with primary and secondary depositions (Voza 1974).

Materials

Bailo Modesti and Salerno (1998) meticulously identified the main features of the Gaudo culture in order to contextualise their study of the site of Pontecagnano , developing a detailed typology of the ceramic assemblages from all Gaudo sites known at the time. Subsequently, an in-depth study of the ritual practices involved in Gaudo burials was carried out, shedding some light on their complexity (Bailo Modesti and Salerno 1995, 1998; Bailo Modesti 2006; see Chapter 2.4.2).

The arrangement of burials at the Gaudo cemetery is typical of Gaudo culture sites (Figure 4.8). Entrance shafts are always present and contain evidence of ritual depositions, represented by much pottery, and in some cases also animal bones and shells (Voza 1974: 15–6, Voza 1975: 59).

Figure 4.9. View of the burial chamber during the excavation of tomb IV (Voza 1974: tab. III).

The entrance to the burial chamber is always closed by a travertine slab, carefully arranged to seal the chamber, often with smaller stones at the sides and also, according to Voza, a clayey material mixed with stones (Voza 1975: 59). The burial chambers are kidney shaped. Small niches in the walls of some chambers (e.g., Sestieri tombs H, 'I' and U'', Voza tombs V and XIVa), suggest more complex depositions. Most of the niches were found to be empty, perhaps suggesting the use of objects fashioned from some perishable material. Only tomb 'U' had two niches, each hosting three vessels and one also a flint dagger.

The type of mortuary deposit found in the burial chambers is variable, covering almost all the layouts known for Gaudo culture burials in general outlined in Chapter 2.4.2. The most common layout at Paestum is the primary deposition of individuals in anatomical connection, with disarticulated bones placed along the walls (e.g., Figure 4.9). The second most common arrangement is the so-called 'tomb-ossuary' with abundant disarticulated bones either randomly covering the whole chamber floor or gathered into small groups. Finally, three tombs yielded only individuals in anatomical connection. The different burial arrangements are evenly distributed across the cemetery. Further details of the mortuary deposits are presented in Appendix 3.

The human remains from the Gaudo cemetery have been subject to several studies (Graziosi 1947; Mallegni 1975; 1979; Lippi and Mallegni 2011), but a comprehensive analysis and location details of the individuals in the graves is not yet available. A preliminary investigation of carbon and nitrogen stable isotopes, designed to detect the dietary patterns of the Copper Age population in southern Italy, was conducted on 77 samples from the cemetery of Paestum (project PRIN 2010–11 *'Eredità biologica e culturale lungo 30 mila anni nella popolazione dell'Italia centro-meridionale'*; main coordinator, Olga Rickards). Initial published results indicate that Gaudo culture people practiced mixed farming with a diet combining plant foods and meat, with no significant contribution from marine food despite their proximity to the coast (Cianfanelli 2015).

The Gaudo cemetery tombs yielded an incredible number of objects. Over 1000 of these are well enough preserved for typological analysis and have a reliable provenance. The overall number could potentially be even greater based on the chance findings from the Army excavation and subsequent periods. Any correspondence between the grave goods and specific individuals is hard to assess and probably not entirely representative of the rituals performed (Bailo Modesti 2006). In the case of disarticulated mortuary depositions especially, the information available from the excavations and the complexity of the depositions prevent a confident analysis of any intentional connections between objects and individuals. Current physical anthropological understanding of the human remains from Paestum does not offer a clear determination of the sex of the deceased, preventing any correlation between sex and grave goods.

The pottery assemblage is analysed in detail in Chapter 6, but some of the main features are outlined here. Many vessel forms are present, in some cases specific to the Gaudo culture, such as the *askoi*, the twin vessels and the *pyxides* (Figure 4.10). The distribution of the pottery in the graves is closely linked to the ritual practices carried out in particular spaces. There is no specific correspondence between the number of vessels and the number of individuals deposited in a given burial chamber. Generally, there are more individuals than vessels, except in two cases, tombs I and VIII, which both contain individuals in anatomical connection as well as secondary deposits. The largest number of vessels generally appears in the 'tomb-ossuaries', such as tomb

XI with 39 vessels and tomb VII with about 48. They are generally located alongside the wall by the entrance of the chamber, not directly associated with the human remains.

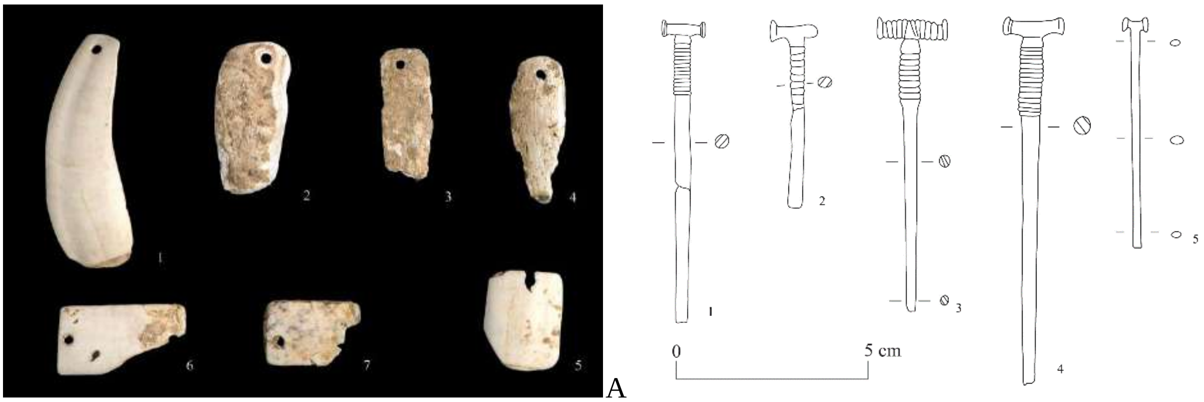
Figure 4.10. Examples of pottery vessels from the Gaudo cemetery of Paestum: (1) *pyxis* with lid, (2) *askos*, (3) two twin vessels, (4) jar and (5) jug.

Some of the stone artefacts exhibit a high degree of technological skill (Figure 4.11). The mono-face and biface flint daggers and long arrowheads in particular represent the skilful production techniques specific to the Gaudo culture. Microliths and stone tools such as blades, scrapers and polishers are also attested. The main raw material is flint, and all the artefacts were produced by knapping and pressure flaking (Bailo Modesti and Salerno 1998: 133–4). A detailed study of the lithic industry has been carried out by the University of Florence and publication is currently in preparation.

Figure 4.11. Stone blades and daggers from the Gaudo cemetery of Paestum.

Metal objects are not common at this site, nor in the Gaudo culture more generally. Nevertheless, some metal weapons, tools and rare ornaments are recorded in the Paestum cemetery. The most common copper dagger is the Gaudo type with rectilinear or slightly curved hafting plate with 3-4 rivet holes, ogival or triangular blade and a thick midrib (tomb M, in Bianco Peroni 1994: 5, tab. 3.22), followed by a form with an elongated blade (Buccino type in Bianco Peroni 1994: 11–12, tab. 100B) found in several tombs and during the Army's rescue activities (tomb U': 'f' chamber b and XIV chamber a). Other metals tools include a awl (tomb IXA) and a rivet, probably from a dagger (tomb IIA). A very rare find is represented by fragments of two silver rings, two of the few metal ornaments attested in the Gaudo culture (Giardino 2000: 52–3, fig. 3.10–11).

Although ornaments are generally rare in Gaudo burials, the site of Paestum yielded more than all other known sites (for a recent analysis see Aurino 2016). All the examples were discovered in Voza's excavations (Voza 1964, 1974), but the high number could be biased by the relatively low standards of the previous excavations. Except for the above-mentioned silver rings and a biconical steatite bead from tomb IV, all the ornaments are made of bone and shell. Only two bone objects are classified as tools: a needle from tomb IV and a spatula from tomb IX, chamber b (Bailo Modesti and Salerno 1998: 139–40, fig. 59). The ornaments, which exhibit a high level of technical specialisation, include pins, plaquettes and pendants (Figure 4.12A). The most unusual ornaments from the site are undoubtedly the five T-shaped bone pins from tombs IIA, IV, IXB and XIII (Figure 4.12B).



A B

Figure 4.12. A) T-shaped bone pins; B) shell pendants and plaquettes from the Gaudo cemetery of Paestum (photo after Aurino 2016: fig. 5).

As discussed in Chapter 2.4.3.2, their stylistic similarities to Caucasian examples and rare distribution in the Italian peninsula make this class of artefact of particular interest for the study of interaction and exchange networks across Europe (Aurino 2016). Other ornaments include five perforated pendants made of wild boar teeth and shell valves, and two rectangular shell plaquettes perforated on the shorter sides, all found in tomb XIII. Voza reports that they were commingled with the disarticulated bones of about 20 individuals in the inner part of the grave (Voza 1974: 22–3).

Overall, the burial site at Gaudo still represents the largest and most distinctive dataset available for the Gaudo culture. The many burials and the specific character of the artefacts, make this one of the most complex sites of the Copper Age in southern Italy. Nevertheless, its potential remains to be fully realised. Specialist, in-depth studies are currently ongoing (or in preparation), designed to investigate all the material classes and especially the human remains, through new techniques such as stable isotope analysis and aDNA studies, which will hopefully identify mobility patterns. These studies, when integrated with the research presented here, might reveal new details on the life of this ancient community and its relationship with the nearby and possibly partly contemporaneous Laterza people, living only 2km away.

4.3.1.2. Paestum – the burial site near the Temple of Cerere

Inside the Greco-Roman city of Paestum, about 2km from the Gaudo cemetery and 80m north-west of the Temple once attributed to Cerere (currently reinterpreted as the Northern Sanctuary), a further significant prehistoric site was discovered in the 1960s (Figure 4.5). In August 1960, the Soprintendenza alle Antichità di Salerno carried out excavations in the area between the Temple of Cerere and the northern part of the city walls, where an expanse of travertine bedrock is located (orange circle in Figure 4.13). The exploration revealed a 200m^2 triangular depression in the travertine, with natural niches in the north-east/south-west part, used for prehistoric burials (Voza 1962).

The central area of the depression contained a considerable accumulation of Neolithic deposits stemming from occupation of the plateau during the Serra d'Alto and Diana cultural phases (Voza 1962; Aurino *et al.* 2017).

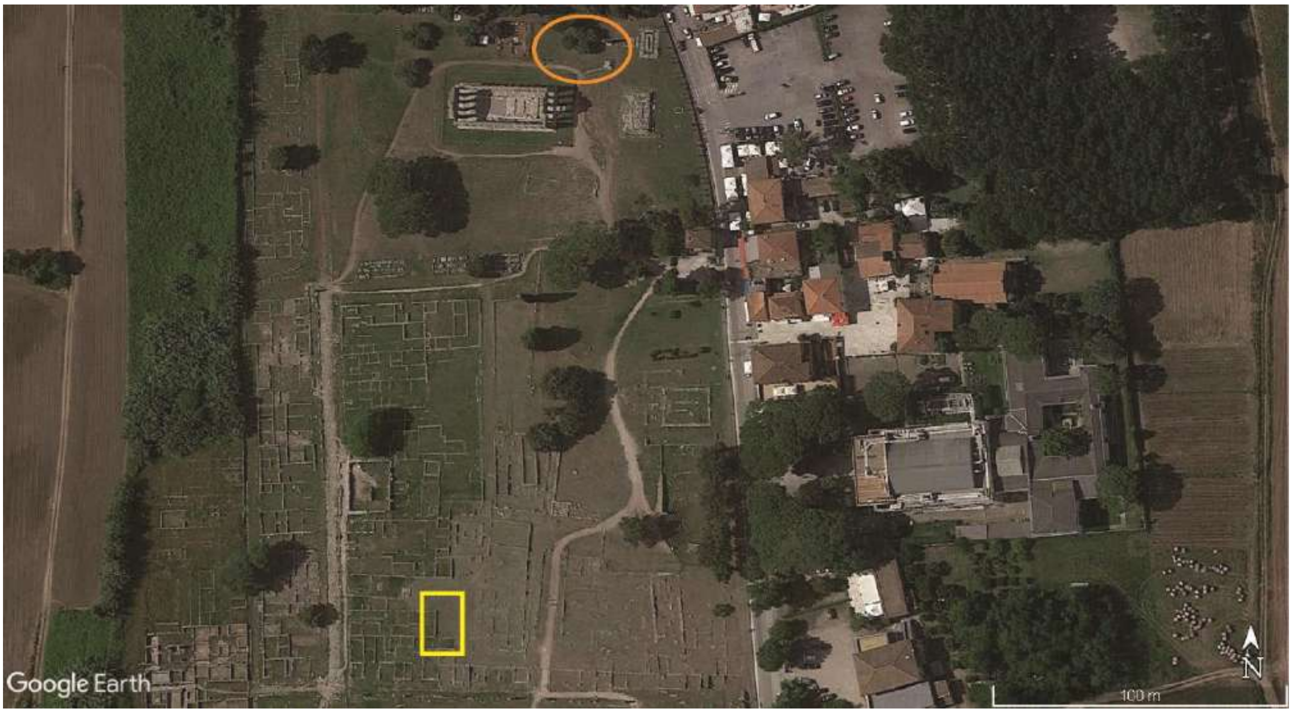


Figure 4.13. Location of the excavations near the Temple of Cerere (orange) and in the *Agorà* (yellow).

The burials, which date to the Copper Age, were located at the sides of the depression and partly in the central area. At the time of their discovery, they were only briefly described since their grave goods could not be easily linked to any known archaeological culture. First recognised by d'Agostino (1981) this phase of activity at the site was re-assessed by Arcuri and Albore Livadie (1988; Albore Livadie *et al.* 2011) who re-analysed the original plans of the Voza excavations and clarified the locations of the burials and the typology of the grave goods. Despite these subsequent phases of research, this site has never been published in its entirety. The poor conservation of the archaeological materials—in some cases still stored in cardboard boxes from the 1960s excavation—resulted in the loss of the exact provenance of some of the artefacts. A final stage of recording was carried out in 2019 during my own internship in the Museo Archeologico di Paestum, allowing more extensive documentation.

The distribution of Copper Age evidence in and around the travertine depression can now be understood in a little more detail. Figure 4.14 indicates the presence of relevant deposits in three main areas: zone A in the centre, and zones B and C to the east and south of the depression respectively.

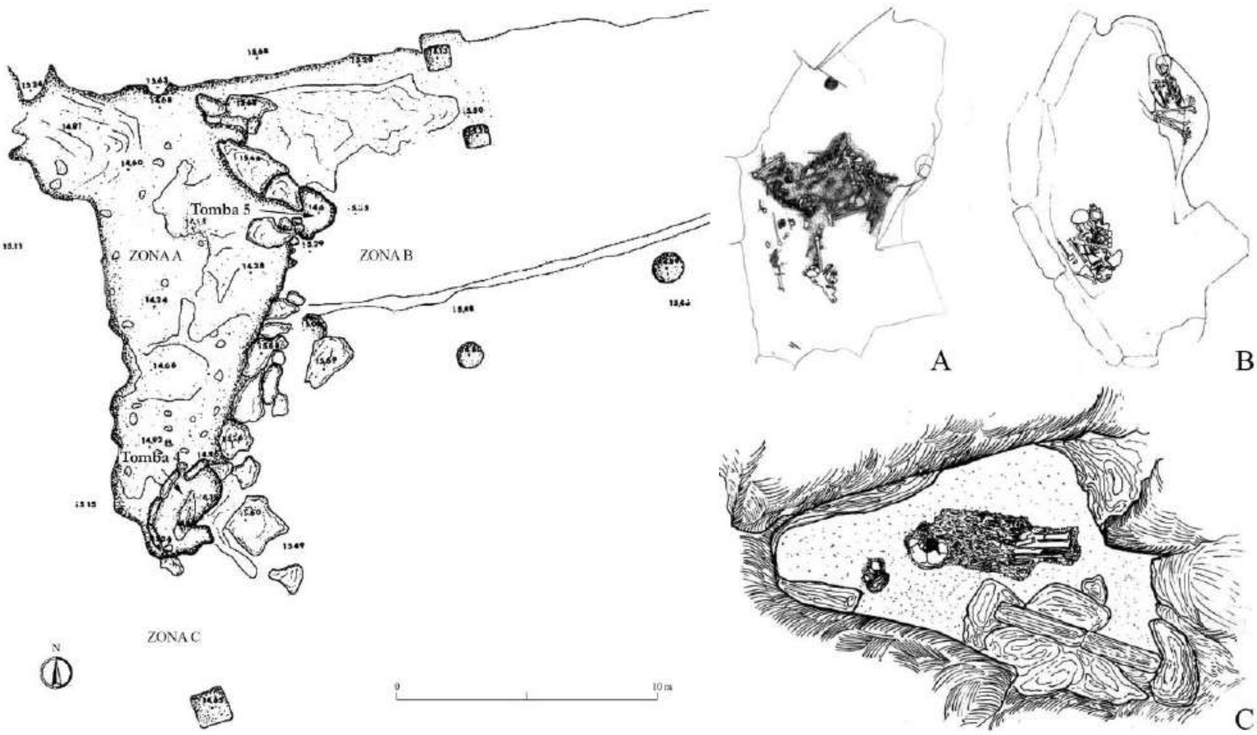


Figure 4.14. Plan of the triangular depression in the travertine bedrock with the Neolithic deposits and Copper Age burials.
A) Deposition in tomb 4; B) detail of the articulated individual, top right; C) inhumation in tomb 5 probably in a crouched position (after Albore Livadie *et al.* 2011).

Two niches in the bedrock were used for human burials (tombs 4 and 5), whilst four additional skeletons were discovered in zone A, according to Voza, in a crouched position (Voza 1962: 14). These can probably be identified either as tomb 1, which hosts two individuals, or as tombs 2 and 3.

The burials in the niches are more clearly documented, than the others. Tomb 4 is partly cut into the rock and has an oval shape; it is set in a slightly lower area, south of the depression. The tomb has a complex structure, enclosed by large travertine slabs set vertically in a semicircle on those sides not sealed by the bedrock. The covering is not preserved but was probably formed by the bedrock itself or by horizontal stone slabs. This structure hosted a collective burial of about ten individuals, with the remains gathered on the southern side. The skeletons of only two individuals remained articulated, in a crouched position. A further inhumation was found in a small niche on the northern side of the tomb, represented by an individual crouched on their right side as shown in Figure 4.14B.

Tomb 5 is located at the north-east end of the depression (Figure 4.14C). It is a small artificial cavity cut into the travertine, smaller than tomb 4, subcircular in shape, and lacking a covering. Only one inhumation is attested, which is poorly preserved and located in the middle of the chamber.

According to the reconstruction by Albore Livadie *et al.* (2011), tomb 1, in zone A, probably hosted two articulated individuals crouching in opposite directions, facing each other. A further flat grave inhumation is recorded from zone A. This individual was reported to be crouched and between 9 and 10 years old (Albore Livadie *et al.* 2011). This burial may be either Voza's tomb 2 or 3.

The exact location of all these burials is still uncertain but an indication of the provenance of the artefacts is better understood, especially in relation to the human burials. The grave goods are mainly represented by pottery vessels and some flint and metal objects (Figure 4.15). Tombs 1 and 4 appear to be the tombs with most numerous artefacts. Tomb 1 yielded various decorated bowls and cups typical of the Laterza repertoire, one flint dagger and three arrowheads. Tomb 4 contained more flint tools and metal objects. In addition to ceramic vessels, represented by a jar, decorated bowls and a beaker, it included a stone dagger, eleven arrowheads, five microliths, three flint blades, two obsidian tools and a copper dagger (Figure 4.15 left).

Figure 4.15. Metal, lithic and ceramic grave goods from the burial site near the Temple of Cerere.

Of particular note is a small fragment of a Bell Beaker rim in the international style (Figure 4.16; Albore Livadie *et al.* 2011: 333, fig. 4.7; Aurino and De Falco 2022). It was reportedly found either inside tomb 1 or in the area surrounding it. The pottery grave goods and their contents probably represented ritual offerings placed both inside and outside the burials. Unfortunately, since the location of the vessels inside the tombs is not reported, the nature of such rituals is not easily determined (Albore Livadie *et al.* 2011).

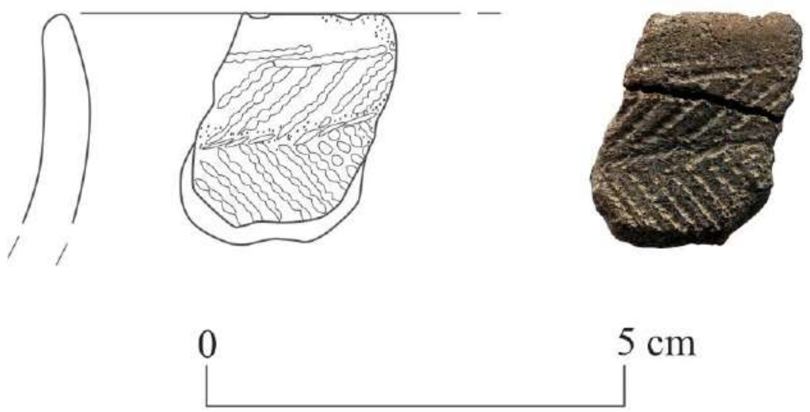


Figure 4.16. Bell Beaker fragments from the area of tomb 1, burial site near the Temple of Cerere.

The preliminary study of the pottery record carried out by Albore Livadie *et al.* (2011) formed the basis for the typo-chronological seriation of the burials, which was only been partially published. This relative chronology proposed that the most ancient burials were tombs 5 and 2, followed by tomb 1, and then tomb 4. The validity of this hypothesis is still to be tested since the burials yielded a great many pottery fragments, some of which are yet to be studied, while no radiocarbon dates are available. Indeed, during the final stage of recording, carried out during my internship at the Museo Archeologico Nazionale di Paestum, I identified a more extensive and diverse assemblage of pottery, including a large number of ceramic fragments and some domestic wares from the burials. Furthermore, a possible transitional phase between the Late Neolithic (following the Serra d'Alto and Diana occupation) and Early Copper Age could also be identified though the style of the ceramics, subsequent to the Final Neolithic Serra d'Alto and Diana occupation. This shows similarities with the first phase of the *Agorà* context outlined below. The ceramic assemblage is described in further detail in Chapter 6.

In summary, the chronology of the site near the Temple of Cerere is hard to assess and therefore also its relationship with the nearby site of the *Agorà*, outlined below. The former is characterised by a possible short Late Neolithic–Early Copper Age (4000-3650 BC) occupation phase followed by a considerable Laterza mortuary use during the 3rd millennium BC, which is comparable to the large collective burials from Apulia (e.g., the Laterza cemetery, Biancofiore 1967). The Bell Beaker evidence also attests to occupation of the area continuing into the Late Copper Age (2900-2300 BC).

4.3.1.3. Paestum – the Agorà

The discovery and excavation of this site is the most recent in the investigation of prehistoric Paestum. It is located about 200m south-west of the previously discussed site (near the Temple of Cerere), lying in the area of the Greek *Agorà* (see Figure 4.5 and Figure 4.13 in yellow). Between July 2007 and October 2008, an excavation campaign was carried out under the scientific direction of Marina Cipriani from the Soprintendenza Archeologica delle Province di Salerno, Avellino e Benevento and Director of the Museo Archeologico Nazionale di Paestum (P.O.R Campania 2000/2006 project). Sounding no. 321 led to the discovery of a prehistoric occupation in an area occupied by two historical shrines and buildings (Figure 4.17).

The main excavation area, shown in Figure 4.17, yielded evidence of a lengthy human residential occupation from the Early Copper Age to the Recent Bronze Age (1350-1150 BC), with the most intense occupation in the Middle-Late Copper Age (3100-2300 BC), when burials were also established.

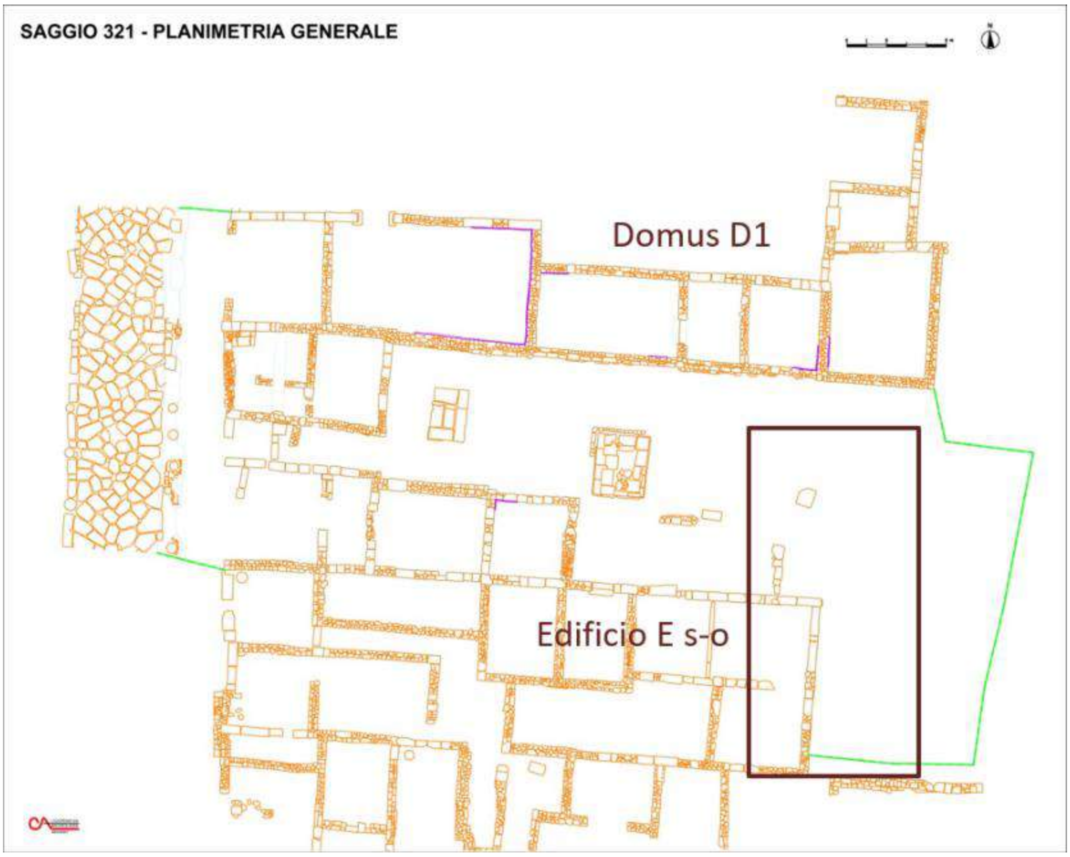


Figure 4.17. Plan of sounding 321; the area of the prehistoric finds is outlined by the brown rectangle.

The excavation was complex both due to its proximity to historic structures and to severe disturbance in subsequent periods. The unpublished report, plans, and photographs of the excavation are stored in the Museo Archeologico di Paestum. A reanalysis of these archival records and of the archaeological material was the object of my Bachelor's degree research, under the supervision of Paola Aurino and with the bioarchaeological support of Melania Gigante and Filiberto Chilleri. In the original excavation report, the chronology of this area was divided into several phases (I–V) and sub-periods (1–7 for each phase), which did not appear to correspond either with the material remains or the thin stratigraphy. The reanalysis led to a clearer understanding of the site and its phases according to the stratigraphy, a reconstruction of ceramics and the spatial distribution of the human remains. The development of this prehistoric site will therefore be presented here based on this reassessment, which also distinguished spatially two homogeneous nuclei. Three main phases of occupation could be distinguished:

1) an early phase indicated by a small assemblage of Early Copper Age (c. 3900-3650 BC) pottery that is distributed across the whole area of the excavation (phase I, Figure 4.18);

2) a longer and more complex phase dated to the Middle–Late Copper Age (c. 3100-2300 BC) characterised by the presence of disturbed mortuary evidences in a possible settlement area (phase II, Figure 4.18); and

3) a find-spot dated to the Recent Bronze Age, testified only by few pottery fragments (nucleus I).

Only the first two phases, which are chronologically relevant to the present discussion, are considered in detail below.

The first, earlier phase yielded stylistically homogeneous materials distributed over the whole area. They lay on top of the travertine bedrock, in a depression (Figure 4.18). Typo-chronological analysis suggests that this dates to between the end of the Neolithic and the beginning of the Copper Age, loosely in the first half of the 4th millennium BC (Pacciarelli and Talamo 2011). The pottery assemblage is stylistically homogeneous, comprising mainly coarse trunco-conical shallow bowls and some small finer vessels. Neolithic characteristics can still be recognised in some features and in the composition of the fabrics (Muntoni *et al.* 2015). A similar phase is attested at the site of Pontecagnano (highway excavations - see Section 4.3.2.1), and at the site of Foglianise, S. Maria a' Peccerella (Langella *et al.* 2008). In addition to ceramics, a few other artefacts were recovered, including a chipped stone blade. An important piece of evidence is represented by a bronze axe, typologically assigned to the Bronze Age. It was probably displaced from the overlying Recent Bronze Age deposits during the subsequent disturbances of the area. A small number of human remains identified were probably also displaced from the upper burial levels dating to the Middle-Late Copper Age (3100-2300 BC).

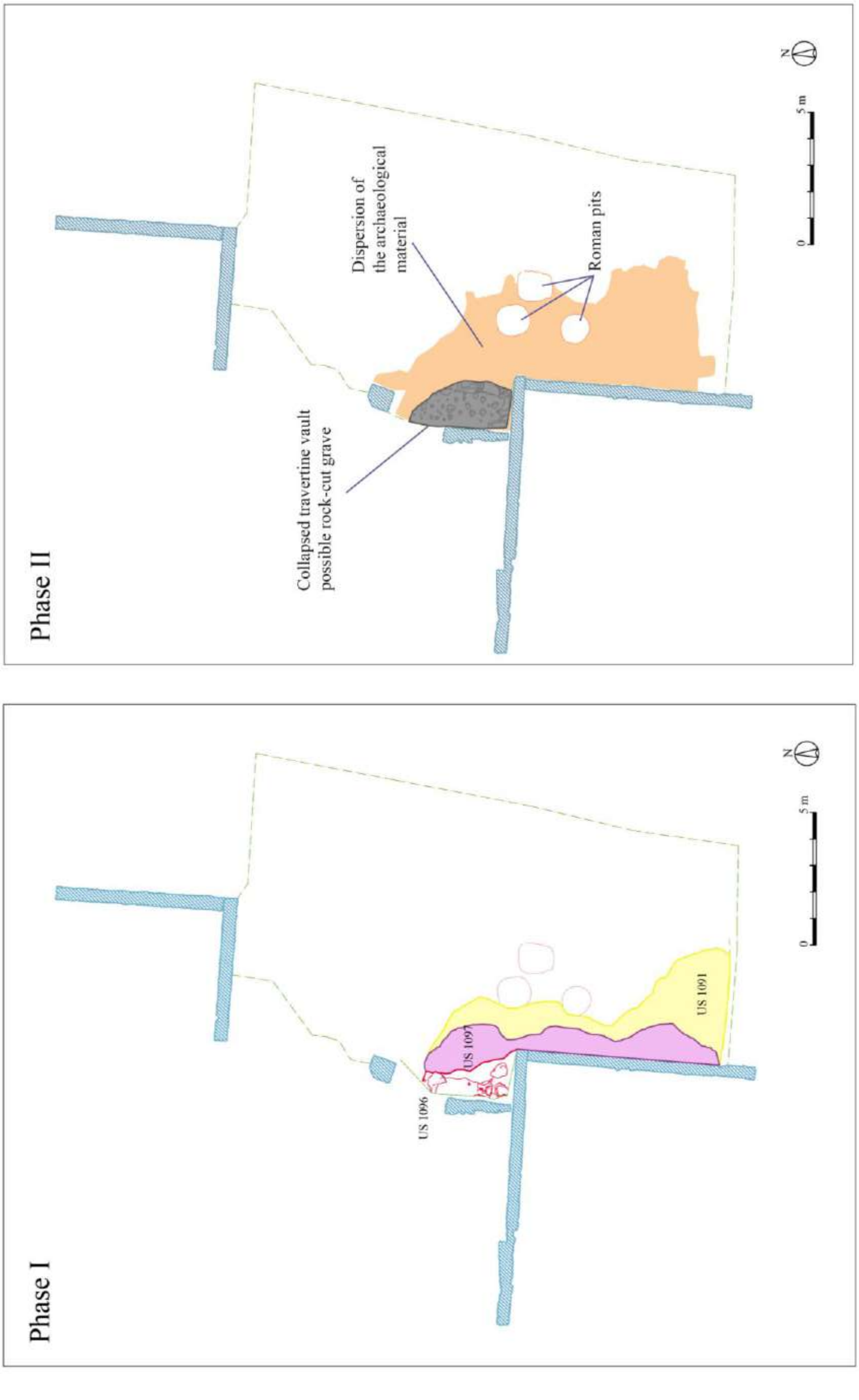


Figure 4.18. Topographic plan of phase I and phase II evidence.

The second phase of occupation is represented by more abundant deposits extending across a larger area. In the north west portion of the excavation was found a collapsed travertine vault probably belonging to a rock cut tomb. In fact, the site yielded a high number of human remains (preliminary MNI of 36 overall) scattered in the whole area, probably as a consequence of the later foundation of the roman buildings wall (phase II in Figure 4.18) with the consequent dispersal of the grave’s content in the adjacent area. It must be noted, that the layers directly underneath the collapsed vault yielded one whole vessel (a bowl with a small foot) containing a flint arrowhead, a human phalanx and a metacarpal bone deposed in a small niche of the travertine bedrock and not disturbed by later activities. From the same area also two almost complete vessels were found (a small bowl and a high handled cup, Figure 4.19.4).

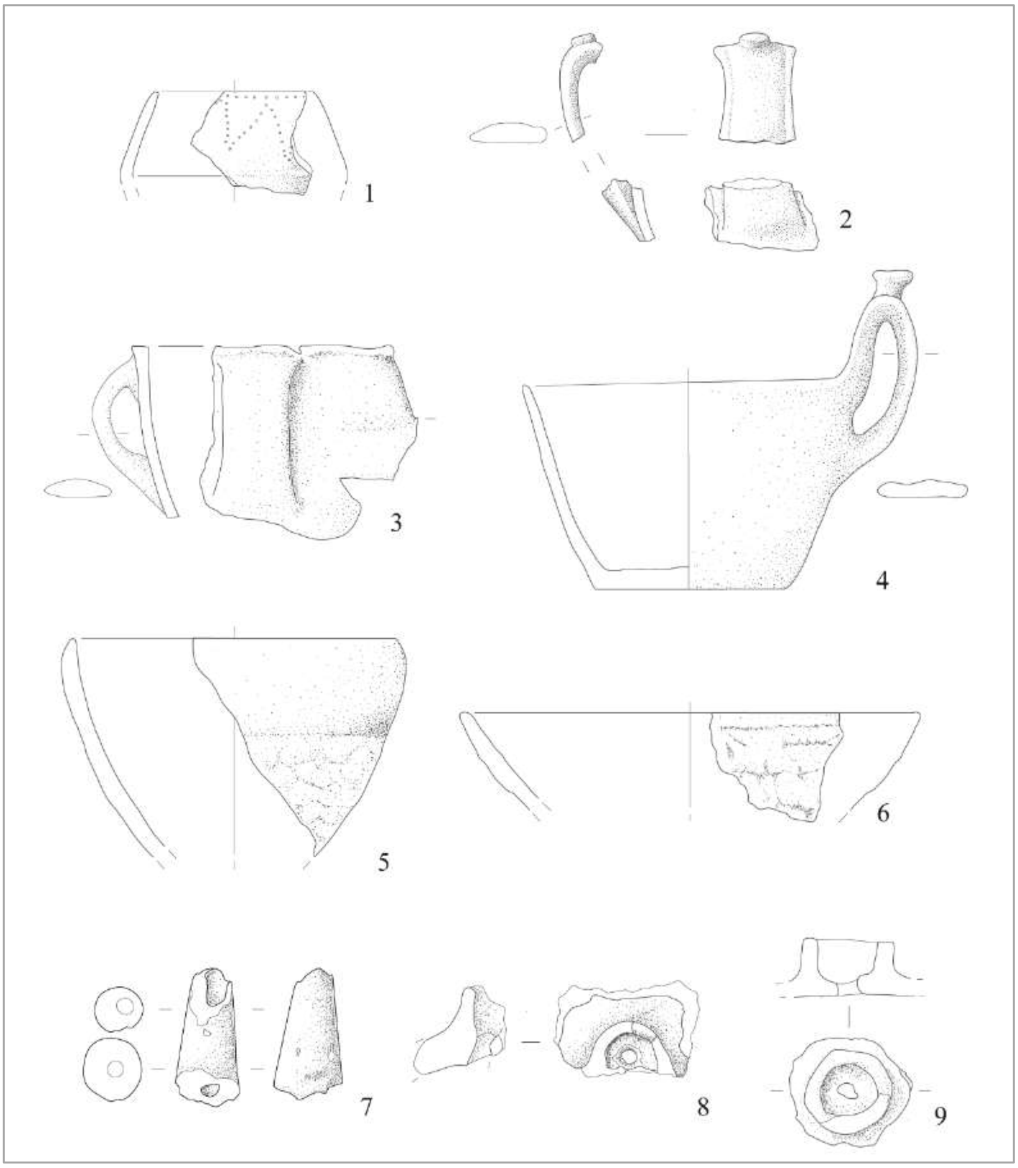


Figure 4.19. Ceramic materials from the Agorà, phase II.

The stratigraphic location and state of preservation of these findings might suggest their original deposition as grave goods. The other conspicuous archaeological materials yielded by the area cannot be clearly linked either to the collapsed grave or to other structures. The presence of several tools and objects for productive or daily activities (such a tuyère, several portable slabs, spindle whorls and loom weights and a boiler lid, e.g. Figure 4.19. 7–9) suggests that the site was occupied also by a settlement of the same chronological phase. Other classes of materials are also represented: six stone tools, two perforated shells and several faunal remains.

The high number of human individuals (preliminary MNI of 36) might suggest a collective burial similar to those identified in the area of the Temple of Cerere or the presence of more than one disturbed graves. Nevertheless, the intense disturbance of the area in later phases prevents any clear understanding of the original mortuary and possible settlement structures. The complete analysis of both the human and faunal remains is ongoing and unpublished. Evidence of a further mortuary deposit is reported nearby. A poorly preserved burial was found inside room 4 of Domus D1; only a cranium is represented, and part of a rough stone structure (Figure 4.20). The burial was heavily damaged by the foundations of a later water system. This might suggest that the Copper Age mortuary site extended further north in the area of the Domus D1 (Figure 4.17).

Overall, the area investigated by Sounding 321 clearly has a mortuary dimension as well as traces of domestic and productive activities.

Figure 4.20. The human burial found in room 4 of domus D1, with remains of the cranium of the inhumed individual (434) and the tomb structure (435).

A multiphased site

Taken together, the prehistoric evidence from Paestum shows a lengthy human occupation of an area of the travertine plateau in the southern Sele Plain. After the Late Neolithic Diana culture (ca. 4500-3800 BC) occupation, a successive phase at the beginning of the Copper Age, probably in the first half of the 4th millennium BC, is attested both in the *Agorà* and in the area of the Temple of Cerere. After this minor occupation, the large Gaudo cemetery was established slightly north of the plateau and used for almost a millennium, from the mid-4th to the mid-3rd millennium BC. Almost 2km away, probably during the 3rd millennium, a further mortuary site was established near the (historic) Temple of Cerere with mortuary practices and grave goods very different to those of the highly coded Gaudo funerary tradition. Another mortuary and settlement zone developed in the area of the *Agorà*.

The lack of radiocarbon dates for the Temple of Cerere and the Agorà excavation areas prevents any clear determination of the chronological relations between the three sites discussed above. Nevertheless, the lengthy duration of the Gaudo cemetery, from the mid-4th until the mid-3rd millennium, implies a degree of contemporaneity.

4.3.2. Pontecagnano (Salerno)

The site of Pontecagnano lies in the northern part of the Sele Plain, in the province of Salerno, in southern Campania (Figure 4.4). It has a long history of occupation, peaking in the Iron Age with the Villanovan occupation that led to the establishment of one of the most important of the small number of Etruscan sites of southern Italy. Large-scale excavations in the area, mainly in response of modern commercial expansion, have allowed a thorough investigation of the site and its past environment. In total, it has yielded over 10,000 burials from prehistoric and historic periods. For the Copper Age, the main evidence is funerary, represented by a small Gaudo culture cemetery and some further burials. In recent years, a second site, centred on an Early Copper Age hut, was discovered during a large-scale preliminary excavation for the widening of a highway. The two sites, described in detail below, are only about 1.5km apart (Figure 4.21).

Figure 4.21. Map of the modern city of Pontecagnano Faiano with indication of the Copper Age evidence. The shaded area represents the extent of the ancient Etruscan and Roman settlement. 1) Burial ground in Pastini locality; 2) Tomb 1497 in the S. Antonio locality; 3) Tombs 548 and 551 in the S. Antonio locality; 4) Deposits 554 and 632 in the S. Antonio locality (after Pellegrino and Rossi 2011: 16, fig. 6).

4.3.2.1. Pontecagnano – the Early Copper Age settlement

The works related to the widening of the Salerno-Reggio Calabria highway were a great opportunity to investigate a long strip of land lying north-east of the modern city of Pontecagnano. An archaeological programme was organised by a joint team from the Università degli Studi di Salerno and the Università degli Studi di Napoli 'L'Orientale' under the supervision of the Soprintendenza Archeologica di Salerno. The highway runs through the north-eastern part of the ancient Roman settlement of Pontecagnano (Figure 4.21). The excavations were carried out in two campaigns, between 2001 and 2002 and between 2005 and 2006. They examined a 2km-long strip running alongside the highway, divided into 60 trenches (the black and white line in Figure 4.21). The results of the excavation were partly published by Pellegrino and Rossi (2011). During the second campaign, an Early Copper Age settlement was detected in trenches 20, 20B and 21. Further finds are reported in trenches 14 and 15, and 56 and 57, but not yet fully published. Evidence dating to the Neolithic and Bronze Age periods was also uncovered (Aurino 2011).

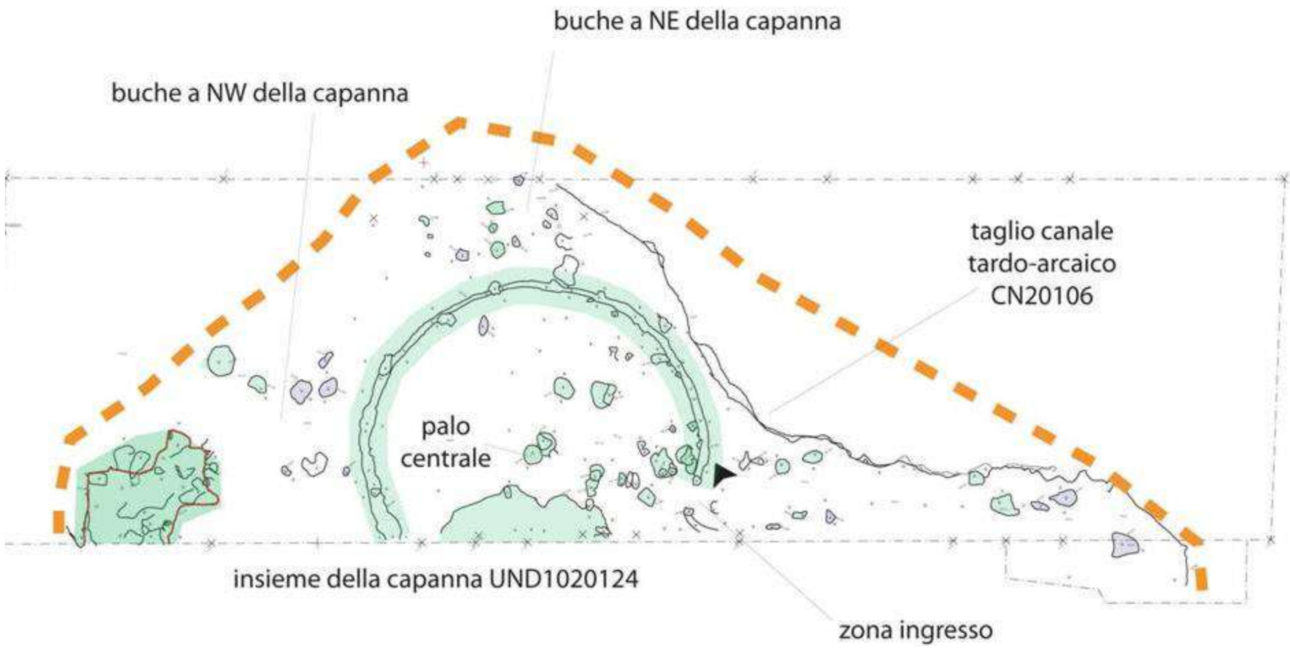


Figure 4.22. Early Copper Age hut (UND002) from Pontecagnano, Anas excavations (Aurino 2011).

The main evidence is concentrated in trenches 20, 20B and 21 where the Early Copper Age hut was discovered. The settlement, located on a travertine plateau extended for about 150m between trenches 15 and 20B. The hut (UND002), located in trench 20, was situated near a paleochannel running along the western side of the plateau (Figure 4.22). The hut was circular in shape with a foundation ditch dug into the soft travertine with 10 embedded post-holes; it had a diameter of about 6m. The entrance was on the southern side, as indicated by an interruption in the foundation ditch. The roof was supported by two central posts and by further external supports. About 70 post-holes dug into the travertine between trenches 20 and 21, 5m north-west of the hut structure, were probably related to associated structures. Based on analogies with Copper Age structures identified in the Rome area, the hut might have been used both as a dwelling place and also for activities such as food storage (Aurino 2011: 40, after Carboni 2002: 76). The material culture from the hut and from the adjoining structures dates them to a very early phase of the Copper Age, in the first half of the 4th millennium BC (Aurino 2011).

As at Paestum, Agorà phase I, the pottery is characterised both by traditional Neolithic features (Figure 4.23) and by shapes and decoration that would later become widespread during the Copper Age (Figure 4.23.1–22.3; Aurino 2011: 40). Similar characteristics are also attested in trenches 14 and 15, almost 100–120m from the hut. Lithic artefacts are limited to just a few flint blades and a single obsidian bladelet.

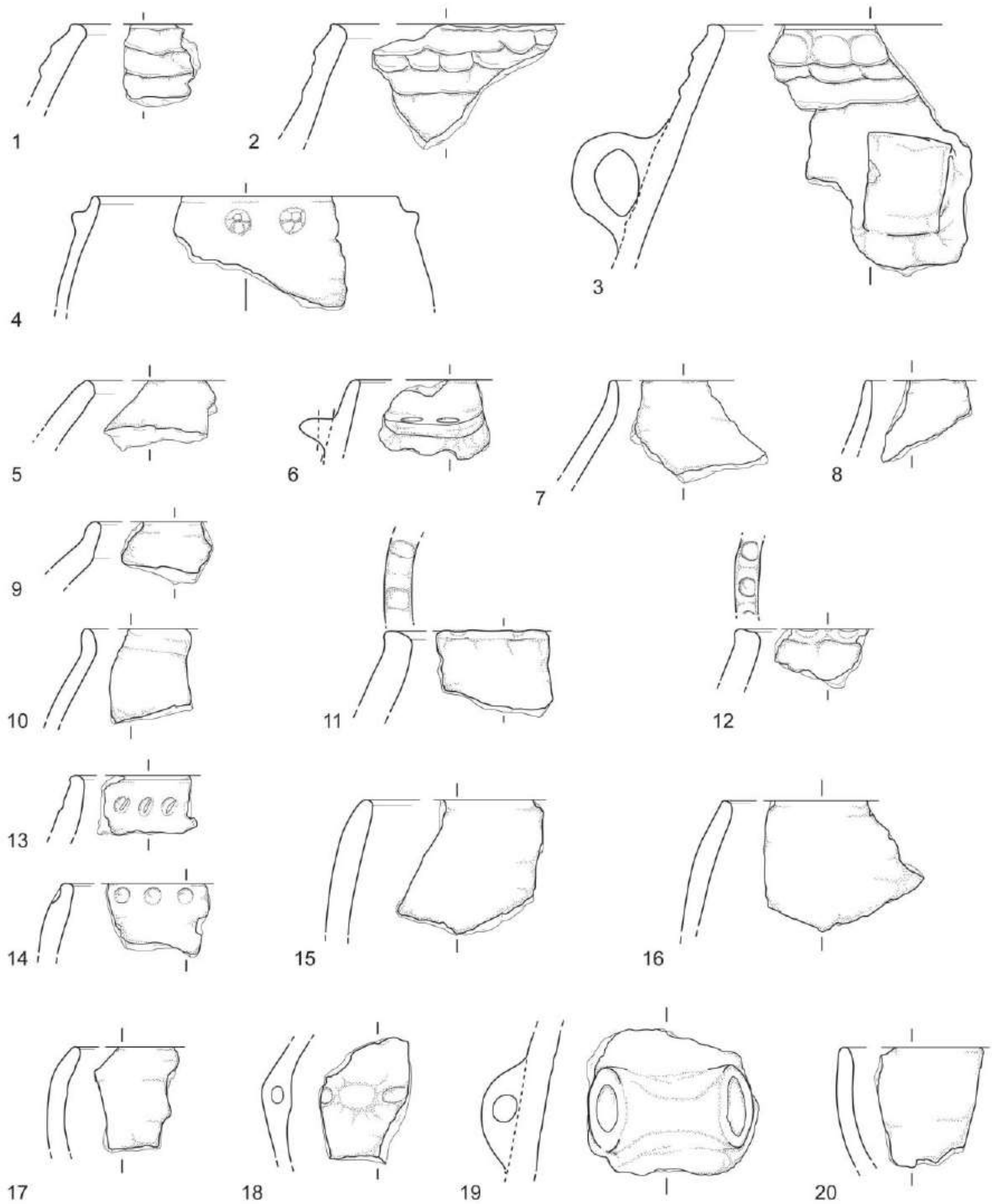


Figure 4.23. Selected ceramics from the Early Copper Age hut, Pontecagnano highway excavations (Aurino 2013, fig. 3-4).

The Early Copper Age settlement occupied the whole travertine plateau, extending between trenches 14 and 21 (Aurino 2011: 44). A second settlement unit was also detected on the other side of the highway, in the Pastini locality, in trenches 56 and 57, mainly represented by post-holes (Tocco Sciarelli 2002: 632–63). As with the main settlement, the structures were probably located near to an ancient stream. Several large bowls were found on the bottom of the paleochannel, suggesting the exploitation of the stream during the daily activities of the village (Aurino 2011: 44).

This Early Copper Age site provides important new evidence of the period between the last Neolithic cultures, such as Serra d'Alto and Diana, and the first Copper Age ones, such as Taurasi and Gaudo. The blurred definition of this interim period, which is roughly placed in the first half of the 4th millennium BC, does not allow proper consideration of the socio-economic features of the communities who lived at this time; labels such as 'Neolithic' and 'Copper Age' are somewhat arbitrary. Nevertheless, the evidence from Pontecagnano, together with that from Paestum, is starting to shed light on this phase, which is better documented in north-eastern Campania (Talamo 2008a). Later Middle Copper Age (3650-2900 BC) evidence is also attested less than 2km away.

4.3.2.2. Pontecagnano - the mortuary sites

The excavation of the Copper Age mortuary sites of Pontecagnano is one of the most important in Southern Italy for the determination of the main features of the Gaudo culture. It was undertaken in 1992, in the context of modern commercial work and, thanks to the scientific accuracy of the fieldwork, the complex rituals that led to the formation of the burials were investigated and documented in detail. The publication of the excavation also allowed the creation of a typology of all the materials then known for the Gaudo culture and a more accurate assessment of Gaudo ritual practices (Bailo Modesti and Salerno 1998).

The most extensive Copper Age mortuary evidence from Pontecagnano comes from two main areas: the Copper Age cemetery near the River Picentino, and minor evidence in the S. Antonio locality on the south-eastern side of the modern (and ancient Etruscan/Roman) settlement, 2km away (Figure 4.21 n. 1). The cemetery comprises ten rock-cut tombs with entrance shafts (Figure 4.24). Only one burial, tomb 6515, was found to be damaged.

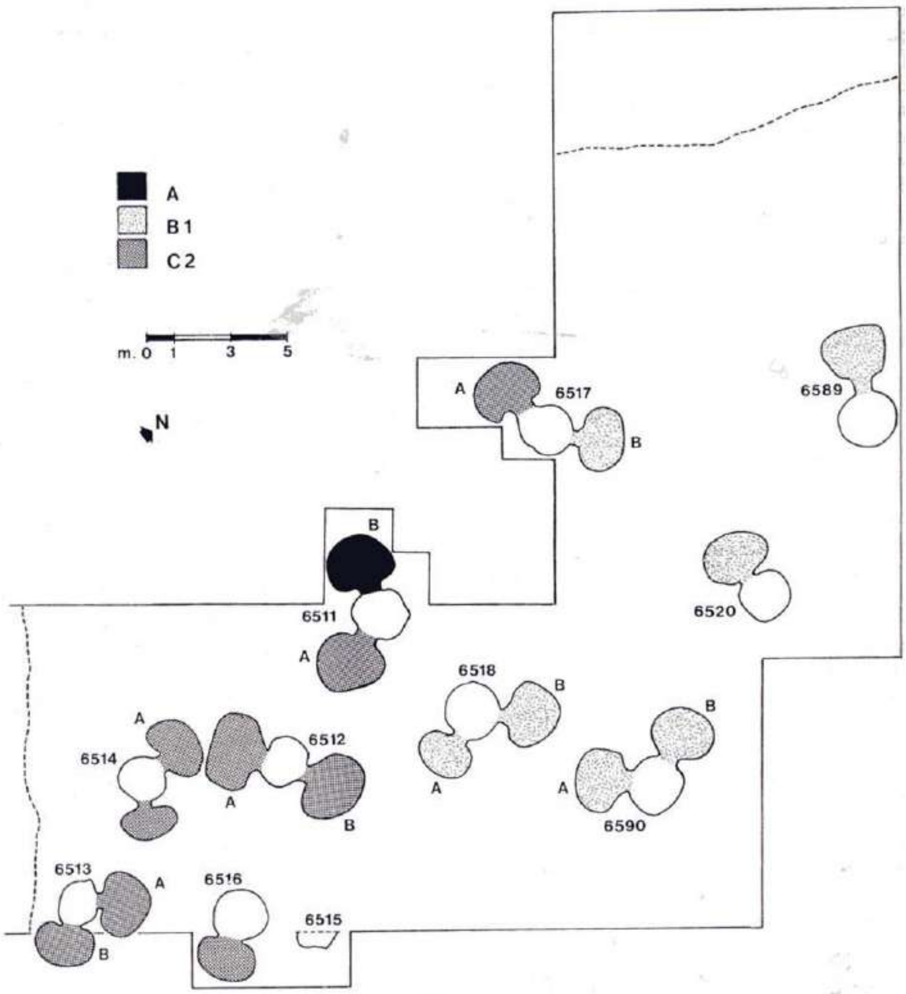


Figure 4.24. Plan of the Gaudo cemetery in Pastini, Pontecagnano with distribution of the tombs: A) burials with individuals in anatomical connection; B1) individuals in anatomical connection and few disarticulated bones; C2) only secondary depositions with disarticulated bones gathered in small groups (Bailo Modesti and Salerno 1998: fig. 77).

The tombs were dug into the Grey Campanian Tuff to a depth of 1.50–1.70m below modern ground level. It is highly likely that the cemetery extended to the south-east of the excavation trenches, but the area could not be further investigated. Seven of the graves had two chambers (tombs 6511, 6512, 6513, 6514, 6517, 6518, 6590), three had one chamber (tombs 6516, 6520, 6589), and one, partly destroyed, was of uncertain form (6515). A total of 18 burial chambers were recorded. A further tomb was probably located between tombs 6511 and 6517 but was not excavated. The relatively large proportion of double-chambered burials is peculiar to this site, although the number might be biased by the partial excavation of what is probably a larger cemetery site.

An unusual feature is represented by cut 6519, located near burial 6590. This represented only the rough structure of a Gaudo tomb, with a travertine slab on the base suggesting that the digging into the tuff was started but not completed, probably to avoid cutting tomb 6590. Tomb chambers with skeletons in anatomical connection are concentrated in the eastern area, in contrast to those containing disarticulated bones. This spatial pattern might be regarded as intentional, and in contrast to that identified at the Paestum cemetery, although the data might be biased at the former by the partial excavation of a larger cemetery.

All the tombs had a circular entrance shaft varying in dimension and depth but always large enough to accommodate ritual acts. In most of the cases, a travertine slab sealed the entrance to each chamber in the same fashion as at Paestum cemetery. A common feature of the Pontecagnano tombs is the presence of a small *dromos* (passageway) at the beginning of the chamber.

The rituals carried out in the entrance shaft appear to have been quite variable. Various combinations of ceramics known for the Gaudo culture are attested: no materials (tomb 6516); one group of pottery vessels including a jar (e.g., tomb 6517A shown in Figure 4.25); two groups of vessels placed at 90° to each other along the central axes of the shaft (e.g., tombs 6513 shown in Figure 4.26); and only fragmented pots (e.g., tombs 6512 and 6514).

Figure 4.25. View of the entrance shaft of tomb 6517 during the excavation; the ceramic ritual set is still at the bottom of the shaft in front of the travertine slab sealing the burial chamber (Bailo Modesti and Salerno 1998: tab. 14.1).

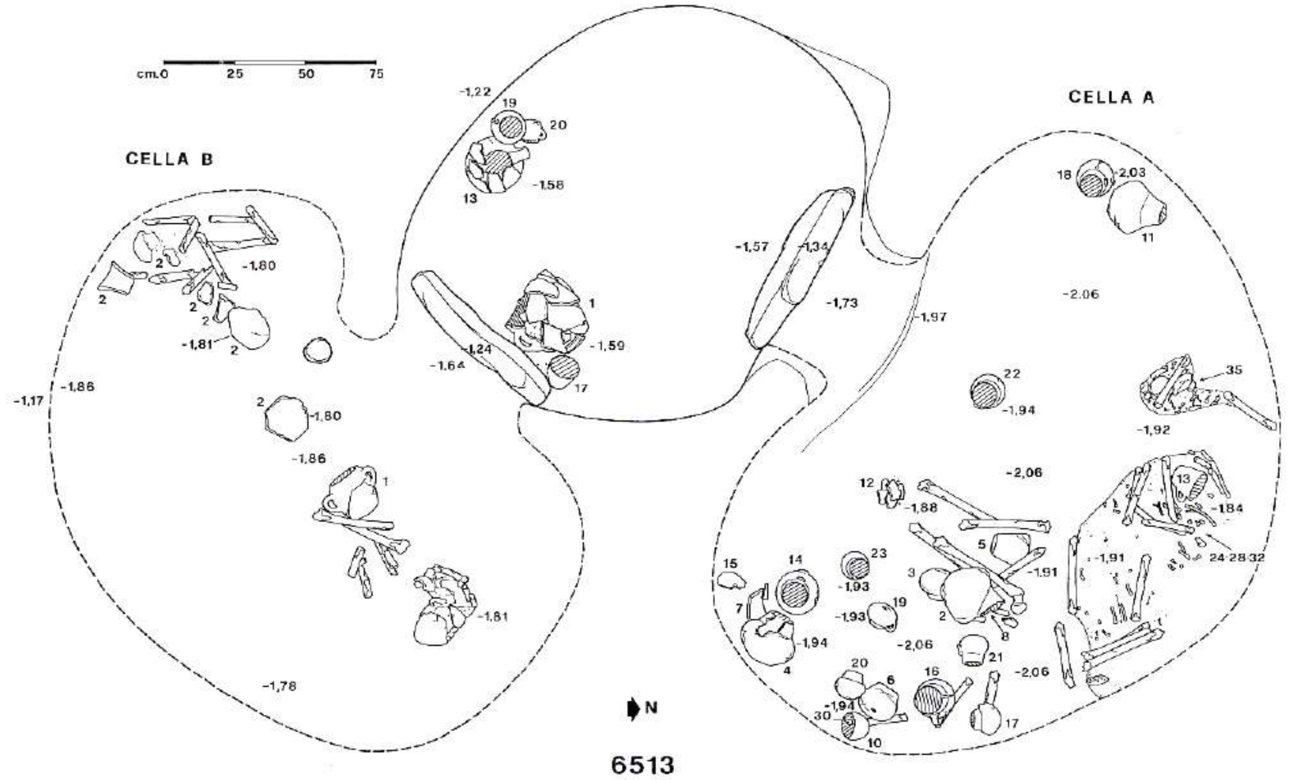


Figure 4.26. Plan of tomb 6513, Pontecagnano, Pastini (Bailo Modesti and Salerno 1998: tab. 36).

An unusual arrangement was observed for burials 6517A and 6589, each of which contained a single ceramic group comprising a jar and a fine vessel of varying form (e.g., cup, jug or pyxis) placed in the entrance shaft; in the chamber, a distinct assemblage was placed at the feet of the articulated body: a jug, sometimes a dagger, and animal remains. This was interpreted as a possible connection to the rituals carried out in the entrance shaft (Bailo Modesti and Salerno 1998: 42–3).

The mortuary deposits in the burial chambers are less variable than in the case of Paestum (Figure 4.24). Only burial 6511B contained the remains of a single individual crouched on the left side and lacking any grave goods. This is unusual since it suggests that, after the deposition, no further ritual was performed in the tomb. More commonly, the burial chambers yielded the remains of one or more individuals in anatomical connection together with disarticulated bones (tombs 6517A, 6518A and B, 6589, 6590A and B). Disarticulated bones were in some cases moved aside to make space for a new body (tombs 6589 and 6590A and B) or carefully selected with a preference for long bones (6517A). Tomb 6514B presents a more complex situation. Disarticulated bones from a single individual were divided between the two chambers and some also placed in tomb 6512. The close relationship between these two burials is also highlighted by the ceramics: some vessels could only be reconstructed using sherds recovered from the chambers and shafts of both tombs. This might indicate, indeed have drawn attention to, a close family link between the deceased individuals in the two burials, although aDNA would be required to confirm this hypothesis. Finally, the so-called 'tomb ossuaries' are quite common at Pontecagnano (tombs 6512, 6513, 6514A, 6517B and possibly also tomb 6516). Based on stratigraphic and post-depositional observation that the disarticulated bones were always found lying on a small organic layer on top of the floor of the tomb, the excavators hypothesised that the bones were originally contained or wrapped in some kind of organic material (Bailo Modesti and Salerno 1998: 42).

Based on a preliminary anthropological analysis of the human remains (Petrone and Bernardi 1998), some information on the minimum number, sex and age of the deceased can be outlined. Overall, the burial site yielded the remains of an estimated 57 individuals: 24 males, 11 females, 15 juveniles and 12 undeterminable. Tombs 6513 and 6514 contained the most individuals with nine present in each. In the case of tomb 6514, it is possible that fewer individuals were present since, as noted, the bones might have been divided between the two chambers. Generally, both sexes are represented in burial chambers, however it is notable that bodies left in anatomical connection are largely limited to adults or subadult males (a single possible exception being represented by a uncertain adult female in tomb 6514B). Most individuals are aged between 20 and 40 years, with a smaller group aged between 13 and 19. Only three mature females are represented and no infants are attested. The adult male in tomb 6589 survived a cranial trepanation.

Alongside human bones, four chambers also yielded animal remains (tombs 6517A and B, 6589 and 6590), generally deposited near the feet of an individual in anatomical connection. The species most commonly attested is sheep/goat, followed by pig and cattle. Dog bones were also recovered from both chambers of tomb 6517.

Turning to the material culture, the site of Pontecagnano yielded 250 archaeological objects. These are mostly ceramic vessels (78%), followed by weapons and tools (generally in flint), and only two metal items: copper daggers found in burials 6589 and 6590B. As at Paestum, the pottery is frequently present both in the shaft and in the burial chamber, whilst stone and metal objects are attested only in the chambers. The pottery is discussed in detail in Chapter 6 but, compared to Paestum, unusual shapes such as the *askos*, twin vessels and the *pyxides* are quite rare in relation to the more common jars, bowls, cups and jugs (some examples are shown in Figure 4.27). A spindle whorl is recorded in tomb 6513. The most frequent lithic items are arrowheads and monofacially flaked daggers, while a few microliths, blades and flakes were also recovered.

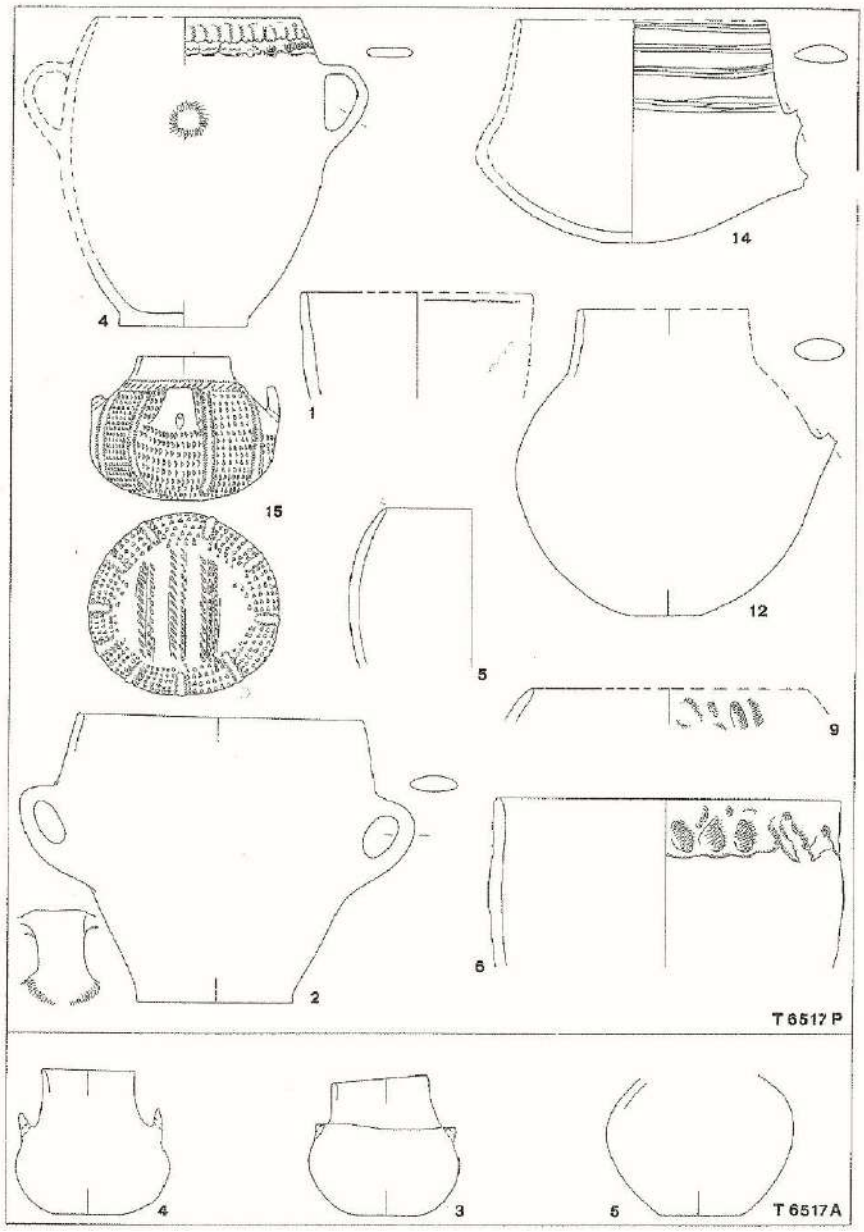


Figure 4.27. Pottery from the entrance shaft and chamber A of burial 6517 (Bailo Modesti and Salerno 1998: tab. 47).

The careful excavation of the cemetery has allowed analysis of relationships between the grave goods and human remains. Only in a few cases do the objects appear to be intentionally located in connection with the deceased. For articulated individuals, a dagger, an arrowhead or a microlith are often located at the side of the body or mixed with the bones. In some cases, a pottery vessel was placed directly above the cranium, on the body, or in close proximity as shown in Figure 4.28. Most vessels are, however, located along the walls or scattered in the chamber, without reference to any specific individual. Another arrangement observed is the placement of a group of pottery vessels, a dagger and animal bones near the feet of articulated bodies. In burials with only disarticulated bones, the number of vessels is generally more abundant and includes mainly cups and open forms.

Figure 4.28. View of tomb 6590 burial chamber seen from the entrance shaft (Bailo Modesti and Salerno 1998: tab. 26.1).

In addition to the well documented Gaudo culture cemetery described above, further Copper Age mortuary evidence is reported in another area of Pontecagnano (Bailo Modesti and Salerno 1998: 35–8), 2km away, in the S. Antonio locality (Figure 4.21 n. 2–4). Here two tombs and two so-called '*depositi*' (deposits) were found. The tombs, 548 and 551, which were damaged by later graves, each contained only one individual placed in a crouched position on the right-hand side. Tomb 548 was probably a trench grave; only two small jars were included as grave goods, one near the head and the other near the feet of the deceased. Tomb 551, which was badly damaged, might have been partially rock-cut; the only grave good was a cup. The *depositi* (nos. 632 and 654) were pits without human remains. They both yielded only pottery objects: one *patera* (shallow bowl) and one small jar. The unusual nature of the evidence from S. Antonio is echoed in the typology of the pottery, which exhibits affinities with the Laterza culture rather than the Gaudo culture.

Further evidence comes from burial 1497 in the same area (Figure 4.29; Bailo Modesti and Salerno 1998: 36). This is a rock-cut tomb, badly damaged by a later grave, with an entrance shaft and one burial chamber. The latter contained the remains of two adults, poorly preserved, but probably in anatomical connection. The form of the tomb and some of the ceramic finds initially suggested a classic Gaudo culture burial (D'Agostino 1974: 88–90; Bailo Modesti and Salerno 1998: 36), but the presence of a cup with parallels, once again, to the Laterza culture, suggests a more complex history (Talamo 2008b), as is the case for other Laterza culture finds in the area, with a situation similar to that at Paestum, where Gaudo and Laterza culture evidence is found just a few kilometres apart.

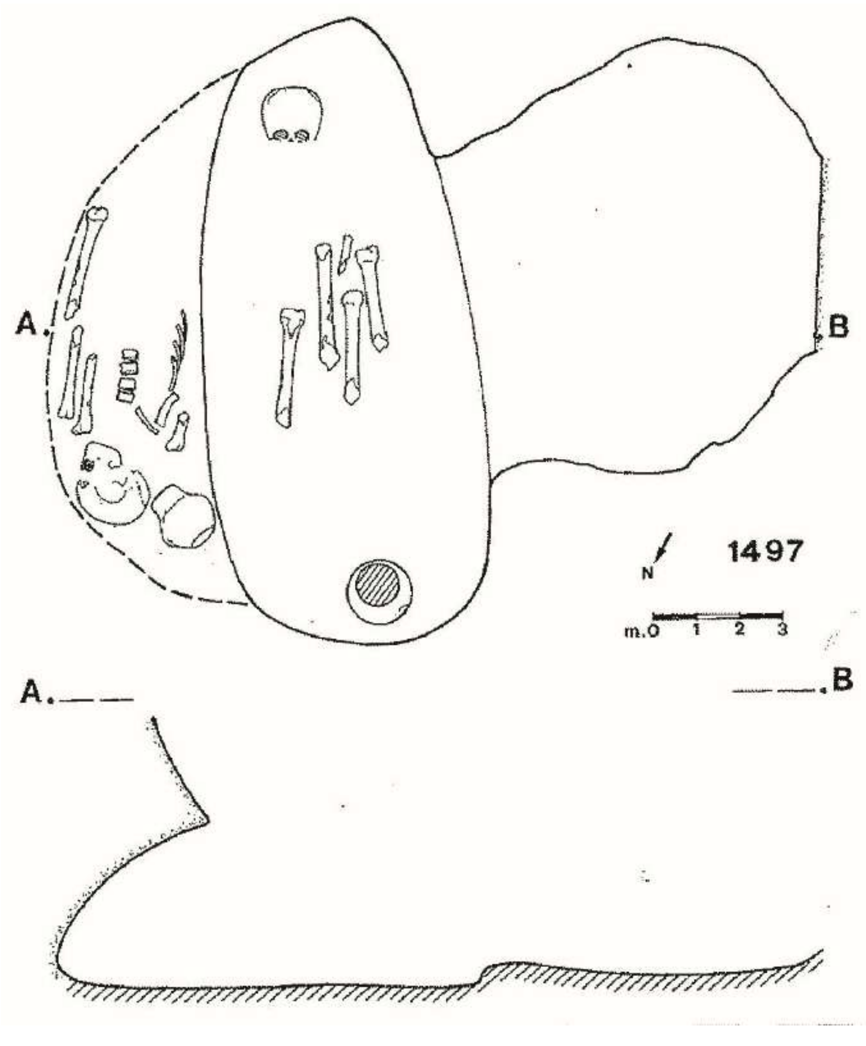


Figure 4.29. Plan of burial 1497, S. Antonio, Pontecagnano (Bailo Modesti and Salerno 1998: 36, fig. 10).

To conclude, the Middle/Late Copper Age evidence from the site of Pontecagnano shows exclusively mortuary activities. It is particularly interesting that two Copper Age mortuary sites are located on either side of the later Roman-Etruscan settlement: a Gaudo one near the Picentino River, and a Laterza culture one at S. Antonio. Hopefully, a radiocarbon dating campaign planned for this site will help clarify their chronological relationship.

4.3.3. Sala Consilina (Salerno)

The site of Sala Consilina, locality Capo La Piazza, is situated on the edge of the Maddalena Mountains in the Vallo di Diano depression (Figure 4.30). A rescue excavation was carried out in 2006 and 2007 by the Soprintendenza Archeologia Belle Arti e Paesaggio per la provincia di Salerno and coordinated by Pierfrancesco Talamo (2008; Talamo *et al.* 2011). The investigation brought to light an extensive archaeological site, with two distinct phases of occupation, both referable to the Copper Age. The area was later abandoned and covered by a thick detrital deposit, formed by materials from the slopes of the nearby Maddalena Mountains, in which sparse remains from the Roman period were scattered. The two phases of occupation are found in the same area and are still in the course of study; therefore, only preliminary information are available on this archaeological site.

Figure 4.30. Location of the sites analysed in the Vallo di Diano: Sala Consilina and Atena Lucana (red dots).

4.3.3.1. Sala Consilina – the cremation burials

Deposits assigned to the first phase of occupation of the site yielded two structures with dry-stone foundation walls, with a plan not clearly identifiable due to the subsequent disturbance of the area. Several cremation urn burials were found, both inside and outside the structures. Further vessels were deposited near the cremation urns, presumably containing ritual offerings. The vessels were found fragmented *in situ* and subsequently refitted. Few objects of other materials were found, such as a small metal pendant still under investigation.

Figure 4.31. Pottery vessels from the first phase of occupation of Sala Consilina.

The type of structures and the cremation rite find strong parallels with the site of Taurasi (see Chapter 2.4.2) suggesting a date around the middle of the 4th millennium BC. The ceramic repertoire displayed in Figure 4.31 is represented mostly by ovoid and globular jars without handles (n. 3-4) or with vertical tunnel handles (n. 1-2), in one case with a striking grooved decoration (n. 1). Further vessel forms attested are small jars (n. 5-6), small bowls (n. 7-8), and large truncated cone-shaped bowls with a single horizontal tunnel handle (n. 9), in one case with a grooved decoration on the inside of the rim (n. 10). These vessel types do not show correspondence with the Taurasi assemblage besides the use of grooved decoration. On the contrary, they find general parallels with Early Copper Age styles, especially Piano Conte (Pessina and Tinè 2008), and with the assemblage from the slightly earlier site of Casalbore (Gangemi 1988), as it will be further addressed in Chapters 6 and 8.

4.3.3.2. Sala Consilina – the trench graves

The second phase of occupation of the site is exclusively represented by five trench graves with inhumations and a scarce grave good composed only by few ceramic objects. The graves (tombs 1073 to 1077) are located ‘near the stone structures, but never directly overlapping them’ (Talamo 2008a: 157). Due to the style of the artefacts and burial customs these tombs have been assigned typologically to a later phase of occupation, corresponding to Laterza cultural tradition. Four of the five inhumations were radiocarbon dated to the first half of the 3rd millennium BC (Talamo *et al*. 2011), confirming this hypothesis. The calibrated dates (see Table 2.2, Chapter 2) and grave goods from each burial are summarised below:

- Tomb 1073: 2867-2583 cal. BC, 2σ, yielded two small hemispheric bowls, one with a false handle, a small slightly carinated bowl and a few ceramic fragments (Figure 4.32 n. 1-2);
- Tomb 1074: 2871-2626 cal. BC, 2σ, yielded one flake of flint and a few coarseware fragments;
- Tomb 1075: yielded only few ceramic fragments, one with scaled decoration;
- Tomb 1076: 2851-2573 cal. BC, 2σ, yielded one globular small jar with a double loop handle (Figure 4.32 n. 3) and a fragment of a small carinated bowl;
- Tomb 1077: 2884-2639 cal. BC, 2σ, yielded a small jar with a low neck (Figure 4.32 n. 4) and several coarseware fragments from the fill.

Figure 4.32. Pottery materials from the second phase of occupation of Sala Consilina with trench graves.

Overall, the two contexts appear as distinct phases of occupation of the same area, by the middle of the 4th millennium and then in the first half of the 3rd millennium BC. It is possible that the stone structures could have been still visible in the following phase of occupation and therefore used as a focus for mortuary deposition.

4.3.4. Atena Lucana (Salerno)

In the northern part of the Vallo di Diano, at Atena Lucana in the locality of Fosso Aimone, a settlement was explored in the years 2005-2007 during work to widen the Salerno-Reggio Calabria motorway. The site is located at the foot of the valley slope, about 8 km from Sala Consilina (Figure 4.30). The site is still under investigation therefore only preliminary information are currently available. The occupation is represented by a large paleo-surface with two structures probably identifiable as houses. The walls were built with a dry-stone foundation and wood framed upper indicated by post holes. The plan of the structures is rectangular with one apse (Figure 4.33 left) details of the dimensions have not yet been published. Outside one of the structures, a pit was found to contain a large jar deposited upside down. In the same area as the pit, the abundant presence of baked clay suggests the presence of firing structures in a production zone (Figure 4.33 right).

Figure 4.33. Excavation at the site of Atena Lucana, locality Fosso Aimone, left: detail of the apse of one of the structures; right: detail of the production zone area with exposure to fire.

Charcoal from the firing structure was radiocarbon dated to 2568-2067 cal. BC, 2σ (Talamo *et al.* 2011, Chapter 2.4, table 2.2), setting the occupation of the site between the Late and Final phases of the Copper Age and the beginning of the Early Bronze Age (generally set around 2200 BC). The ceramic assemblage also points to a date in the last centuries of the 3rd millennium BC due to the presence of decorations and vessel forms of the Cetina style (Forenbaher 2018). This type of pottery is generally dated to the second half of the 3rd millennium BC, possibly continuing into the first centuries of the 2nd millennium BC (Recchia and Cazzella 2017; Gori *et al.* 2018). The most striking example of Cetina style pottery from the site is the handled beaker displayed in Figure 4.34, n. 1, which finds close parallels both in South-East Italy, n. 2, and in the Balkans, n. 3-4. The settlement yielded a large amount of archaeological material still in course of study.

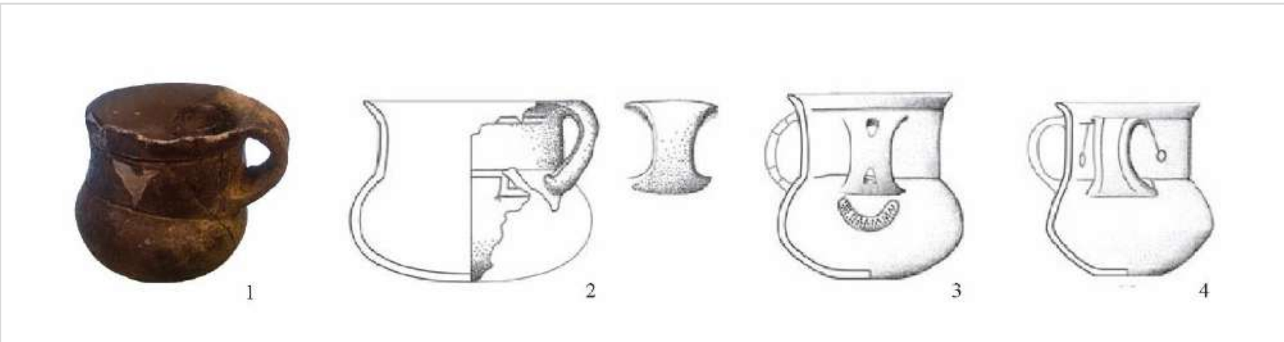


Figure 4.34. Typical Cetina style handled beaker from Atena Lucana (1) and parallels from South-East Italy, Pisciulo, Casal Sabini (2, after Cataldo 1996) and from Lukovača (3-4, after Forenbaher 2018, fig. 5).

Despite the limited published information (Talamo *et al.* 2011), this site has frequently been the object of discussion in the archaeological literature (Arcuri *et al.* 2016; Gori *et al.* 2018; Recchia 2020), given its location west of the Apennine chain where only a few examples of materials displaying connections to the trans-Adriatic culture of Cetina are known. To investigate the nature of this connection further in the present study, the ceramic assemblage was initially sorted then materials with Cetina style decoration sampled for preliminary characterisation.

Further details of these, and all the other, ceramic materials introduced above will be provided in Chapter 6, after clarifying the macroscopic and microscopic methods used in their analysis (Chapter 5).

Chapter 5 - Methods: from macroscopic to microscopic observation

5.1. Aims of this chapter

This chapter will focus on the stages of research and empirical methods used to collect data from the ceramic assemblages of the four sites selected and described in Chapter 4. The first phase of the study involved the macroscopic examination of the ceramic assemblage from each site, which focused mainly on features relating to shape and finishing. All the information relevant to the identification of the vessel (morphology, typology and technology) were recorded in a database (Section 5.2). The second stage involved sampling the ceramic assemblage for archaeometric analyses (5.3) and the archaeometric analyses themselves (5.4) followed by the interpretation and combination of the data collected in each stage.

5.2. Macroscopic observations

Macroscopic observations were carried out and recorded in a database, on the whole ceramic assemblage, when possible, from each of the four sites analysed. The number of ceramics and features recorded depended largely on the characteristics of the assemblage and its state of preservation. Published data, generally integrated with first-hand observations, were also incorporated. The main criteria leading the data recording were the reliability of the ceramic's stratigraphic provenance and its chronological attribution. Most of the sites analysed are multiphase and, in some cases, the type of excavation (often undertaken in the 1960s) or the state of preservation of the record (dependent on storage conditions) prevented precise stratigraphic and chronological attribution of sherds. Where these data were not completely reliable, macroscopic observations were recorded only for ceramics from clear or closed contexts (like tombs) or for diagnostic ceramics, i.e., whole or fragmented vessels with stylistically or chronologically relevant features, also referred to as 'feature' sherds (PCRG 1997: 30). By excluding unattributable sherds (such as those from undecorated vessel bodies or bases) or from insecure contexts, any risk of an over- or under-representation of certain contexts or phases was eliminated.

For the site of Atena Lucana, due to the type of site and the stage of research, macroscopic data were available only for the samples selected for archaeometric analysis. This site is an extensive settlement which yielded a large quantity of archaeological materials. It is also currently unpublished, and its ceramics have only been subject to a preliminarily analysis as part of a Master's research programme (D'Agostino 2020). Nevetheless, the site is particularly relevant to the current study since it is the only example attested in Campania with features specific to the Late Copper Age–Early Bronze Age Četina style. For this reason it was still selected for archaeometric analysis of the most characteristic Cetina pottery in order to compare its ceramic production with the nearby site of Sala Consilina, where Early Copper Age (Taurasi culture) and Late Copper Age (Laterza culture) activities are attested. This analysis should be considered preliminary, to assess the fabrics and technologies used for pottery making. It should also be noted that the assemblage was not included in broader macroscopic and typological comparisons with pottery production of the other sites analysed.

All the data were collected in an Excel database, with each context recorded in a different data sheet (see example in Table 5.1). The database design was based on an adaptation and combination of different techniques for describing Italian prehistoric pottery developed during my undergraduate and Master's research (De Falco 2012, 2016) with elements from the recording sheet suggested by the Prehistoric Ceramic Research Group (PCRG 1997) and other approaches presented in the literature (Levi 2010; Rice 2015). Firstly, information about the identification of each specimen was recorded, including inventory number (when present), place of preservation, and archaeological provenance (area, tomb number, chamber or shaft, stratigraphic unit). Additional information included the relative chronology (Early Copper Age, Taurasi, Gaudo, Laterza or Cetina cultures), the state of documentation (photo and drawing), and notes and observations. The macroscopic, typological, and technological data recorded are outlined in detail in the following sections.

Identification			
N. Inv.	US	Place of preservation	Provenance

Form								
Vessel category	Type	Body Part	State of Preservation	Height	Length (max)	Diameter	Thick. (min)	Thick. (max)

Technology					
Ware	Macro fabric	Surf. treat (in)	Surf. treat (out)	Surface (color)	Firing

Technology				
Decoration technique	Decoration position	Decoration motif	Technological traces	Functional traces

Additional information			
Chronology	Drawing	Photo	Notes

Table 5.1. Example of the database framework for ceramic macroscopic features recording.

5.2.1. Form

The ‘Form’ section of the database contained all information contributing to the definition of the shape of the vessel, whole or fragmentary. ‘Vessel category’ and ‘Type’ refer to the general shape of the vessel (clarified further below); other fields are descriptive of the vessel: ‘State of preservation’ (such as whole, restored, in fragments, etc.), the vessel part if not completely preserved (e.g., rim, body, base, handle, etc.), and its dimensions. When the pot was incomplete, the maximum height of the sherd was recorded, when possible, also taking into consideration the inclination. ‘Length’ was measured at the maximum extension of the sherd; it was not measured for whole vessels. The diameter was measured at the rim for whole vessels; in the case of rim or large enough body fragments, it was geometrically reconstructed (Leonardi and Pennello 1991; Rice

2015: 239), but this was not always possible due to the irregularity of the vessels and consequently the asymmetry of the rim. Maximum and minimum thickness was recorded for each vessel, generally for the body and the rim. In addition to providing information about morphology, the thickness is an important indicator of technological characteristics, such as stability and mechanical and thermal shock resistance (Rice 2015: 327), and also of functional aspects (Rice 2015: 418); it can also provide useful information relating to production techniques (Ther 2020).

Given the aim of the present research to combine technological and typological data referring to different cultural trends, the definition of shapes and the typological approach were carefully considered. It was essential to use a typology of vessel forms which could be reliably applied to distinct cultural trends and chronological phases. A further aim was to assess the effectiveness of the traditionally used typology by checking whether specific ceramic types and styles correspond to distinctive technological features (e.g. temper, surface treatment, etc.). Therefore, both the broader 'Vessel category' and more specific 'Type' were used to detect any technological uniformity or variability at two different levels of detail. The traditional Italian typological approach was combined with broader technological and productive observations (Rice 2015: 208), as explained in detail below.

Italian archaeologists have developed a detailed typological approach to categorise prehistoric periods (Peroni 1994; Cocchi Genick 1998) yet the creation, by traditional means, of a coherent typology for Copper Age pottery has proved challenging (as made clear in Cocchi Genick 2013) due to its intrinsic characteristics of broadly circulating types (such as flask vases and *askoi*) coupled with a high level of local variability; it lies between the simpler Neolithic pottery forms and the more complex but also more standardised Bronze Age repertoire. For these latter periods, scholars have developed effective typologies and approaches. In the case of Neolithic pottery, the typology is based mainly on geometric nomenclature and criteria to avoid over-specialised classifications which would not reflect the simple and probably broadly multifunctional forms (Pessina and Tiné 2008; Tiné 2009). For more specific traditions, Italian archaeologists have developed regional or cultural typologies to better reflect the distinctiveness of pottery productions characterised by unique features, as exemplified by Serra d'Alto ware and Square Mouthed Pottery (Chimenti *et al.* 1999; Mazzieri and Bernabò Brea 2012). In the case of Bronze Age pottery, a more specialised typology was developed based on shapes and possible functions (Peroni 1994, 1998; Cardarelli *et al.* 1999; Recchia 1997, 2010; c.f. Sarti 1989, 2005). Bronze Age typology strongly contributed to the definition of chrono-typologies thanks to the extensive and intensively studied excavations available for the period (e.g., Cardarelli 2009 and references). During this period, the recurrence of specific types and attributes hints at a more specialised production and use of the pottery vessels with a larger territorial distribution.

Returning to Copper Age pottery, the distinctions between vessel types appears more blurred. Simpler shapes (similar to geometric Neolithic examples) predominate in the Early Copper Age with more variable and more complex forms emerging in the Late Copper Age. After initial systematising work, deeply rooted in the later protohistoric approach (such as Peroni 1971), several typological classifications have been created for single 'cultures', chronological phases or contexts (e.g., Longhi 2010 for the Remedello culture; Cazzella and Moscoloni 1999 for the site of Conelle di Arcevia and 'Conelle' culture; Manfredini 2002 for the site of Maccarese; Del Fattore *et al.* 2017 for the Early Copper Age; Anzidei and Carboni 2020 for the area of Rome; Bailo Modesti and Salerno 1998 for the Gaudo culture). These regional or cultural typologies are generally based on deductive and empirical criteria (as opposed to the *typologie analytique* after Laplace 1975 used by Sarti 2005). They provide useful groupings and 'parallels' but often at the cost of complicating the classification and interpretation of the ceramic record. In fact, narrow classifications create too many sub-divisions due to stylistic variations and these do not necessarily correspond to functional and technological differences. A shift in the typological approach to Copper Age pottery is represented by the work of Cocchi Genick, who built a reference typology for northern and central Italy based on broader morphological classes and metric criteria (Cocchi Genick 2008, 2012). This approach was deductive and empirical, and aimed to create classes of vessels, such as necked jars and biconical vessels, characterised by common features (Cocchi Genick 2008: 12). This resulted in very broad typological classes based on specific features (such as the presence/absence of a neck) often overlooking other attributes that were of great importance both in the technological process and for functional purposes (such as the presence and type of handles or the type of decoration). Despite providing a tool for the organisation of the Copper Age pottery record and highlighting the need for a more effective approach, this typology was never widely adopted due to several internal inconsistencies, most resulting from highly restrictive morphological distinctions that overlooked functional attributes.

In the present research, the starting point was the main typology available for the Campania region, as developed for the Gaudo culture by Bailo Modesti and Salerno (1998). The aim for the current work was to verify this classification and broaden it to include the whole pottery production of Campania during the Copper Age. Bailo Modesti and Salerno's typology is organised according to hierarchical criteria from 'families', which are broader groups related to function (e.g., jar), to 'types' (e.g., ovoid jar), to 'varieties' (e.g., ovoid jar with straight rim; Bailo Modesti and Salerno 1998: 96; Peroni 1995: 16–19; Bailo Modesti *et al.* 1999). In the international literature, the main unit of classification is 'type', i.e., vessels with recurring combinations of attributes (e.g., shape of rim, number and shape of the handles, body shape; Rice 2015: 231; Bortolini 2016: 657). For the present research the most relevant level of classification was vessel types (e.g., jugs, jars, shallow bowls etc.; corresponding to 'families' in Bailo Modesti and Salerno 1998 and to 'categories' in Cocchi Genick 2008) which could easily group pottery from all the ceramic traditions of the period. Some types were not considered since their form was barely discernible, an example being 'amphorae', which showed no major difference from double-handled jars (Bailo Modesti and Salerno 1998: 107). Narrower varieties (following the type-variety approach, Rice 2015: 230–1) were not considered given their high number and the high variability of the pottery record of the period. Rather, types were further analysed to identify broader vessel categories, rather than narrower varieties, which could also reflect different intended functions and productive steps. For a clarification of the typological terms used see the glossary in Appendix 1. Vessel types were organised according to the following use-related properties which can determine the design of the vessel (Rice 2015):

a) The mouth opening and its dimensional relationship with the maximum diameter of the vessel (i.e., restricted vs. unrestricted opening).
b) The presence and shape of the handles, i.e., one or two handles, and their grip.

The organisation of the shapes according to these criteria is shown in Figure 5.1. Since these characteristics are not completely exclusive (the opening can be more or less restricted), typological families were organised within a gradient from restricted to unrestricted opening in combination with either no handle, a single or a double handle. These two features are just two of the many characteristics of a vessel but they nevertheless imply a clear choice during the productive process which significantly influences the shape.

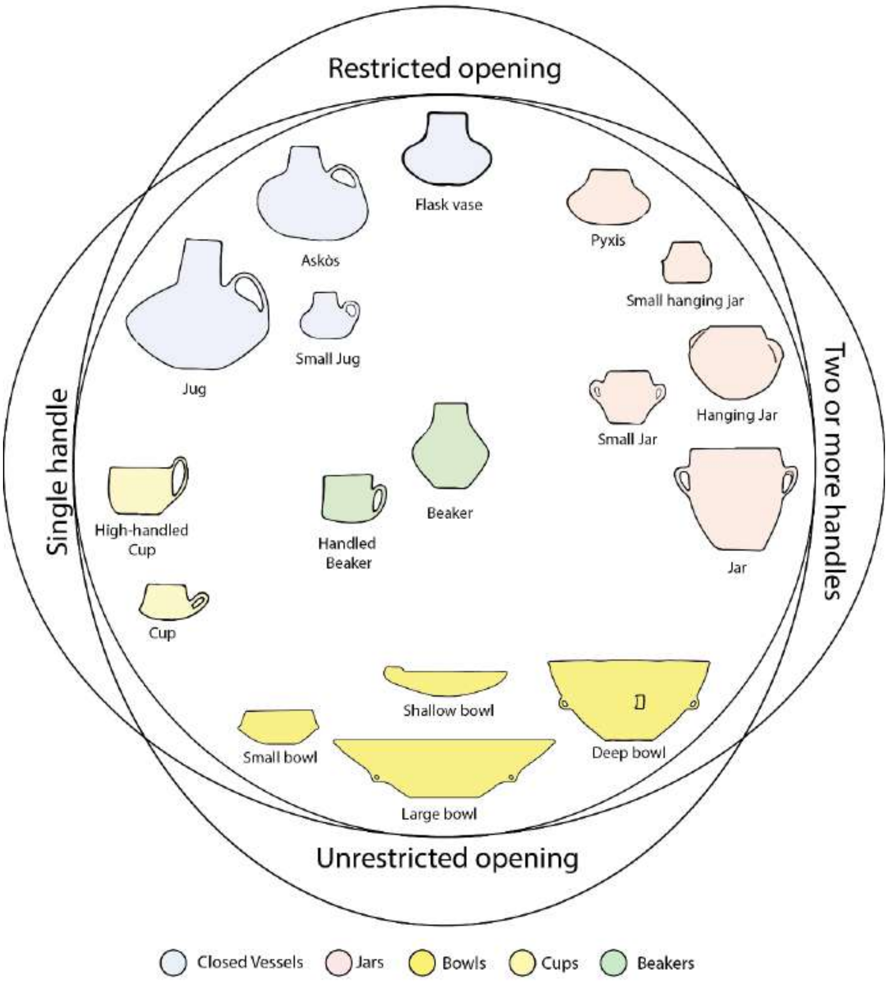


Figure 5.1. Organisation of typological families according to morphological criteria.

The opening is often the part of a vessel most specifically changed or adapted to distinct uses (Rice 1987: 236). Vessels with an unrestricted opening are useful for holding frequently used goods since the content can be easily accessed using hands or utensils. The contents of the vessel are also more visible, which is especially important when the vessel is used to serve food. Restricted openings, on the other hand, help to contain the contents, especially liquids, preventing spillage during serving and processing. For cooking pots, small openings reduce evaporation of the contents and, for storage vessels, they can easily be closed with a lid or stopper (Rice 2015: 236). Handles are also an important feature, and their morphology can provide clues to the use of the vessel: vertical tunnel handles are more suited for hanging the vessel than for hand-holding it;

high overhanging handles might be useful for scooping or drawing liquids; single handles are more adapted to pouring or drinking; while double loop handles can be firmly grasped. Based on these considerations, the main vessel categories and types considered are summarised in Table 5.2 along with their corresponding Italian terms and a description.

Vessel Category	Type	Type *Italian term*	Description	Example
Closed vessels Restricted opening, generally necked, with none or single handle, taller than wide, with the widest part at the body.	**Jug (big and small)**	*Brocca e Brocchetta*	Restricted opening with neck, single loop handle	
	Askòs	*Askòs*	Restricted offset opening with neck, single loop handle	
	Flask vase	*Vaso a fiasco*	Restricted opening with neck, no handles or vertical tubular handles for hanging	
Jars Slightly restricted opening. Taller than wide, with the widest part near the opening.	**Pyxis**	*Pisside*	Restricted opening with neck, holes for hanging and a conical lid	
	Small hanging jar	*Orcioletto*	Restricted opening with holes or holed lugs for hanging	
	Hanging jar	*Olla con anse verticali*	Restricted opening with holes or vertical tubular handles for hanging	
	Jar (big and small)	*Olla e olletta*	Slightly restricted opening, generally two opposed loop handles	
Bowls Wide unrestricted opening, wider than tall, with widest part at the rim.	**Small bowl**	*Ciotola*	Unrestricted or slightly restricted opening, generally hemispherical	
	Deep bowl	*Scodella*	Unrestricted opening, deep and generally with truncated cone shape	
	Large bowl	*Scodellone*	Unrestricted opening, large, truncated cone shape often with horizontal tubular handles	
	Shallow bowl	*Patera*	Wide unrestricted opening, shallow and generally subspherical	
Cups Restricted and unrestricted opening, smaller shapes with single handle	**Cup**	*Tazza*	Slightly restricted opening, shallow, single loop handle	
	High handled cup	*Attingitoio*	Generally unrestricted opening, single overhanging handle	
	Twin vessel	*Saliera*	Two cups joined by a bridge	
Beakers Slightly restricted opening, single or no handle	**Beaker**	*Bicchiere*	Slightly restricted or flaring opening, handle-less	
	Handled beaker	*Boccale*	Slightly restricted opening, single handle	

Table 5.2. Typological table with morphological categories, typological families with equivalent Italian terms, and descriptions.

For example, the types ‘jugs’ and ‘*askoi*’ both have a closed neck shape, with an expanded body and a single handle. Both have features suitable for pouring and holding liquids. Therefore, they have been grouped in the vessel category of ‘closed vessels’, together with ‘flask vases’, which share the same characteristics (although they lack the handle they can easily be grasped by the neck).

Other functional ceramic objects were also recorded and, in some cases, selected for archaeometric analysis in order to provide a wider understanding of the production process of ceramic artefacts. These additional objects included ceramic slabs. They are a few centimetres thick and generally circular with rounded or oblique edges. On their lower side they have impressions of organic material, probably grass or other plants, while the upper side is smoothed. These kind of artefacts, fired at low temperatures, are generally interpreted as cooking or work surfaces (e.g., Moffa 2007; Debandi *et al.* 2019). Other categories of ceramic artefacts examined included lids for boilers, flat discs with various holes, and a *tuyère*. When detected, fragments of wattle and daub were also selected for analysis. These are particularly relevant for archaeometric analyses since they are generally made with local, easily accessible materials which might be indicative of the local clay composition (Amicone *et al.* 2020).

5.2.2. Technology

All features that reflect different steps of the productive process were recorded, including forming techniques, surface treatment, decoration and firing. These stages are particularly relevant since they are the outcome of learned moves and gestures carried out by potters with a ‘practical consciousness’ (Ther 2020: 172) which is often considered to be one of the most conservative aspects of human behaviour (e.g., Nicklin 1971; Arnold 1985; Gosselain 2000, 2008; Roux *et al.* 2017). This practical consciousness ‘represents complex and deeply rooted bonds between mind, body, and environment’ reflecting ‘individual links in the social networks in which the potters were embedded’ (Ther 2020: 2; see also Lemonnier 1992, 1993; Dobres 2000). Therefore, for the present analysis it was particularly relevant to record these features and verify their occurrence between different sites, phases and cultural entities. A further aim was to assess their distribution between morphological categories and typological families to detect any correlation between technology, shape and function.

The first feature considered was the ‘ware’. This is a classification of the pottery record often used in the Anglo-American tradition (Rice 1976, 2015: 230–1), roughly corresponding to ‘class’ in Italian prehistoric ceramic studies (Levi 2010; Levi and Vanzetti 2009). The concept combines typological and technological attributes such as fabric, surface treatment, decoration, colour etc.: ‘fundamental defining criteria are aspects of composition, manufacturing technology or surface treatment’ (Rice 2015: 231). In the Italian literature, ‘classes’ are generally defined as ‘pottery productions characterised by specific stylistic and technical features, typical of a certain geographic area in a certain time period’ (Levi 2010: 7). Ceramic ‘wares’, in the Anglo-American tradition, are different to ‘classes’ in that they also relate to productive and sometimes functional characteristics. This conception of wares is widely used for later periods, from the Bronze Age onwards, when pottery products are clearly specialised and different wares tend to correspond to different modes, areas and even workshops of production (e.g., Italo-Mycenaean ware, Jones *et al.* 2014; Roman Sigillata ware). It must be noted that, in the contemporary literature on pottery, the term ‘ware’ is used inconsistently to indicate ceramic assemblages characterised by a specific attribute, for example the same decoration technique (e.g., dark burnished ware in the Balkan tradition, Amicone *et al.* 2020), the same function (e.g., kitchen ware or table ware), or paste composition (e.g., coarse/fine ware). In relation to the Italian Neolithic and Copper Age, this concept is mainly linked to differences in the macroscopic fabric, the most common distinction being between ‘fine’, ‘coarse’ and ‘figulina’ wares, based on the use of different raw materials or their diverse processing (e.g., presence/absence of depuration) suggesting separate production stages. While this distinction is effective for the Italian Neolithic, it is less informative for the Copper Age. In the case of Neolithic pottery, specific shapes, decorations and treatments are mainly linked to fine, coarse and figulina wares (e.g., the painted decoration almost exclusively occurring on *figulina* ware, Laviano and Muntoni 2008). In the case of Copper Age ceramics, *figulina* ware is only attested in the earliest phases, in continuity with the Neolithic tradition.

Pottery assemblages are often subject to an initial rough classification into fine and coarse wares, generally based on granulometric criteria in conjunction with consideration of surface treatment and colour (Anzidei and Carboni 2020; Cazzella and Moscoloni 1999: 14; Levi and Vanzetti 2009). In the present analysis, observation of the pottery record for Copper Age Campania, and consideration of fabrics from a petrographic point of view, highlighted some inconsistencies in this binary distinction between fine and coarse ware. In fact, no major correlation was noted between the coarseness of the fabric and recurring attributes. For example, a rather coarse fabric could be found both in highly finished funerary vessels and in very rough domestic ones. It was noted, instead, that significant attention was given to surface treatment which generally recurs with specific features (shapes, type of decoration, thickness of the vessels). Therefore, a first broad classification of the pottery record of Copper Age Campania was based on the degree of surface polishing rather than on granulometric criteria. This approach was applied only as an initial means of classification prior to more specific analyses, and was tested by combining macroscopic and archaeometric results (Chapter 8) and relating surface treatment, composition, forms and decorations in order to check the eventual correspondence between wares and typological and technological attributes. This was expected to suggest the existence of a set of recurrent features (surface treatment, thickness, type of decoration, form and composition) reflecting a specific product, roughly identified by the ware. Though not exclusive, wares might help in correlating vessel sherds to a range of possible types and technological processes, supplying a useful means for a first broad classification of the pottery record during fieldwork.

For the purposes of the present research, then, three wares were defined:

- *Finished ware*: with accurately smoothed or burnished surfaces.
- *Rough ware*: with surfaces roughly regularised.
- *Scaled ware:* with partial or a fully-covered scaled outer surface.

The scaled ware category is based on the most common type of Copper Age pottery, the so called '*ceramica a squame*', a kind of decoration that appears towards the end of the Neolithic (first half of the 4th millennium BC, Talamo 2008a) and is specific to Copper Age contexts throughout Italy (e.g., Bagolini and Cremonesi 1988; Leonini and Sarti 2008; Bailo Modesti and Salerno 1998; Anzidei and Carboni 2020). As the name suggests, the main characteristic of this pottery is the textured surface treatment resembling scales, present to varying degrees, covering the whole vessel (generally on jars or bowls) or in one or more bands near the rim, and sometimes varying in shape (for a classification of the scale's shape see Talamo 2008a). The decoration is created by pressing and dragging the soft clay surface of the vessel, over the coils. Often, further clayey material is added to the surface in order to create more defined scales.

Surface treatments were recorded both for the inner and outer surface of sherds and vessels. Observation was made by eye and, for selected representative samples, also by stereomicroscope. Technological aspects of surface treatments have been widely investigated, including through several ethnoarchaeological and experimental observations (e.g., Rye 1981; Rice 1987; Arnold 1985; Roux 1994; Pétrequin and Pétrequin 1999; Livingstone-Smith 2001; Gosselain 2002). They have important implications both for aesthetic effects and functional purposes (Rice 1996; Roux 2017) such as durability (Echallier 1984; Diallo *et al.* 1995; Lepère 2014), permeability and washability (Schiffer 1990; La Torre *et al.* 2020) and even resistance to thermal shock (Schiffer 1990). Several recent studies involving in-depth analyses of macro traces have revealed valuable information relating to the techniques, gestures, and skill levels of ancient potters, providing a valuable set of reference material (Lepère 2014; Amicone *et al.* 2019; Roux 2019; Forte 2020; Derenne *et al.* 2020; Manem 2020). In the present study, in order to address the technological implications of the terminology used for surface treatment (e.g., differences between 'polishing' and 'burnishing', Lepère 2014: 145), particular consideration was given to the final outcome of the process, i.e., the nature of the finish, such as matte, lustrous, or textured. It has been widely shown that the tools and techniques used for surface finishing varied during prehistory and can be inferred by macro-traces analysis (e.g., Lepère 2014; Roux 2017; Forte 2020). At this stage of the present analysis, which considered multiple aspects from typology to petrography, and given the large pottery assemblage, the observation of the surfaces was limited to a description of the general appearance in order to carry out a preliminary macroscopic distinction, without reference to macro-traces. Clear traces of the finishing actions were ultimately reported in the 'Technological traces' section of the database. The types of surface treatments and outcomes identified are summarised in Table 5.3 (the code in parentheses was used in the database recording).

It must be noted that the surface of the vessel is not always preserved due post-depositional factors, which may also affect the survival of burnished, lustrous surfaces, which could be underrepresented due to a partial loss of the original lustre (Forte 2020: 95) with a consequent overrepresentation of matte, smoothed surfaces.

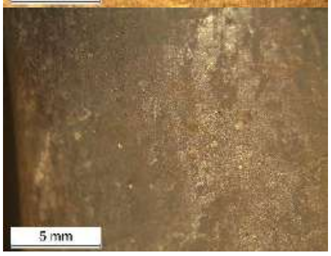
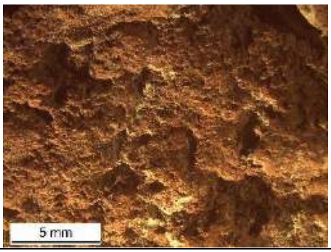
Stereomicroscopic Picture	Surface treatment description
	**Rough (R):** matte surface, no regularising actions can be detected.
	**Roughly Smoothed (S):** matte surfaces, traces of smoothing can be detected, but are not homogeneous.
	**Accurately Smoothed (S):** matte surface, homogeneous smoothing on the vessel surface.
	**Smoothed/Burnished (S/B):** matte/lustrous surfaces, smoothed but with a good light reflection, partially shining possibly resulting also by a medium polishing action or to the post-depositional degradation of the burnished surfaces.
	**Burnished (B):** lustrous surfaces, smoothing actions carried out when the clay is leather-hard or dry, with a hard or soft object (including both burnishing and polishing actions as intended in Rice 2015: 149).
	**Scaled (Sc):** matte, textured surfaces by pressing and dragging the surface of the vessel in the shape of more or less defined scales.

Table 5.3. Surface treatments identified in the studied assemblage.

A second step of macroscopic classification, also used for sampling purposes, was based on the determination of fabrics. Only features easily detectable with the naked eye were selected, such as the amount, type, and sorting of inclusions. The colour of the sherd was also recorded but this was not based on the Munsell Soil Colour Chart, since a variety of hues could be observed on a single sherd due to the uneven firing conditions of the vessels. Instead, a simplified colour coding was used: brown (dark or light), black, red, orange-red, and yellow. Based on the colour and observations of the section, a first approximate assessment of the firing condition was made: reducing, oxidising, incompletely oxidising with black core and irregular firing (Rice 1987: 331–7; Nodari *et al.* 2004; Maritan *et al.* 2006). This distinction is preliminary and largely depends on the presence in the ceramic body of iron compounds and organic matter and on the firing atmosphere (e.g., Maggetti *et al.* 2011; Gliozzo 2020); it was further investigated through XRD analysis (see Section 5.4.2).

Decorative techniques and motifs were also recorded in order to identify technological and stylistic trends over time and space. In the Copper Age, beside the above-mentioned scaled treatment, the most common types of decoration are 'impressed', 'incised' and 'plastic' (Bailo Modesti and Salerno 1998; Talamo 2008a and b). When possible, the decoration patterns were carefully observed to determine differences in the tools and techniques used (Roux 2019; Forte 2020).

All those features which could be linked to the production or use of the vessel were recorded in the 'Technological traces' and 'Functional traces' sections of the database. 'Technological traces' included additional attributes evidencing the technological process, such as shaping techniques or surface treatments. Observations regarding breakage patterns and the morphology of sherd sections were carried out to infer possible shaping techniques such as moulding and coiling (Forte 2020; Ther 2020).

5.3. Sampling strategy

The sampling strategy for archaeometric analysis was determined by the characteristics of the site, the state of preservation, and the reliability of the provenance data for the ceramics. The sites selected for the research are characterised not only by different contexts (funerary, living), but also by different histories of excavation and preservation, as noted in Section 5.2.

The sampling strategy took into account these differences while aiming to maintain a consistent approach. For all the contexts the main characteristics considered were: chronology; provenance (burials, stratigraphic units, etc.); ware; macroscopic fabric; and typology. The general sampling and sub-sampling strategy for each stage of analysis is shown in Table 5.4, alongside the main aims pursued in the analytical procedure (see Chapter 3).

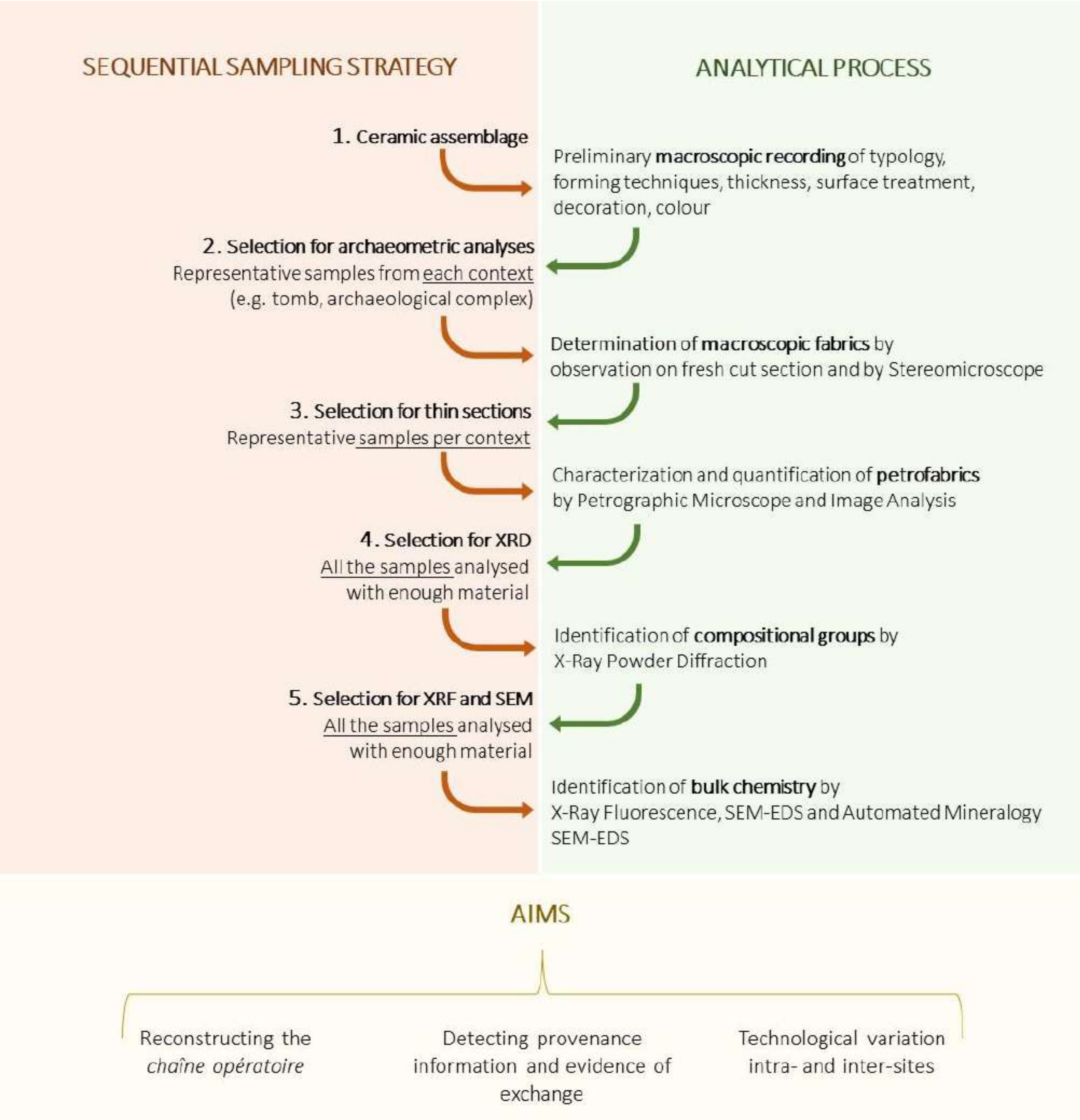


Table 5.4. Summary of the sampling strategy and analytical process.

Of the total 296 samples collected, only representative examples (225 samples, 76%), according to macroscopic fabric, class and context (based on closer macroscopic observations and in some cases also by stereomicroscope) were used for archaeometric analyses. A major target of the sampling was to ensure specimens from each specific context, such as each burial (shaft and chamber) and area of the excavation (e.g., settlement and burial areas of the Agorà, see Chapter 4.3.1.3). This was particularly important for large burial sites such as the Gaudo cemetery of Paestum where, given its long history of burial practices, changes in ceramic technology could potentially occur between burials and burial groups. The sampling strategy was limited by the availability of materials for the archaeometric analysis selected, which generally required a total of about 15g per sample.

5.4. Archaeometric analyses

Chemical and mineralogical compositional analyses are widely applied in archaeology, particularly to pottery samples (Rice 1987, 2015; Cuomo di Caprio 2010; Hunt 2016; Quinn 2022). The use of multiple techniques has been widely shown to produce reliable results in relation to both provenance (intended after Joyce 2012) and technology (Quinn 2013: 10; Rice 2015: 292, and for recent reviews see Montana 2020 and Hein and Kilikoglou 2020). For this reason, four key approaches were applied to compliment and reinforce the data acquired through each individual analytical method. Mineralogical analyses such as petrography in thin section were used to gain an initial petrographic assessment of the samples, their composition and texture; X-Ray Diffraction (XRD) was used to check the mineralogical identification and gain information on temperature-related changes in the mineral composition. X-Ray Fluorescence spectroscopy (XRF) was used to obtain the bulk chemical signature of each sample and the data were statistically treated to identify compositional groups. Scanning Electron Microscopy - Energy Dispersive Spectroscopy (SEM-EDS) was used to check specific minerals, their morphology and chemical composition. Automated mineralogical maps created by SEM-EDS were used to gain a complete qualitative and quantitative mapping of representative samples for each petrographic fabric detected. The data obtained from each method were compared and with those from the other analyses. A detailed explanation of each method and the operating procedures applied is given below.

5.4.1. Petrography in thin section

Petrographic analysis in thin section is a common strategy for the classification of ceramics, through both qualitative and quantitative identification of mineral inclusions and rock fragments (Arnold 1972; Whitbread 1987; Quinn 2010, 2013, 2022; Braekman and Degryse 2016). It is a well-established method which aims to provide a compositional characterisation, to determine a classification, to identify provenance and to reconstruct the technology used to produce ceramic archaeological materials (Quinn 2013: 9). The effectiveness of this method is enhanced when combined with other mineralogical and geochemical analyses (e.g., XRD and XRF). Thin section microscopy can make a significant contribution to the study of the life cycle of a ceramic artefact (production chain, distribution, use), as well as to the study of the technical skills and social organisations of the associated cultures (Tite 2008). These aspects are particularly relevant to the present study given its aim to detect pottery making traditions and variability in cultural groups across time at site and regional scales.

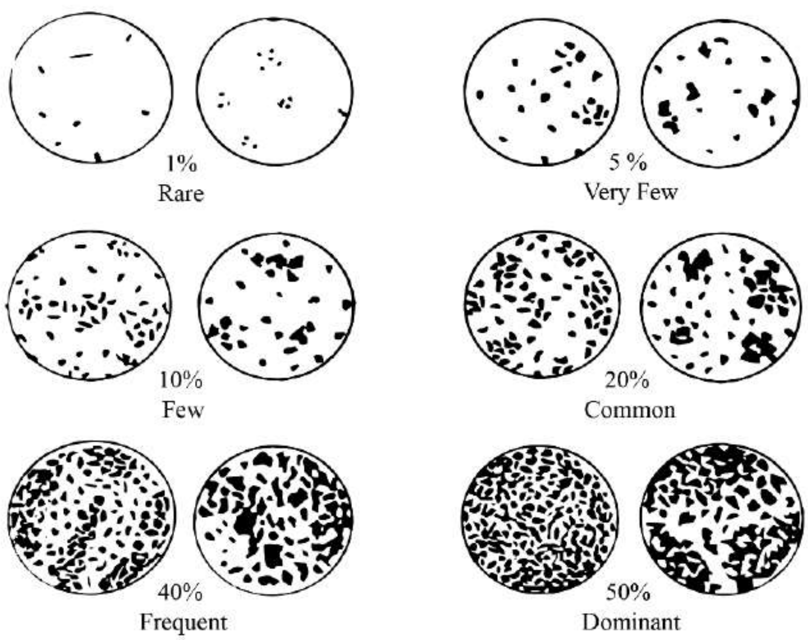
The procedures and terminology used to analyse and describe ceramic samples in thin section petrography is relatively standardised, with some minor differences between scholars (Whitbread 1989; Whitbread 1991; Reedy 2008; Quinn 2013). Here, the descriptive system developed by Quinn (2013; 2022) was adopted combined with the general terminology, grain size categories, and frequency percentages (these aspects are summarised in Table 5.5) adapted from the descriptive system of Whitbread (1989, 1991). The analysis involved the observation and description of the clay matrix, voids, and inclusions. The term ‘inclusions’ is intended to encompass all non-plastic components present in the clay matrix above silt size that were either added to the clay by the potter or are naturally present (Rice 2015: 84; Rye 1981: 31–2). This term was chosen since it does not involve any *a priori* technological implication (see a review of the words used to describe inclusions in Rice 2015: 83–5). The term ‘temper’ is used here only when the intentional addition of the inclusions might be inferred (Shepard 1956: 25).

Different features may hint at the intentional addition of aplastic material to the ceramic paste (see review in Rice 2015: 80, table 4.1). One type of inclusion frequently identified as artificial is grog. This is commonly defined as crushed ceramics (Quinn 2013: 58; Rice 2015: 82), sometimes also indicated as *chamotte*, mainly in the French, Italian and German literature (Cuomo di Caprio and Vaughan 1993). A distinction in the meaning and the interpretation of the two terms has recently been proposed, with grog indicating recycled ceramics and *chamotte* indicating calcinated clay reaching lower temperatures compared to those achieved in pottery firing (Eramo and Mangone 2019; Eramo 2020: 163).

GRAIN SIZE

Clay sized	<0.002 mm
Silt sized	0.004-0.0625 mm
Very fine sand	0.0625-0.125 mm
Fine sand	0.125-0.25 mm
Medium sand	0.25-0.5 mm
Coarse sand	0.5-1.0 mm
Very coarse sand	1-2 mm
Granule	2-4 mm
Pebble	4-64 mm

FREQUENCY



SORTING

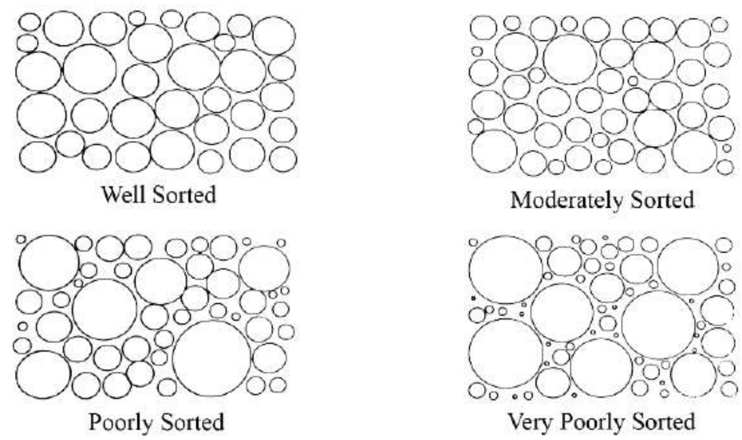


Table 5.5. Terminology used for petrographic description.

Grain size: distinctions in the diameter of the grains based on Udden-Wentworth scale, a standard for the grain size description of sediments (after Klein and Philpotts 2017: 358).

Frequency: visual estimation chart of the percentage of inclusions/minerals in thin section. The circles represent the field of view down the microscope (after Quinn 2013: 82 fig. 4.9).

Sorting: comparison chart for estimating the degree of sorting in clastic sediments and sedimentary rocks applied to ceramic thin sections (after Quinn 2013: 87, fig. 4.15).

This distinction is, however, secondary to the proper identification of grog which has been discussed in several scientific research papers (Porter 1964; Shepard 1964; Stoltman 2001; Herbert and Smith 2010) with some attempts to provide clearer guidelines for a more correct identification and distinction between grog and clay pellets or Argillaceous Rock Fragments (ARF) (Whitbread 1986; Cuomo di Caprio and Vaughan 1993). The main distinction is the angularity of the ceramic inclusions and their degree of sintering, in both cases higher in crushed and already-fired ceramic fragments. Furthermore, grog is generally more internally heterogeneous than mudstone and does not contain bedding or conchoidal fractures (Quinn 2013: 58). Another useful and effective way to recognise the presence of grog is the detection of relic surfaces in thin section (Figure 5.2; Quinn 2013: 59, fig. 3.29; Eramo 2020: 164, fig. 2).

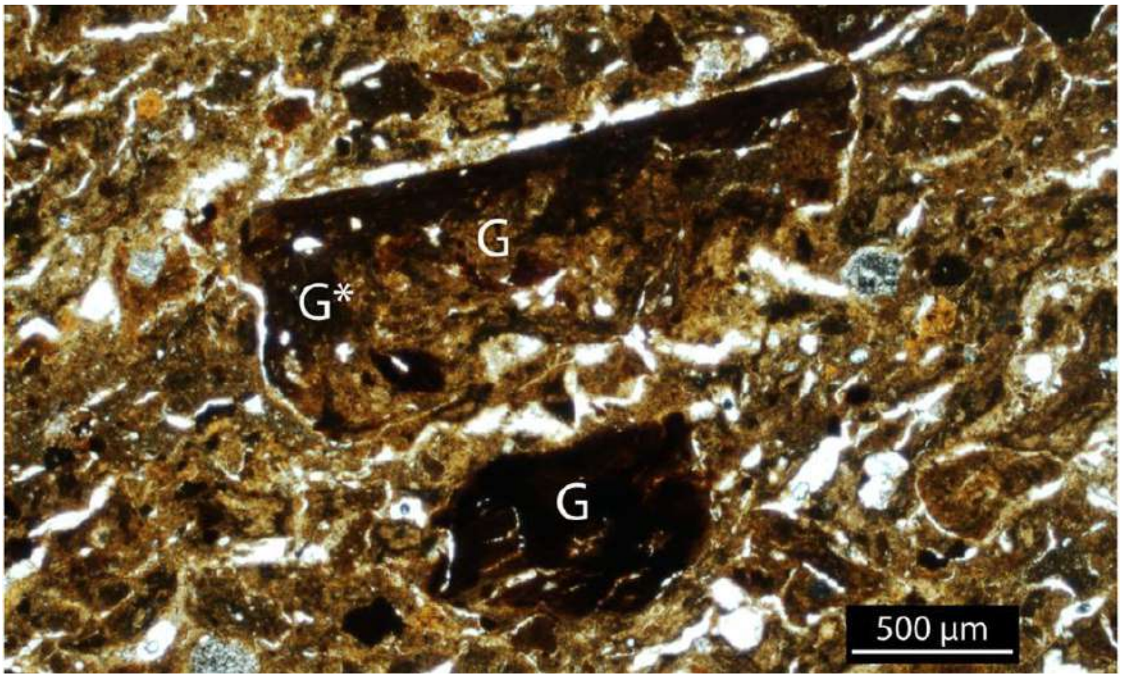


Figure 5.2. Grog (G) in cooking ware from Afragola (Napoli), 2nd millennium BC. Photomicrograph in plane polarised light (after Eramo 2020: 164, fig. 2).

Petrofabrics were distinguished based on observations of the texture and composition of the samples under a polarising microscope. Each petrofabric was indicated by a code referring to the site and by a number referring to the different fabrics. A descriptive name was also assigned to provide an immediate impression of the petrographic composition of the fabric, which can be common to more than one site (e.g., PAE.1 – Quartz-feldspathic with grog = Paestum's petrofabric 1). The fabric characterisation was based on the first or second most abundant inclusions (natural or temper), since for most of the samples the main mineral components were quartz and feldspars. A second criterion used in the definition of fabrics and subfabrics was the shape and sorting of the inclusions (rounded to angular, poorly to well sorted, unimodal to bimodal sorting). Textural analysis, considering aspects such as the size, shape, frequency, and degree of sorting of inclusions, was also used since these aspects might have had important technological implications (Quinn 2013: 161; Rice 2015: 85–8). For example, the bimodal sorting of inclusions is generally regarded as a consequence of non-geological processes (Freestone *et al.* 1982; Middleton and Freestone 1991) since it is not common in nature and might therefore suggest the intentional addition of inclusions to the clay matrix as temper (Quinn 2013: 161). Overall, the definition of petrofabric groups was based on the notion that choices of different clay types and inclusions are recognisable and reflect the environment of production (raw materials available) and the technological choices of ancient potters. The characteristics of fabric groups for each site are discussed in Chapter 7 with extensive descriptions in Appendix 11.

Given the importance of the surface treatments in the ceramic assemblage studied here, observation of the surface morphology in thin sections was also undertaken (Ionescu and Hoeck 2020). When the surface of the vessel was preserved, it was possible to observe the topography of the surfaces in thin section to reinforce macroscopic observations. In fact, irregular topographies are generally connected with a smoothing treatment, while flat topographies can be related to burnishing (Ionescu and Hoeck 2015). In the case of accurate burnishing coarser inclusions might also be pushed in the ceramic body by the pressure of the tool resulting in a thin finer surface layer (Quinn 2022: 255).

The samples were analysed in 30µm sections with a Leitz Laborlux 12POL polarising microscope with plane and cross-polarising light. Stitched photomicrographs of about 13 × 3mm were taken for each thin section with a Leica microscope camera in plane and cross-polarising light.

5.4.2. X-Ray Diffraction (XRD)

XRD is a useful technique to detect both compositional and technological data; it can characterise archaeological ceramics in terms of the minerals present and their relative abundance. It provides mineralogical data that can be effectively compared with petrography in thin section to reinforce and correct mineral identification. Nevertheless, minerals attested only in minor quantities, which might be fundamental in the discrimination of ceramic groups, can be hardly detected by this technique, making it indispensable to couple it with thin section petrography (Quinn 2022: 433). On the contrary, XRD can be extremely useful to detect mineral phases, such as clays, which are too small to be recognised by optical microscopy. Knowledge of these phase composition can be used to reinforce provenance groups based on their mineral composition (Maggetti 1982; Velde and Druc 1999: 273–4; Rice 2015: 382–6; Heimann 2016: 328) and to estimate firing temperature ranges, by observing the formation or decomposition of particular minerals which are temperature dependant (Heimann and Franklin 1979; Maggetti and Rossmanith 1981).

The basis of the XRD technique is the identification, through X-ray diffraction, of mineral 'phases' which represent crystalline compounds in which atoms are arranged in a geometrically well-ordered periodic array (Heimann 2016: 327). In crystalline materials, atoms are arranged according to crystallographic planes which are typical of each mineral. In XRD, X-rays are generated and aimed at the specimen. When the specimen is bombarded by X-rays, at a given angle, the atomic planes of its constituent minerals diffract the waves in certain directions at angles (indicated with θ) picked up by a detector (Ermric and Opper 2011), producing a diffractogram pattern with peaks detected at specific angles. The peak positions and the wavelength of the rays allow the mineral to be identified by its characteristic lattice spacings (d-spacing) (Rice 2015: 296; Heimann 2016). Hence, X-ray diffraction provides a 'fingerprint' that can be checked against the Powder Diffraction File (PDF) of the International Centre for Diffraction Data.

Compared to homogenous materials composed of one or two mineral phases, ceramics are highly heterogeneous, meaning that the clear distinction of the mineral phases can be hindered by overlapping peaks and the multiple matches possible in the interpretation of the diffractograms (Quinn and Benzonelli 2018; Quinn 2022: 433). For this reason, the use of XRD is checked and reinforced with reference to the mineral identification obtained by optical petrography, SEM, and by bulk chemical analyses. By comparing Optical Mineralogy and XRD results, mineral inclusions in the ceramic body, either natural or temper, can be easily identified (e.g., quartz, feldspars, pyroxenes, calcite, etc.). XRD can also be used to detect the minute clay minerals present in ceramics fired at relatively low temperatures (Quinn and Benzonelli 2018). When exposed to high temperature, clay minerals lose their crystalline structure and transform into an amorphous phase, represented by a background noise in the diffractogram, which cannot be easily distinguished by XRD. Different clay minerals (e.g., illite, smectites, kaolinite and chlorite) start this dehydroxylation process at different temperatures (Maggetti 1982; Rice 2015: 382). Given the relatively low firing temperatures of the ceramics that are the object of this study, in many cases it was still possible to detect weak clay mineral peaks, giving information both on the composition of the clay and on the firing temperatures. The reaction to high temperatures of different types of clays has been widely studied providing a good reference point for and predictions of their likely behaviour when exposed to firing (Dubois *et al.* 1995; Maggetti and Rossmanith 1981, Maggetti 1982; Cultrone *et al.* 2001; Aras 2004; Trindade *et al.* 2010; Gliozzo 2020). The presence/absence of clay mineral peaks depending on the temperatures at which they were exposed is an important proxy for the estimation of firing temperature ranges, as explained below.

The use of XRPD to estimate the Equivalent Firing Temperature (EFT; Tite 1969) of pottery is a common practice in the study of archaeological ceramics, validated through several studies and experimental laboratory analyses (e.g., Maggetti 1982; Maggetti *et al.* 2011; Cultrone *et al.* 2001). The underlying principle is based on the presence/absence of mineral phases that form or disappear at specific temperatures and atmospheric conditions. A summary of some of these mineral phase changes is provided in Figure 5.3 (Maggetti 1982: 128; Maritan 2004: 304; Maritan *et al.* 2007: 533; Nodari *et al.* 2007: 4668). Differences in the composition of the clays and inclusions affect the firing in different ways. Granulometry and firing conditions should be also considered (Tite and Maniatis 1975; Maggetti and Rossmanith 1981; Maggetti 1982; and for a recent review see Gliozzo 2020). In ceramics fired at low temperatures, such as those analysed for the present study, the most relevant phase transformations are related to the type of clay (e.g., illitic, kaolinitic) and its calcareous content (non-calcareous, calcareous, highly calcareous). Illitic non-calcareous clays do not show great changes in mineralogy when subjected to typical firing temperature used for prehistoric pottery, generally between 500 and 900°C (Maggetti 1982: 127). Indeed, the crystal structure of illite collapses at around 850–900°C (Kulbicki 1958; Maggetti 1982: 127).

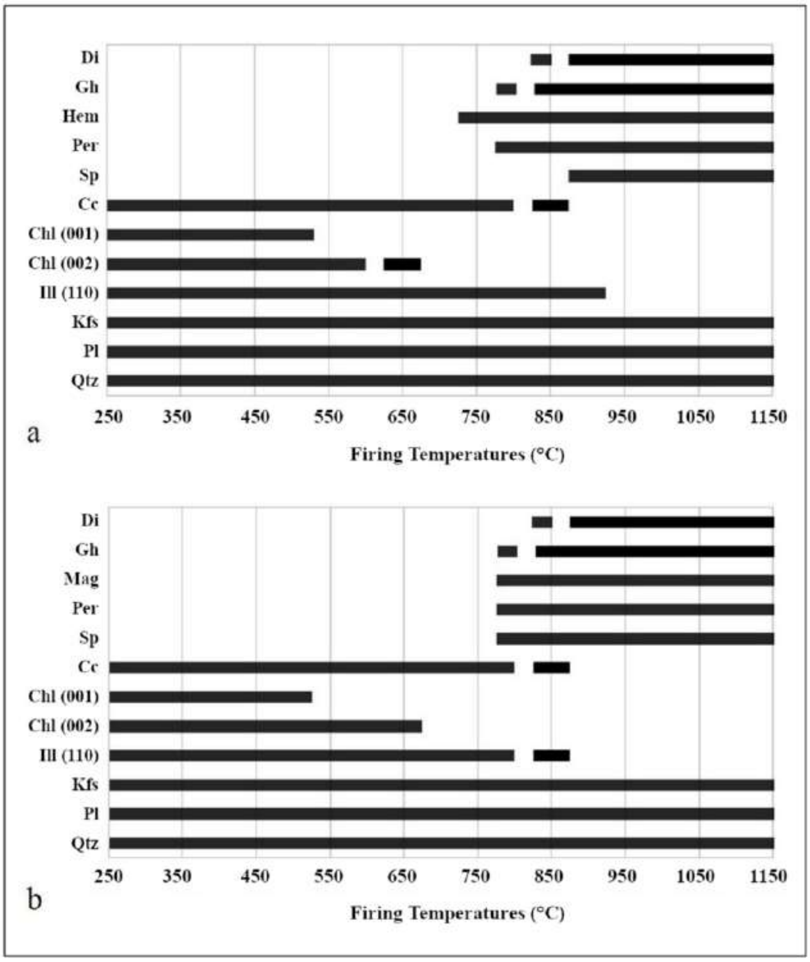


Figure 5.3. Bar diagrams documenting the mineralogical changes that take place during the firing of earthenware ceramics in oxidising (a) and reducing (b) atmosphere. The dashed lines indicate a decrease in the occurrence of the minerals at those temperatures. Mineral abbreviations: Di = diopside; Gh = gehlenite; Hem = haematite; Mag = magnetite; Per = periclase; Sp = spinel; Cc = calcite; Chl = chlorite; Ill = illite; Kfs = potassium feldspar; Pl = plagioclase; Qtz = quartz (Amicone *et al.* 2020, fig. 3).

In contrast, the presence of carbonates in carbonate-rich clayey materials, causes a lower sintering temperature (~ 800°C) than in carbonate-poor clayey materials, because Ca and Mg act as fluxes (Segnit and Anderson 1972; Maniatis and Tite 1975). The presence of carbonates is also significant for the temperature-dependant transformation occurring in calcite, from its decomposition (around 800°C) to the formation of lime (around 800–850°C, Shoval *et al.* 1993; Cultrone *et al.* 2001; Maritan 2004: 304; Maggetti *et al.* 2011: fig. 7). Other clayey materials are more indicative of temperature exposure. Examples include smectite, generally decomposing at around 800°C (Maggetti 1982: 127; Cultrone *et al.* 2001: fig. 3), kaolinite generally disappearing between 500–600°C (Maggetti and Rossmanith 1981: 185; Maggetti 1982: 127; Trindade *et al*. 2010: table 2), and chlorite between about 550 and 650°C (Maritan *et al.* 2006; Trindade *et al*. 2010).

Furthermore, depending on the composition and the firing conditions, neophases can form when specific temperatures are reached. An example is the nucleation of haematite from goethite present in the raw material in oxidising conditions at about 700°C (Nodari *et al.* 2007: 4668; Amicone *et al.* 2020). Depending on the composition and inferred firing conditions, all these transformations were considered during the interpretation of the diffractograms of the samples analysed.

The samples were powdered using a planetary ball mill to between 1–10μm grain size. Approximately 2g powder were analysed for each sample. The analysis was undertaken using a Panalytical Aeris XRD with a CuKα1 emitter. Measurements were taken from 5–70° 2θ at a step size of approximately 0.0054° at 39.5 seconds per step. The powdered sample was placed in a circular sample holder with a diameter of 32mm and a depth of 3mm. A nickel-beta filter was used on the incident side, along with 0.04 rad soller-slits inserted on the both the incident and detector side of the beam. The analytical configuration also included ¼° divergence slits, a 20mm beam mask, and a beam knife in the high position, and a 9mm anti-scatter slit. The total time for the analysis of each sample was 22m 32s. The analysis of the results was completed using the High Score Plus proprietary software package by Panalytical which allows to automatically, and manually, compare the peaks obtained in the diffrattogram with a library of known diffractograms of thousands of minerals (in particular the International Center for Diffraction Data (ICDD) Database, and the Crystallography Open Database (COD)). The automatic identification was manually refined also based on the observations made in thin sections.

5.4.3. X-Ray Fluorescence spectrometry (XRF)

Compositional chemical data are generally used in archaeological materials analysis to infer the geological and geographic provenance of ceramic artefacts (Rice 2015: 291–303; Velde and Druc 1999: 278; Hein and Kilikoglou 2020; Quinn 2022: 430-438). They can contribute to the definition of different compositional groups among the assemblage analysed, hinting at provenances and/or *chaînes opératoires*. Provenance and compositional groups can be determined by comparing the concentrations and relative amounts of the major, minor, and trace elements contained within the ceramics. The approach assumes that there is a relationship between the chemical composition of the pottery and the clay(s) and temper(s) used to manufacture it (Hall 2016: 343 and references therein). Therefore, ceramics from the same production workshop should be chemically and mineralogically similar, while being distinguishable from the pottery of other production series (Hein *et al.* 2004). Nevertheless, the impact of human refinement and tempering of the ceramic body should be also taken into account as further clarified below. Chemical analyses can be performed with a range of methods mainly based on spectrometric or spectroscopic techniques, including Instrumental Neuron Activation Analysis (INAA), Laser Ablation-Inductively Coupled Plasma-Mass Spectrometry (LA-ICP-MS), X-Ray Fluorescence spectroscopy (XRF) and Proton-Induced X-Ray Emission spectroscopy (PIXE) (Artioli 2010: 20; Hein and Kilikoglou 2020: 4, table 1). XRF is the most commonly used in the analysis of archaeological ceramics in combination with mineralogical and petrographic analyses (Artioli 2010: 35–6; Rice 2015: 302; Hall 2016: 343).

The physics behind XRF is based on the interaction between X-rays and the atoms composing the elements. The specimen is irradiated with primary X-rays generated by an X-ray tube. The beam displaces electrons from the inner orbits of the atoms, and these are then substituted by electrons from the outer levels (Brouwer 2010). The energy released in this process is emitted as secondary or fluorescent X-rays, whose wavelengths are unique to each element and form the basis for the identifications. Two main types of XRF are available, each using a different type of detector: energy dispersive (ED) and wavelength dispersive (WD). ED-XRF directly measures the energy of the fluorescent X-rays through solid-state detectors. WD-XRF indirectly measures the X-ray fluorescence through a set of collimators, a diffraction crystal, and a detector. The X-rays from the sample fall on the crystal, which diffracts the X-rays with different wavelengths (i.e., energies) in different directions (Brouwer 2010: 25). By placing the detector at a certain angle, the intensity of X-rays with a certain wavelength can be measured. WD-XRF spectrometers are characterised by lower counting rates but higher energy resolution and they can therefore discriminate overlapping fluorescence lines more efficiently, while ED-XRF spectrometers have higher counting rates but significantly lower energy resolution (Artioli 2010: 35) and are consequently often used for fast, low-resolution measurements, for example in a portable or handheld version for field analyses (Holmqvist 2016). WD-XRF systems are used in the laboratory and provide high-resolution measurements with better precision, particularly for light elements and some of the rare earth elements (REEs) (Artioli 2010: 35–6; Hall 2016: 351). For the present analysis, WD-XRF was undertaken at the Department of Archaeology, Durham University. Minor and trace earth elements (such as REEs) are particularly important in investigations of the possible provenance of clay raw material. In fact, major elements are commonly affected by the amount of non-plastic inclusions in the initial clay paste, which might represent the coarse fraction (sand, calcite or feldspar), rather than being affected by the elemental composition of the clay fraction (Hein and Kilikoglou 2020: 3). Minor and trace elements can be more securely related to the original clay source, though several possible bias must be also taken into account. In particular, clays with similar compositions can be found in different areas (Hein and Kilikoglou 2017), as well as the same clay deposit can display a high inner variability (Hein et al. 2004). Furthermore, the impact of human refinement and tempering actions on the composition of the ceramics should be always carefully considered.

Specifically, in approaching pottery chemical analysis, it must be kept in mind that human behaviour, for example the artificial preparation of the paste, can strongly influence the chemical signature of the ceramic, by diluting its elemental composition, so obscuring a clear link to a specific clay deposit (Hall 2016: 343). Nevertheless, this does not prevent the identification of unique, statistically significant compositional groups (Hall 2016: 343; Neff *et al.* 1988; Arnold *et al.* 1991). In particular, dilution effect can be constrained by using element ratios, rather than element concentration, to identify variations in the original clay source of the fabrics since these are less affected by differences in tempering (Degryse and Braekmans 2014; Finlay *et al*. 2012: 2389). Each compositional group may represent ceramics made using raw materials from the same outcrop, suggesting a shared production location (Orton and Hughes 2013: 168–83). Distinct compositional groups can be interpreted as resulting from diverse sources or processes, which might indicate either different clay sources or internal variability within the same clay deposits (Hein *et al.* 2004; Hein and Kilikoglou 2017), and/or different production processes (Arnold *et al.* 1991; Costin 1991). Because of the human factors noted above, the provenance of the raw material can also be inferred by comparison with the chemical data of pottery products of known provenance. Accurate provenance can be determined based on the identification of workshops and ceramic processing areas like kilns, or of known production centres, especially in later periods. Ceramic workshops are, however, quite rare in the archaeological record. Nevertheless, the comparison between the chemistry of local raw materials and ceramic compositional groups has been used with varying levels of success depending on the raw materials and the degree of paste processing (Hein *et al*. 2008). Results can be less reliable when there is a large modification of the original clay through the addition of temper or major depuration processes (Buxeda i Garrigos *et al.* 2003). Another widely attested practice, both in archaeological and ethnographic contexts, is the mixing of clays from different sources, to obtain desired characteristics (Ho and Quinn 2021). As mentioned above, a further element to consider, while sampling raw material, is the inner variability of the clay sources and the possible presence of multiple clay sources with a similar chemical composition, due to similar geological processes in several locations (Day *et al.* 1999; Hein *et al.* 2002, 2004). The raw material is therefore strongly dependent on the regional frameworks and productive processes associated with each case study.

In the present analysis, given the chronology and types of products (generally within households, Forte 2020), and the lack of reference archaeometric analyses on known local pottery products for the period, a major focus was the detection of compositional groups in relation to different contexts (funerary vs. domestic), chronological phases, and cultural traditions. The main aim was to detect continuity and change in the compositional groups that might suggest different technological traditions, supported by the results of other analytical methods. A comparison with local raw materials and products is available only for the area of the Sele River Plain (sites of Paestum and Pontecagnano) where chemical analyses on the clay sources and Greek-Roman pottery were carried out by the project ‘Ceramic production in the plain of Paestum’. Local ceramic production centres near the sites of Paestum and Pontecagnano are testified both by the archaeology and by literary sources from between the 6th and 3rd centuries BC (Pellegrino and Serritella 2013; Ferrara *et al.* 2014). These data were cautiously considered given the significant technological differences between Greek-Roman and Copper Age pottery and the variations between different laboratories and measurements (Hein *et al.* 2002).

As noted in Section 5.3, chemical analysis was carried out, where possible, on all the samples analysed through thin section petrography and XRD in order to have comparable data. For the major elements, the samples were prepared by the addition of flux and fusion into beads. Pressed pellets for minor and trace elements analysis. Fused beads were used for major elements because they enable higher accuracy, than pressed pellets due to the elimination of any matrix effect compared to the standards (since everything is converted to a similar glass matrix) (Hall 2016: 346). However, this method cannot be used for minor and trace elements because the dilution effect due to the high ratio mixture (1:10) with a flux (see methods below), takes the concentration of a number of elements near the detection limits of the instrument leading less reliable results or an inability to detect some key trace elements. Additionally, exposure to high temperatures required for fusion can skew the measurement of volatile elements such as S, Hg and Cd (due to loss on ignition). Minor and trace elements were therefore measured using pressed pellets which provide a more accurate detection of minor and trace elements, even though care must be taken to produce homogeneous pellets in order to avoid texture issues. Some samples were excluded based on a lack of sufficient material for the preparation of either fused beads or pressed pellets.

The samples were powdered using a planetary ball mill with an agate mortar to 110μg grain size. Preparation of the beads involved fusing 0.600g of the powdered sample with a flux (6.000g), in this case lithium tetra-borate, at 1000–1200°C. The mixing ratio of sample and flux in weight was sample 1:flux 10. The error in measurement was kept below ±0.5mg. Fusion was carried out using a LaNeo Claisse Bead fuser inside a platinum crucible and mould (95% platinum and 5% gold). The analysis of the beads was carried out in a Panalytical Zetium XRF spectrometer with Wroxi calibration standards. Pressed pellets were prepared using 12g of sample mixed in a ball mill with 3g of wax binder (mainly Ultrawax) with a ratio of sample 4:binder 1. When the material available was slightly less than 12g, the analysis was still carried out keeping the ratio constant and taking the lower weight into account during measurement. The 32mm diameter pellets were pressed in a Herzog press up to a pressure of 200bar. The analysis was carried out in the Panalytical Zetium XRF spectrometer with Protrace calibration standards.

Chemical data were evaluated using different statistical methods. A first approach involved the univariate and bivariate analysis of each element measured, without any transformation. This allowed the investigation of the structure of the data, eventual departure from normality, long tail for variables and outliers (Papageorgiou 2020: 3). Principal Component Analysis (PCA) was used to explore relationships among the different pottery samples. The data were first log10 transformed to avoid scale effects on the results (Hall 2016: 352; Papageorgiou 2020: 3–4). Negative numbers in the data were avoided when possible, while zeroes were replaced with half the detection limit for the given element (approach in Hall 2016 after Sanford *et al.* 1993). R-studio statistical software was used with the ‘prcomp’ function for PCA calculation, ggbiplot and factoextra packages for plotting of the graphs. The PCA on the correlation matrix was performed using the concentration of major (Al_2O_3, CaO, Fe_2O_3, K_2O, MgO, Mn_3O_4, Na_2O, SiO_2, TiO_2) and minor and trace elements (Ag, As, Bi, Ce, Co, Cr, Cu, Ga, Hf, La, Mo, Nb, Nd, Ni, Pb, Rb, Sn, Sr, Th, Tl, U, V, W, Y, Zn, Zr). P_2O_5 and Ba, Br, Hg, I, Yb, though measured, were not included in the analysis of the data as these could have been affected by post burial contamination processes (Maggetti 2001). Elements with mostly negative values or beneath the detection limit in our dataset (for the detection limits LOD see Appendix 14) were also not considered (i.e., Cd, Cs, Ge, Sb, Sc, Se, Sm, Ta, Te). The accuracy and precision (Quinn 2022: 343-358) of the XRF analysis were determined by running certified reference materials multiple times during each batch of analyses: for fused beads 'NCS DC87103 Soil' and 'GBW 07109 Rock'; for pressed pellets 'NCS DC87103 Soil', '. Elements with an abundance below the limits of detection of the machine (see Appendix 14) were disregarded before submitting the geochemical dataset to multivariate statistical analysis.

5.4.4. Scanning Electron Microscope (SEM) - EDS

Scanning Electron Microscopy (SEM) coupled with Energy Dispersive X-ray Spectroscopy (EDS) is a commonly used technique in archaeology (Freestone and Middleton 1987; Rice 1987: 401; Tite 1992; Velde and Druc 1999: 271; Quinn 2022). It is generally used in pottery analysis for high magnification and high-resolution imaging and for microscopic compositional analysis. The imaging system produces grayscale images with a particularly good depth of field. These images are produced by a narrow beam of electrons that interacts with the atoms at various depths in the sample (Ponting 2004). There are three main types of signals produced by this interaction: back-scattered electrons (BSE), secondary electrons (SE) and characteristic X-rays. The impact of the primary electron beam on the sample generates low energy SE, ejected by the surface. BSE have higher energy and are generated deeper within the sample. Both SE and BSE produce high resolution images widely used in ceramic analyses. SE are mostly useful for textural evaluation of the clay body and its degree of sintering (e.g., Freestone and Middleton 1987; Ionescu and Hoek 2020; Emami *et al.* 2016). BSE are useful for compositional and image analyses (e.g., Gliozzo *et al.* 2004; Dal Sasso 2014) since they reflect variations in the atomic number of the elements detected, effectively creating a map of chemical density across the sample, with brighter parts of the image corresponding to zones with a higher atomic number.

In addition to imaging, SEM can be used for compositional analysis due to the X-ray signal produced. When the primary electron beam hits the atoms contained in the sample, a secondary electron is ejected and an electron from a higher orbit takes the vacant space. In this process an X-ray is generated with a characteristic energy and wavelength specific to each element and each shell. By measuring the energy or wavelength of these characteristic X-rays the elements present in the sample can be identified, quantified, and mapped (Ponting 2004). For this purpose, SEM is generally coupled with EDS or with Wavelength Dispersive X-ray Spectroscopy (WDS). For archaeological applications, EDS is the most commonly used and provides information on the distribution of elements on the sample surface (Froh 2004). The measurement can take place on a specific point or across a larger area allowing a good compositional characterisation both of specific minerals and features and of the clay body (Tite 1992).

In the present research, SEM-EDS analyses were carried out on the samples for the sites of Paestum and Pontecagnano—both characterised by relatively large and complex assemblages—in order to verify specific compositional features. The analyses were performed on carbon coated thin sections with a Hitatchi TM3000 SEM-EDS in the Department of Archaeology and with a Sigma 300 VP, Zeiss in the G.J. Russell Laboratory, Department of Physics, at Durham University and were analysed through EDS with the software Aztec 5.0 using standardless matrix corrections and is semi-quantitative.

Chapter 6 – Results: typology and macroscopic analysis

6.1. Aims and overview of this chapter

This chapter presents the results of the typological and macroscopic analysis carried out on the ceramic assemblage from the four sites described in Chapter 4: Paestum, Pontecagnano, Sala Consilina and Atena Lucana. As argued in Chapters 3 and 5, the integrated study of typology and technology is key to the successful performance of ceramic analysis. The combined use of observations regarding typology and morphology with archaeometric and technological analyses reveals primary technological choices made by the potters to create artefacts with particular physical properties and morphologies (Santacreu 2014: 177). These choices might, in turn, shed light on certain behaviours and specific activities (Capel *et al*. 1982; Hally 1986; Schiffer and Skibo 1987; Spataro 2002; Tite *et al*. 2001). The multi-scalar approach to ceramics is also intended to increase understanding of the range of production modes, technologies and styles, and to unlock new lines of enquiry. As a step towards achieving these goals, here, the results of typological and macroscopic analyses are described for each site analysed. Data are also represented graphically in pie charts and tables in Appendices 4–9. Following the framework presented in Chapter 5.2, quantitative and qualitative data for each site are presented in two subsections for each site: ‘Form’ and ‘Technology’.

6.2. Paestum

As explained in Chapter 4.3.1, the site of Paestum was occupied throughout the Copper Age in different areas and with occupations traditionally attributed to several cultural entities. As shown in Figure 6.1, the four contexts considered here are: Agora Phase I (an early phase of the Copper Age), the large Gaudo culture cemetery (Early and Middle Copper Age), and Agorà Phase II and Cerere, both associated with the Laterza culture (Middle and Late Copper Age). As highlighted in Chapter 4, the four sites are characterised by very different histories of excavation and variable preservation of the pottery assemblage. As such, the ceramic material selected for macroscopic examination and archaeometric analyses depended on the reliability of the provenance and excavation data, as explained below.

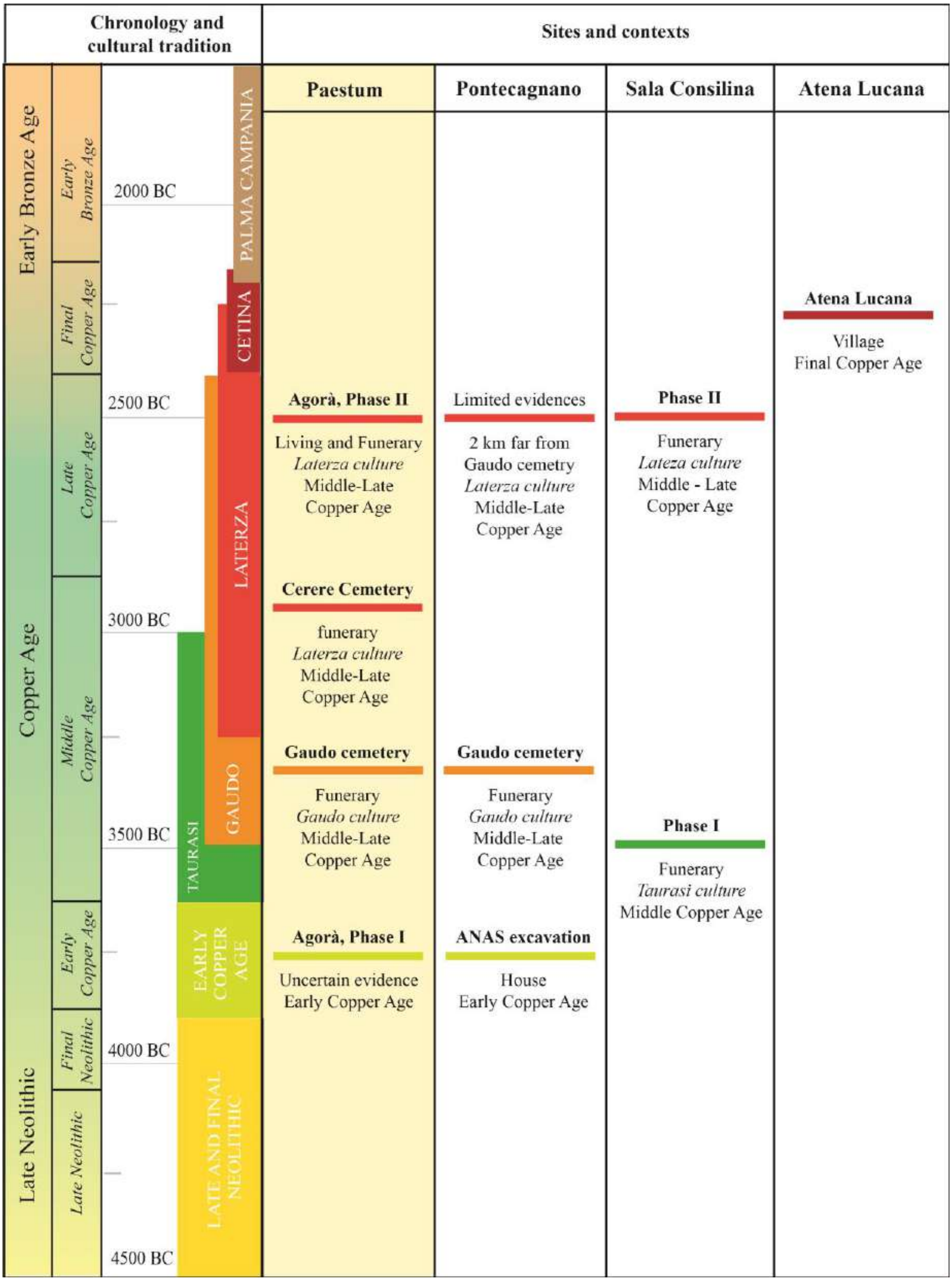


Figure 6.1. Synoptic table of the main sites and contexts considered. The contexts considered for the site of Paestum are highlighted.

The **Gaudo cemetery** yielded 568 almost complete pots (11% of the total ceramic assemblage) and 4592 pottery fragments (89% of the total ceramic assemblage) clearly originally deposited in the tombs. A further 90 whole vessels with no clear provenance, but originating from the same area as the tombs (and possibly from other undocumented tombs), are also preserved in the Museo Archeologico Nazionale di Paestum and in the Museo Archeologico Nazionale di Napoli. Macroscopic data were recorded for 480 whole pots from the tomb chambers with clear provenance and 152 representative fragments from the tomb shafts. The macroscopic analysis was integrated, in some cases, with the data available from previous studies (Aurino 2013b). Technical drawings of the pottery were already available (Aurino 2013b), and a further 65 drawings were made for the fragmented materials coming from the excavated shafts associated with tombs I–VII.

The area of the Copper Age cemetery near the **Temple of Cerere** was not excavated stratigraphically, but rather using spits, and the assemblage of over 2000 ceramics contains a mixture of Neolithic, Copper Age and Greek-Roman sherds. The macroscopic analysis and sampling processes were therefore carried out only on finds having a clear indication of provenance (e.g., closed contexts such as burials) or that could be clearly assigned to the Copper Age due to their diagnostic features, by comparison with other published sites with a clear chronology, stratigraphy, and context (e.g., Biancofiore 1967; Fugazzola Delpino *et al.* 2007; Palermo Rossetti and Talamo 2011). The macroscopic analysis focused particularly on 152 whole vessels and pottery sherds representing all the diagnostic ceramics clearly identified as having been found in the graves. A partial typological analysis of the pottery record has previously been published (Albore Livadie *et al.* 2011) and was integrated with my own, broader evaluation.

The site of the **Agorà** has seen the most recent excavation, in 2008, allowing a better characterisation of the pottery assemblage which includes 1477 ceramic fragments from the two phases of occupation (Aurino *et al.* 2017; Aurino and De Falco 2021). Macroscopic analyses were carried out on diagnostic pottery finds dated to the Early Copper Age/Agorà Phase I (175 sherds; 29 drawn), and to the Laterza Culture/Agorà Phase II (259 sherds). For details of the contexts see Chapter 4. The typological analysis on the Agorà Phase II pottery was carried out during research for my Bachelor’s degree and updated with further analysis to create a total of 222 drawings.

The analysis of the ceramic complex is presented here according to chronological and cultural criteria, starting with evidence from the Early Copper Age Agorà Phase I context, moving to the Gaudo cemetery and finally the two (later Copper Age) Laterza culture contexts of Agorà Phase II and Cerere. Data from the different contexts is compared.

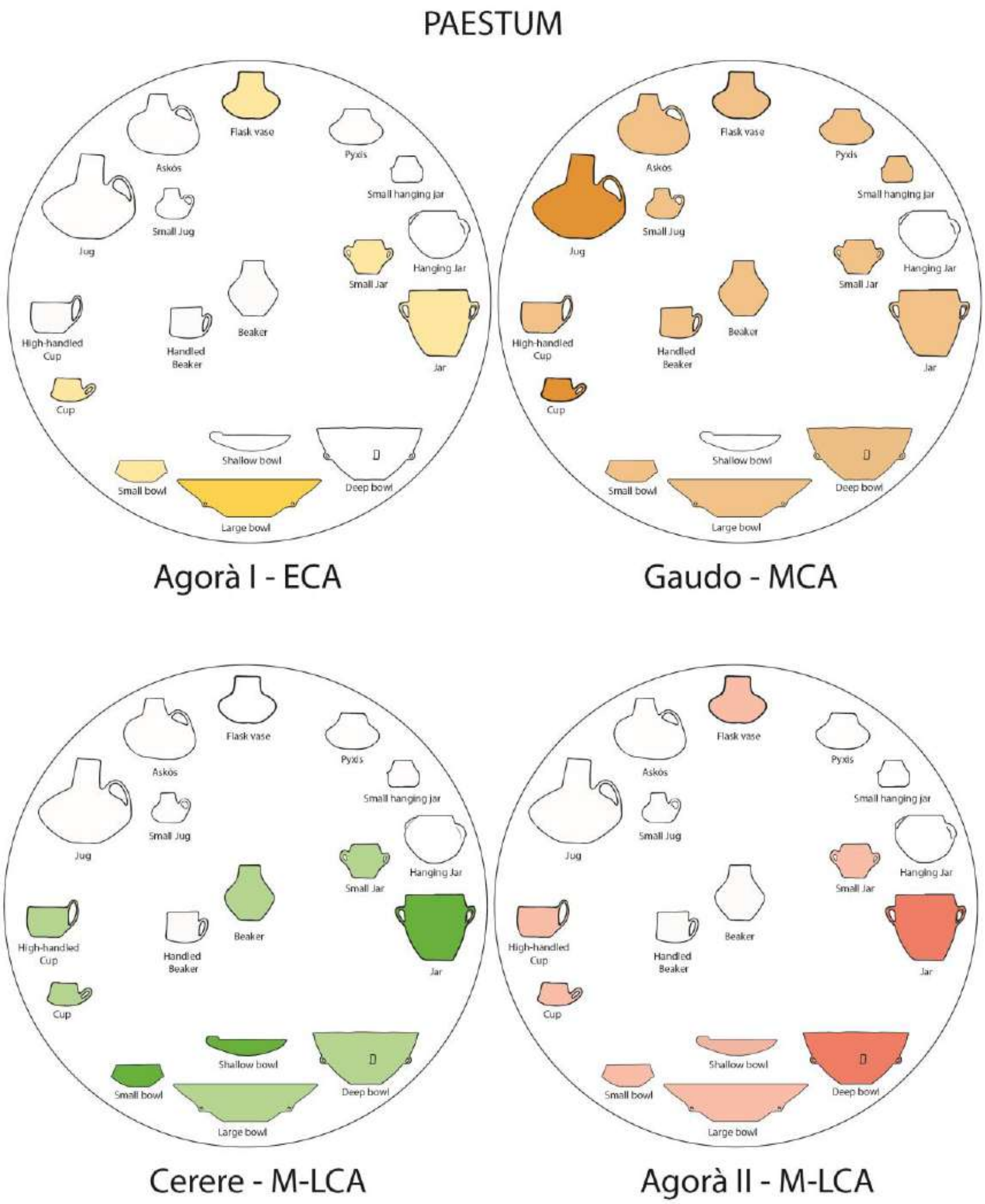


Figure 6.2. Paestum. Occurrence of vessel types in the four contexts analysed. The darker shading corresponds to a higher frequency shapes for each. The relative percentages and absolute numbers of occurrence of the types can be found in Figure 6.3.

6.2.1. Form

There are clear differences in ceramic forms analysed across the four contexts from Paestum. These relate to the presence/absence of specific types and the complexity of the shapes. It must be noted that two of these contexts (Gaudo, Cerere) are clearly funerary and two (Agorà Phase I and Agorà Phase II Figure 6.1) are unclear but showing in the case of Agorà Phase II traces both of mortuary and domestic activities. The type of context and the associated activities clearly influenced the types of vessels preserved, although their forms reflect common trends in the overall ceramic production for the Copper Age in Southern Italy. Where relevant, differences in the nature of the contexts are considered in the following discussion.

Distribution of vessel types

Across the four contexts there are clear differences in the occurrence of vessel types, their frequency and morphology (Figure 6.2). The limited repertoire from Agorà Phase I contrasts with the abundant assemblage from the Gaudo cemetery. The poor representation of different types at Agorà Phase I is undoubtedly due to the scarcity of evidence, however those types that are present correspond well to the ceramic typology common in Late Neolithic–Early Copper Age Southern Italy (Chimenti *et al.* 1999; Pessina Tiné 2008). Agorà Phase II and Cerere (both Laterza culture), also show a small number of types but these are quite similar for each context, confirming their cultural homogeneity. The types most represented in each context vary: large bowls are dominant at Agorà Phase I, jugs at the Gaudo cemetery, and jars and shallow, deep and small bowls at Agorà Phase II and Cerere.

Figure 6.2 and Figure 6.3 clearly show that certain types of vessels are found exclusively in specific contexts. Jugs, small jugs, *askoi*, flask vases, pyxides, small hanging jars, twin vessels and handled beakers are exclusive to the Gaudo cemetery. By contrast, bowls, especially small and shallow bowls, are found only in the Cerere and Agorà Phases I and II contexts. The most striking difference is the almost complete absence from both the Early Copper Age (Agorà Phase I) and later Copper Age Laterza contexts (Agorà Phase II and Cerere) of closed, necked shapes mostly suited to pouring, such as jugs, *askoi* and flask vases. By grouping the types by chronology and cultural tradition it can be hypothesised that these trends in the relative distribution of types have contextual and cultural roots (It must be noted that the distinction between the contexts cannot be made solely on a typo-chronological basis since the Gaudo and Laterza styles might overlap chronologically, as explained in Chapters 1 and 2).

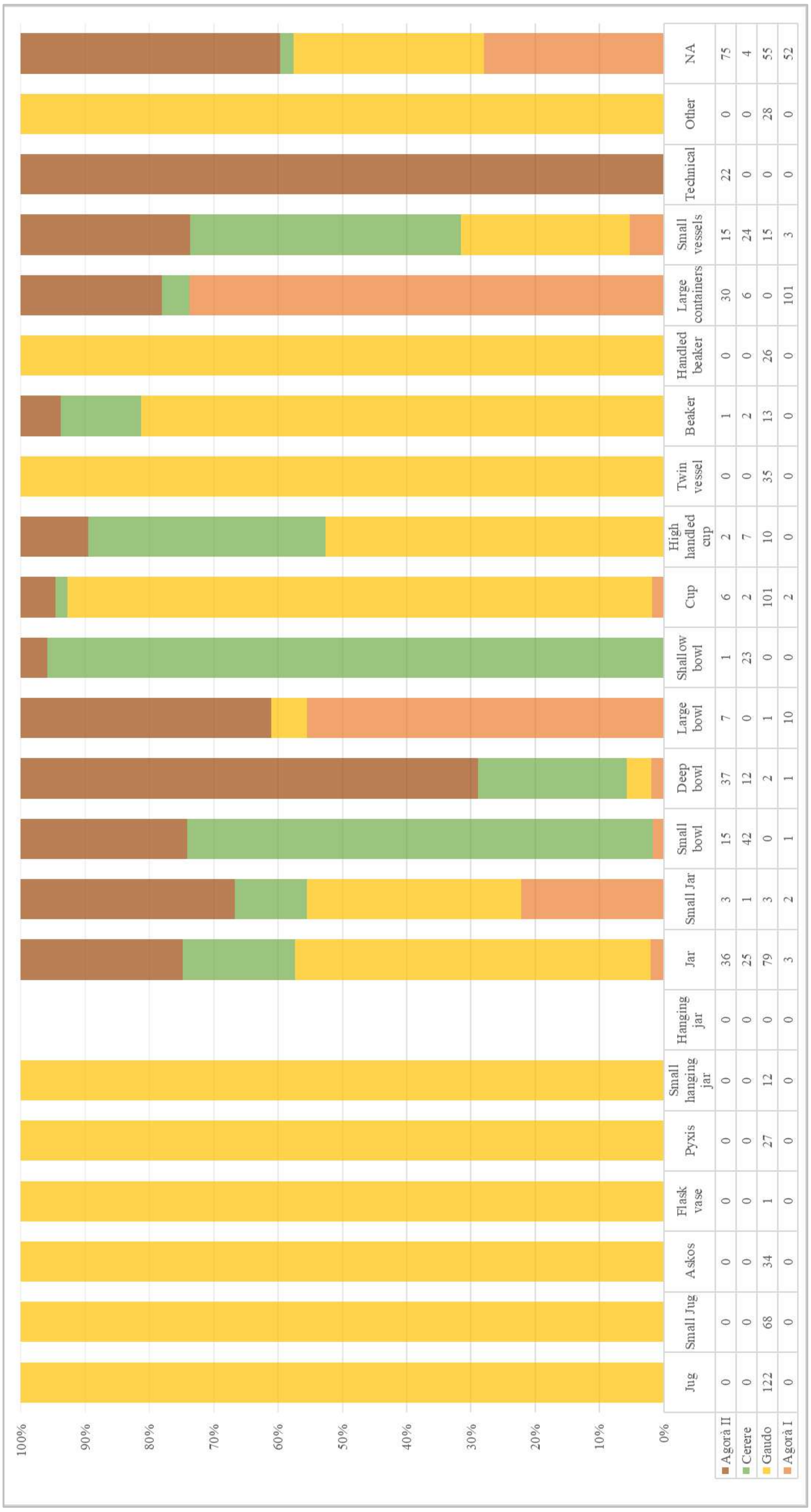


Figure 6.3. Paestum. Relative distribution and absolute number of types across the four contexts.

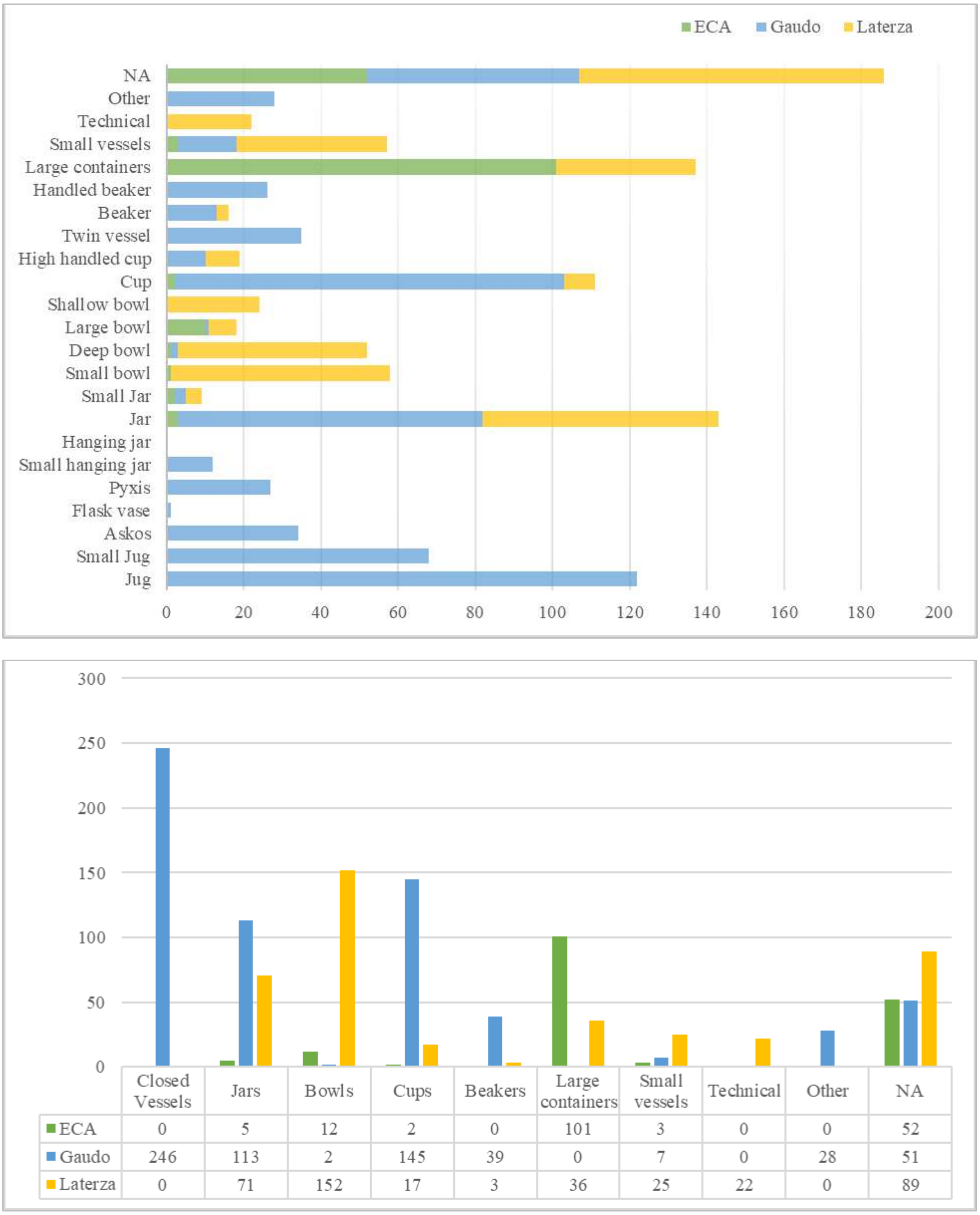


Figure 6.4. Paestum. A: Distribution of types by chronology and cultural tradition. B: Distribution of vessel categories across the three cultural traditions.

As shown in Figure 6.4A, the three cultural traditions show different representations of types. If broader vessel categories are considered (Figure 6.4B), these patterns emerge even more clearly. In Figure 6.3 and Figure

6.4B, in addition to the vessel categories explained in Chapter 5.2.1 others are included that could not be attributed to a specific family ('N/A', mostly body sherds) together with two broader categories for vessels that were not clearly recognisable:

- 'Large containers', including large bowls, deep bowls and jars; and
- 'Small vessels', including beakers, cups, shallow and small bowls, small jars, pyxides, etc.

The attribution of sherds to these categories was based on their macroscopic characteristics (thickness, surface treatment) and morphology. In most cases, the small dimensions of the sherds did not allow a clear attribution to a specific type. An example is provided by jars and deep bowls which often have a similar morphology at the rim but different body shapes.

To summarise. During the Early Copper Age (Agorà Phase I), bowls and large containers predominate, with only a few other vessels represented. The pottery from the Gaudo culture context includes a greater variety of shapes, with exclusive types as mentioned above, especially closed vessels. The two later Copper Age Laterza cultural contexts (Agorà Phase II and Cerere) are dominated by bowls, particularly deep, small and shallow bowls, followed by jars and small numbers of cups, beakers and small vessels. These morphological trends are undoubtedly significant in terms of the different uses and meanings of the pottery, which will be further analysed for each context and cultural tradition in Chapter 8.

Distribution of vessel types in Gaudo tombs

In the Gaudo cemetery a distinction in the distribution of types can be made between the ceramic materials occurring in the tomb shaft and those in the burial chamber. As noted in Chapter 4, the rituals carried out in the two areas of the tomb involved different vessels with shapes and treatments, with ritual fragmentation especially evident in the shafts, and possible food and liquid offerings placed in the chambers. For this purpose, only graves excavated by Voza were considered (graves I to XIV) since he consistently investigated both shafts and burial chambers (see Chapter 4). In some cases, particularly tombs VIII and X, the structure of the tombs is unclear and so these were not included in this analysis.

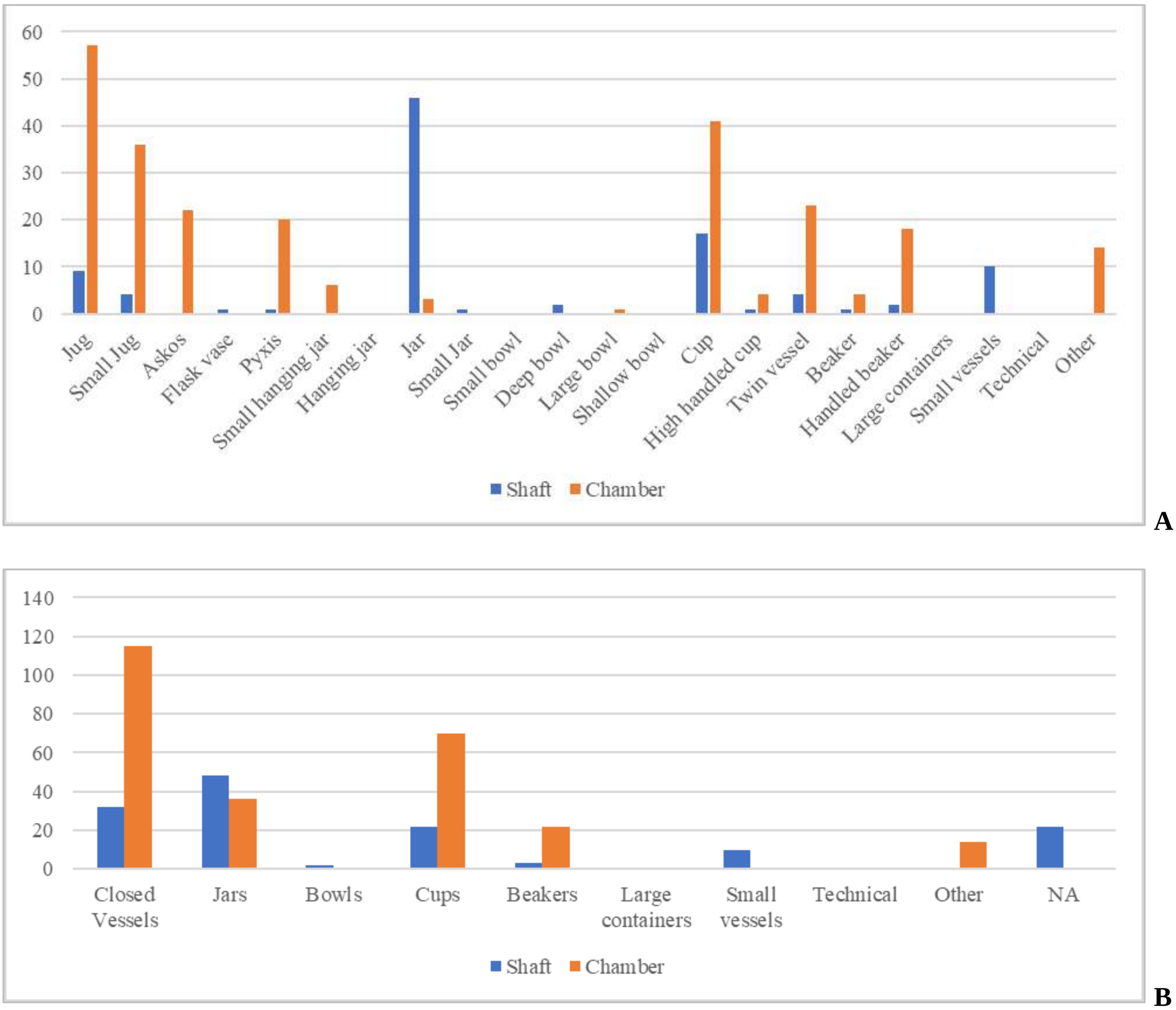


Figure 6.5. Paestum. (A): distribution of vessel types between burial shaft and chamber, and (B) distribution of vessel categories in the Gaudo cemetery in tombs from Voza's excavations: tombs I– VII, IX, XI, XIII, and XIV.

Figure 6.5 shows the distribution in tombs I to XIV (excluding tombs VIII and X) of the main vessel types and categories attested at the site, divided by shaft and chamber. Closed vessels, cups and beakers are dominant in the burial chamber while jars are found mostly in the shaft and in some cases can be almost completely reconstructed. In Gaudo tombs, jars are generally ritually fragmented in the shaft in front of the chamber entrance. Three of the nine jars attested in the burial chambers have been fully reconstructed; the other cases comprise only a few fragments. A further difference between the ceramic finds deposited in the shafts and in the chambers is their different depositional treatment. The finds from the chambers are mostly intact, with only 6% in a fragmentary state, although it should be noted that intact (rather than fragmentary) objects may have been preferentially collected during the excavation. Conversely, in the shafts, whole vessels comprise only 7%

of the assemblage, with jars and cups most prevalent, followed by jugs, and one pyxis. The number of unidentifiable fragments is much higher in the shafts than in the chambers, suggesting a higher presence of fragmented objects resulting from ritual fragmentation (Chapter 2.4.2). The types typical of the Gaudo repertoire, such as pyxides, *askoi*, small hanging jars and twin vessels, are found almost exclusively in the chambers. This clear distinction supports the hypothesis of an intentional distinction maintained between the two spaces of the Gaudo tombs, each with different ritual acts involving distinct sets of ceramics.

Technical ceramic objects

The broad category of 'Technical ceramic objects' is represented only at Agorà Phase II, where finds included a small fragment of wattle and daub, a ceramic tuyère, a possible fragment of a crucible, two possible boiler lids, ten different pieces of portable slabs with organic impressions on their bases, three spindle whorls and one loom weight. The fragment of wattle and daub might be associated with nearby structures, although no other traces were found. The tuyère (Figure 6.6.1) and crucible might be linked to metal production or processing. Ceramic objects related to copper melting are documented from several sites from the Late Neolithic, especially in Northern and Central Italy (Chiarenza and Rossi 2011; Dolfini 2019). Conical tuyères are generally used in association with blowpipes and/or bellows to heat the minerals in crucibles (Artioli *et al.* 2014). It must be noted, however, that no metal object was found at Agorà Phase II, but that a copper dagger was found in grave 4 at the Cerere cemetery.

The two fragments interpreted as boiler lids (Figure 6.6.2-3) are only partially preserved and are characterised by a flat or conical body with a hole surrounded by a small perpendicular wall. Example no. 2 could be also interpreted as a spouted vessel, often attested in Copper Age contexts, while the flat base of no. 3 suggests its use as a lid, with a shape resembling later, Bronze Age, boiler lids (Puglisi 1959: tab. 3; Soriano 2021: 205, no. 181). Boiler lids are not particularly common at Copper Age sites, partly because of a less standardised typology than Bronze Age examples. Nevertheless, some examples are attested in Italian Copper Age sites, even though often not clearly published (e.g., Le Cerquete Fianello, mentioned in Carboni 2020: 81). The ceramic spindle whorls and loom weights (Figure 6.6.4-8.7) are of the same type as examples attested in the area of Rome, in contexts dated mostly to the end of the 3rd millennium BC (Laterza and Ortucchio cultures), but in one case also to the beginning of this millennium (Gaudo culture, Anastasia *et al.* 2020).

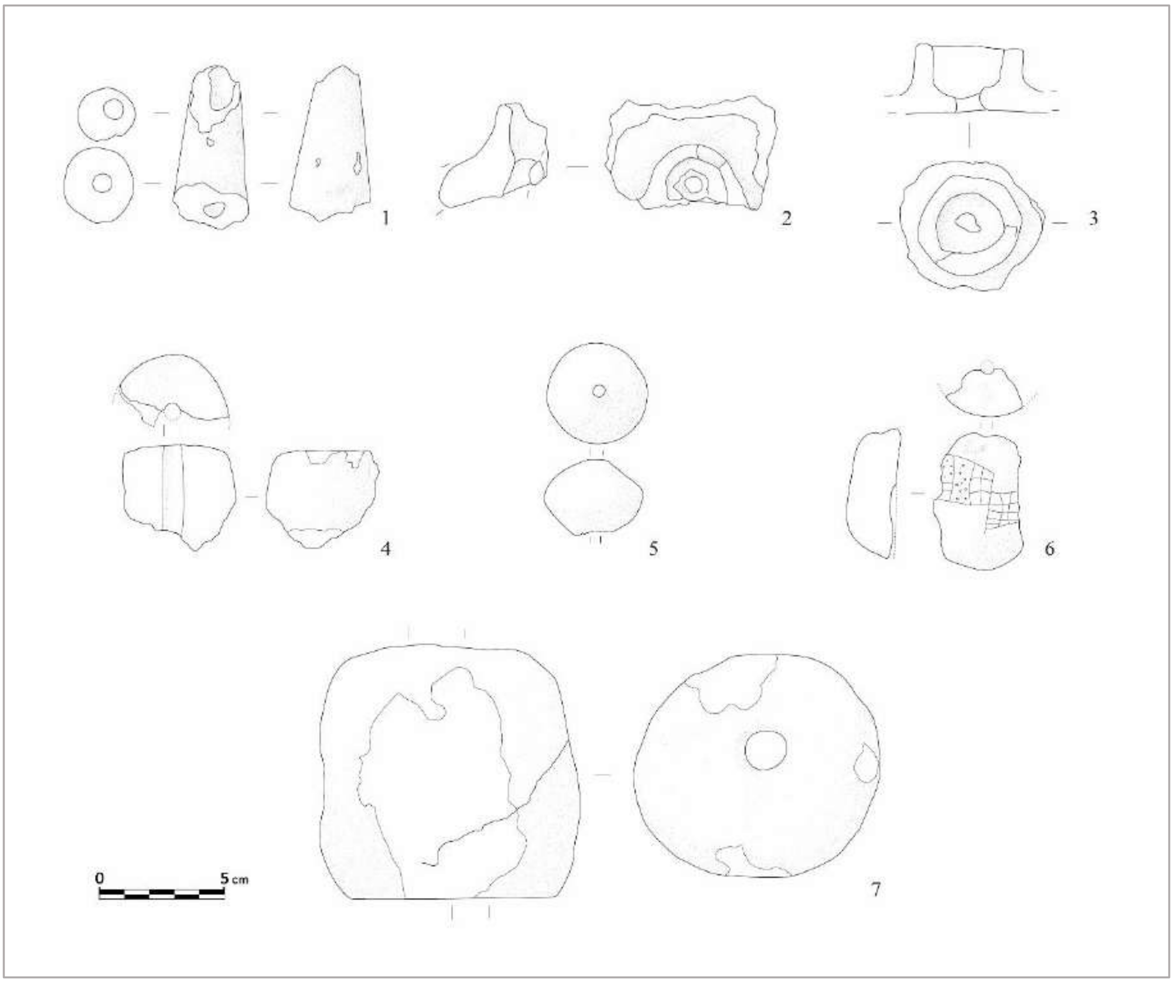


Figure 6.6. Paestum, Agorà II. Technical ceramic objects: 1. tuyère; 2., 3. boiler lids; 4. spindle whorl; 5. loom weight; 6. functional plane/cooking slab.

They are clear indicators of spinning and weaving activities carried out at the site. The loom weight is roughly conical in shape and low fired, as is common in Copper Age and Early Bronze Age contexts (for Copper Age examples see Anzidei *et al.* 2007; Anzidei and Carboni 2020: 141, fig. 3.6. 47 type 230B; for the Early Bronze Age see Bazzanella 2003: 157–8). The two spindle whorls (Figure 6.6.4–8.5) have a simple, rounded biconical shape which is especially associated with Late Copper Age and Early Bronze Age contexts. Late Copper Age examples are recorded at Quadrato di Torre Spaccata (Anzidei and Carboni 2020: 342, fig. 2.5. 55) and Casetta Mistici (Anzidei and Carboni 2020: 396, fig. 2.5. 107). A further possible conical spindle whorl or small loom weight (Figure 6.6.6) bears an impressed and incised decoration with few parallels. The spindle whorls and the loom weight find good typological parallels from Late Copper Age Ortucchio culture contexts in the area of Rome, especially in a settlement area of the site of Osteria del Curato-Via Cinquefrondi (Anastasia *et al.* 2020).

The portable cooking slabs consist of flat, circular ceramic discs with a smoothed upper surface and rounded or oblique edges (Figure 6.7). They are characterised by plant impressions on the base, probably derived from grass. Functional, low fired slabs are quite common in Copper Age contexts, although generally take the form of a clay layer directly set on top of the soil, with no clear edges. The findings of the Agorà Phase II are particularly relevant, since up until now, portable slabs are mostly associated with Bronze Age sites (Carloni *et al.* 2017; Acquafredda *et al.* 2006; Moffa 2007), with a few exceptions, e.g., in the area of Rome (Carboni 2020: 232 and fig. 3.8.32 no. 52) and at Castello di Annone, possibly dated to the Middle Neolithic (Peinetti 2014: 296–7, fig. 283),.

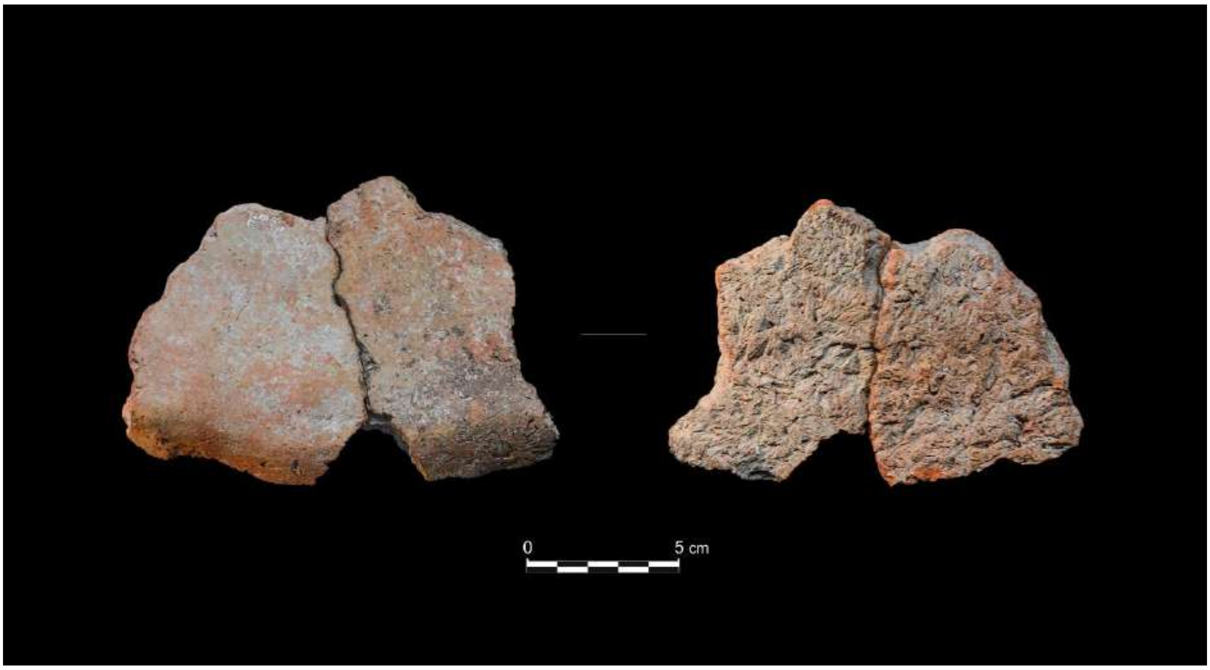


Figure 6.7. Paestum, Agorà phase II. Portable ceramic slab with smoothed upper surface and plant impressions on the base.

The vessel category of ‘Others’ includes 26 pyxis lids and two miniature vessels at Gaudo. The lids are generally found in association with the pyxides and, in a few cases, with small hanging jars. This type of lid is not represented in other contexts, (where pyxides and small hanging jars are absent) and does not appear in association with other vessel forms. Miniature vessels are also attested only at Gaudo, exclusively in tomb G, in both burial chambers. The two vessels are 3.9cm and 5.7cm high respectively and both have a diameter at the rim of about 6cm (Figure 6.8).

Figure 6.8. Paestum. Miniature vessels from the burial chambers of tomb G, Gaudo cemetery.

Similar miniature vessels are documented at only a few other Gaudo sites in Campania, including Pontecagnano and Mirabella Eclano (Bailo Modesti and Salerno 1998: 130), and in the area of Rome (Carboni 2020: 141). Lids are attested from several Copper Age contexts, mostly having a conical or truncated cone shape (Cocchi Genick 2008: 302–4), though they are most common in the Gaudo repertoire. These technical ceramic objects from the Middle Copper Age (especially Laterza contexts) suggest a progressive specialisation of the outputs of ceramic production, responding to more varied needs, production activities and ritual practices, compared to the Early Copper Age which is further analysed in Chapter 8.

Vessel morphology

Alongside typology, the morphology of the vessels has important implications, especially regarding skills and production (Forte 2019). Major morphological differences in each type, relating to cultural tradition and changes over time, can be detected in the four contexts analysed. The general trend is from simple, angular shapes in the Early Copper Age to highly complex forms associated with the Gaudo culture, returning to greater simplicity with more sinuous profiles in the later Copper Age Laterza repertoire. The relative distribution and development over time, and the cultural phase of each vessel category is summarised in Appendix 4.1 with drawings of the main types for each vessel category in all the contexts, where attested archaeologically.

Other similarities and contrasts can be noted in slightly more detail. Both the Early and Late Copper Age periods are characterised by simple vessel shapes, with a single geometric form, either a truncated cone (*cf*. bowls and cups from Agorà Phase I and Phase II) or a hemisphere (*cf*. Cerere bowls). In the Laterza contexts (Cerere and Agorà Phase II), bowls are often characterised by partially raised rims and often decorated with internal incisions or moulded appendages. In the Gaudo culture, composite shapes are more common, with multiple geometrical forms combined (Shepard 1956: 224–55; Bortolini 2016). Closed necked vessels such as jugs and *askoi*, hanging jars and cups usually consist of conical necks set on more-or-less spherical, often squashed shapes. Jars are mostly homogeneous across all the contexts, suggesting a preference for ovoid and globular forms. In only two cases are flared rims set on jars, at Agorà Phase I and Phase II respectively. The complexity of the vessel forms has important implications. Composite shapes such as jugs and *askoi* require a different technical knowledge, operational sequences, and skills; they also imply multi-staged forming processes to build the different portions of the vessels and allow for a partial drying of the lower portion (Roux 2019: 162), as explored in more detail later in this chapter.

A Bell Beaker fragment from tomb 1 in the Cerere cemetery is worth mentioning (Appendix 4.1.E). The fragment is very small but bares a clear impressed comb decoration below the rim in the International Beaker style (Lemercier, 2018). Unfortunately, the dimensions of the fragment do not allow a more accurate typological characterisation. Nevertheless, the presence of this Bell Beaker is indicative of the introduction of new ceramic types and morphologies probably linked to specific cultural practices and connections (see Chapter 2.4.3.1).

It must also be noted that the shaft in tomb P at the Gaudo cemetery in Paestum yielded a cup with morphological parallels in both the (later Copper Age) Laterza and the Early Bronze Age repertoires (Figure 6.9, no. 1). The cup has a sinuous profile with an everted rim and an angular handle, with a possible axe-shaped appendage that has strong parallels with handles attested in the eponymous Laterza cemetery in Apulia (Biancofiore 1967: fig. 50, 1979: spits XII–XIII), and with other Laterza and Early Bronze Age contexts (Laterza and Ortucchio cultures, Anzidei and Carboni 2020: 234, fig. 3.8.32 nos. 1, 9, 47, 53–5; 156, fig. 3.7.5 nos. 4 and 21). The other vessels found in the shaft (Figure 6.9, nos. 2 and 3) and in the two chambers are typical of the Gaudo repertoire. As will be further explored in Chapter 8, the presence of vessels typologically associated with the Laterza repertoire is quite common in Gaudo contexts, as at Mirabella Eclano (Bailo Modesti and Salerno 1998: 129–30), or in their proximity, as at Pontecagnano (Bailo Modesti and Salerno 1998: 33–8), reinforcing the hypothesis of the contemporaneity of these two cultures (see Figure 6.1), and the presence of interactions and overlaps between groups characterised by distinctive material cultures and ritual practices.

Figure 6.9. Paestum. Ceramic materials from the shaft of tomb P.

6.2.2. Technology

Technological observations on the pottery assemblage for each context involved recording the following aspects: wares, shaping techniques, wall thickness, surface treatment, decoration, colour and firing, the results are summarised in Table 6.1.

Paestum – contexts Chronology	Shaping of the body	Shaping of the handle	Surface treatment	Decoration	Firing
Paestum Agorà I **Early Copper Age** **3900-3650 BC**	Coiling also for bowls	Handle attached by spreading or by piercing the vessel wall	1% Burnished 57% Smoothed/Burnished 7% Accurately Smoothed 5% Roughly Smoothed 1% Rough 0% Scaled 9% NA	Decorated (6%) Undecorated (94%)	17.7% Oxidising 57.7% Reducing 6.3% Irregular 0% Black core 18.3% NA
Gaudo cemetery **Middle-Late Copper Age, Gaudo** **3500-2500 BC**	Coiling and slab building Moulding of lower body	Handles attached by piercing the vessel wall	10% Burnished 25% Smoothed/Burnished 51% Accurately Smoothed 5% Roughly Smoothed 1% Rough 0% Scaled 9% NA	Decorated (45%) Undecorated (55%)	9% Oxidising 17% Reducing 58% Irregular 3% Black core 13% NA
Temple of Cerere **Middle-Late Copper Age, Laterza** **3100-2300 BC**	Coiling and slab building Moulding for bowls	Handle attached by spreading or by piercing the vessel wall	11% Burnished 16% Smoothed/Burnished 64% Accurately Smoothed 4% Roughly Smoothed 2% Rough 1% Scaled 2% NA	Decorated (47%) Undecorated (53%)	10% Oxidising 33% Reducing 54% Irregular 1% Black core 0% Overfired 2% NA
Agorà II **Middle-Late Copper Age, Laterza** **3100-2300 BC**	Coiling and slab building Moulding for bowls	Handle attached by spreading or by piercing the vessel wall	5% Burnished 2% Smoothed/Burnished 26% Accurately Smoothed 10% Roughly Smoothed 20% Rough 30% Scaled 7% NA	Decorated (60%) Undecorated (40%)	10% Oxidising 25% Reducing 41% Irregular 15% Black core 2% Overfired 6% NA

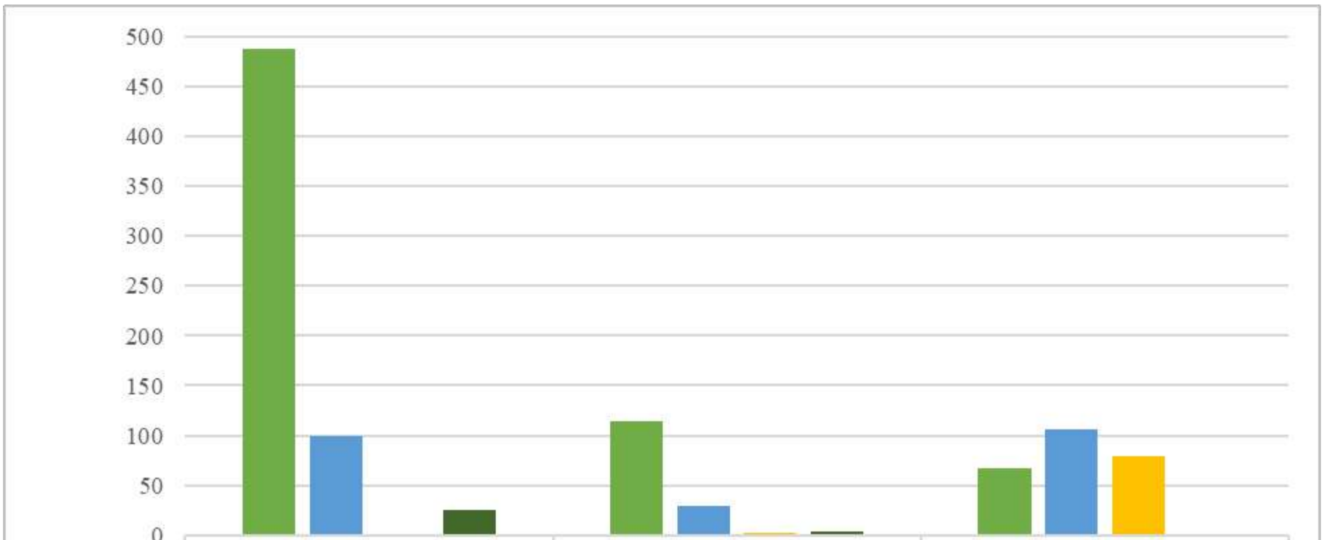
Table 6.1. Summary of the technological results for the site of Paestum.

Wares

The first level of technological observation involved grouping the ceramics into three main wares: ‘finished’, ‘rough’, and ‘scaled’ (as defined in Chapter 5.2.2). In cases where the surface treatment was not homogeneous a further hybrid ware was identified as ‘finished/rough’. This classification scheme was applied to all three exclusively Copper Age contexts: Gaudo, Cerere and Agorà Phase II. In the case of the Agorà Phase I context (Early Copper Age), due to the poor preservation of the surfaces and the type of macroscopic fabrics, which were linked more closely to Late Neolithic products, the classification used for Neolithic contexts of ‘coarse’, ‘fine’ and ‘figulina’ wares was adopted. ‘Figulina’ wares imply that the clay raw material was refined by removing the coarser fraction (Rice 2015: 133). The type of ‘figulina’ found at the Agorà phase I is not particularly depurated as will be explained in Chapter 7. Therefore, these examples were identified as ‘fine/depurated’, as they showed a poor refinement treatment compared to fully depurated pottery, classified as *figulina* and attested in the preceding (Neolithic) Serra d’Alto-Diana phase (Muntoni *et al.* 2015). For Agorà

Phase I, the most recurrent ware is coarse (84%), followed by a minor amount of semi-fine (6%) and fine/depurated wares (10%) identified on the basis of inclusions visible to the naked eye that are not present for fine/depurated wares (Appendix 5.1).

The distribution of wares among vessel categories was also considered. Large containers and bowls are mostly made in coarse ware; jars and small vessels are represented in all three wares, while cups are made in fine and semi-fine wares, although there is only one vessel of each at Copper Age Paestum. Across the three exclusively Copper Age sites, the ceramic wares have a rather variable distribution (Figure 6.10). In the Gaudo and Cerere cemeteries finished ware is the most represented (respectively 80% and 77%), followed by the rough ware. In contrast, in Agorà Phase II there is a greater balance between wares, but with a predominance of the rough ware. Scaled ware is found almost exclusively at Agorà, with very few occurrences in the other contexts.



	Gaudo	Cerere	Agorà II
Finished	488	114	67
Rough	99	29	106
Scaled	1	2	79
Fin/rough	25	3	0

Figure 6.10. Paestum. Relative distribution of ceramic wares between the three contexts analysed.

In Appendix 5.1, the occurrence of each ware is shown for the other exclusively Copper Age contexts with their distribution in relation to vessel categories. For the Gaudo cemetery, almost all the vessel categories are finished ware. Jars are generally rough ware (about 60%), but include a significant representation of finished ware (about 35%). The picture is similar at Cerere: almost all the vessel categories are made in finished ware with minor amounts of the other wares; jars and large containers are mostly rough ware. Agorà Phase II shows a more balanced distribution of the wares, with rough ware dominant in all the categories except for cups. Jars, bowls and large containers are mostly fashioned in rough and scaled wares. The moderate correspondence between wares and types suggests the existence of a set of recurrent features (surface treatment, thickness, type of decoration) that is associated with specific shapes and possible functions. Though not exclusive, analysis of wares might help in correlating vessel sherds with a range of possible types and technological processes, providing a useful basis for broad preliminary classification of Copper Age ceramic assemblages in Campania.

Shaping techniques

Macroscopic observation of ceramic sherds and vessels allowed recognition of some fashioning traces visible in broken sections and breakage patterns. Examples for each site are displayed in Appendix 6.1–4. In summary, the coiling method is attested in all the contexts, with flattened coils ranging between 3cm and 4cm in diameter and shaped by pinching, given the alternating U-shaped or rounded breaks.

For Agorà Phase I, shaping traces could be identified on eight ceramics. These are mainly related to coiling, with U-shaped fractures (Appendix 6.1, nos. 1 and 2) and recurrent breakage patterns (Appendix 6.1, no. 4). In two cases, a hole with a truncated cone section was drilled after firing on the body of the vessel. One was a fragment belonging to a large container, probably a jar (Appendix 6.1, no. 3), and the second was a fragment of fine/depurated ware probably belonging to a small vessel. This suggests that the containers were repaired in the past with a commonly attested technique consisting of drilling holes on both sides of the crack and joining them together, possibly with vegetal fibres and an adhesive (e.g., Miloglav 2020).

In the Gaudo cemetery, 33 vessels yielded traces of shaping techniques. These traces could be identified on sherds or restored vessels through their breakage patterns. The good state of preservation of most of the ceramics and the accurate finishing did not allow further evaluation of the rest of the assemblage (as also noted in an analysis of similar contexts, Forte *et al.* 2020). The manufacturing traces detected are related to coiling and joints between different parts of the vessel. In closed vessels, such as jugs, *askoi* and pyxides, and also in cups, the neck has a truncated cone shape and is clearly joined to the body at the base of the neck (Appendix 6.2, nos. 1, 7 and 9). This forming technique is evident in the preferential breakage at the neck joint, which is often highlighted by a decoration in the form of a horizontal incised line.

Jugs, *askoi* and cups have the most complex shapes in the Gaudo repertoire. Their large dimensions, especially for jugs and *askoi*, suggest that the vessels were manufactured by modelling the lower and upper parts separately. This process is also hinted at by the recurrent kinds of fracture evident in several vessels. As shown in Appendix 6.2, jugs no. 7 and no. 8 display a horizontal crack at the maximum width of the body, corresponding to the point where the two halves were joined. This process might also apply to cups, where fractures at the maximum width are also commonly attested (Appendix 6.2, no. 12). The two halves of these complex vessels might also have been produced using different forming processes and at different times. The bases are generally rounded, and sometimes slightly flattened or concave, and they are highly homogeneous, suggesting the use of a mould, which would also help in supporting the ceramic structure during manufacture when the upper part was added. The use of moulds is documented in several ethnographic cases (Roux 2019; Mayor 2010) and has also been detected in the Rome area in contemporary Gaudo or slightly earlier contexts (Forte *et al.* 2020; Forte 2020: 103–14). Furthermore, the common horizontal fractures occurring along almost the whole circumference points to a multistage forming process, with a drying phase aimed at avoiding the collapse of the vessel under its own weight (Roux 2019: 170).

An exception to this method might be represented in some jugs and *askoi* that also show traces of coils or slabs in the lower portion of the body (see Appendix 6.2, nos. 4, 9, 10, and 11). This is particularly evident in jug no. 4, where parallel small coils can be detected. In the two *askoi*, nos. 10 and 11, the most frequent fracture is instead located below the widest point. This might be due to the irregular shape of *askoi* bodies, suggesting the use of slabs and coils rather than regular moulds. The presence of coils does not, however, completely rule out the use of a mould into which the ceramic paste was placed in separate pieces rather than in one large sheet.

The upper parts of the vessels generally show superimposition of slabs or coils, due to recurrent horizontal and parallel fractures at the junction points as shown in Appendix 6.2, nos. 7 and 9. Small vessels such as cups, which show homogeneity and no recurrent breakage at the base, also suggest the use of moulds to create their hemispherical bases (Appendix 6.2, no. 12). In the case of pyxides, irregularity and regular breakage around the base might hint at the use of coils and slabs (Appendix 6.2, no. 2). As shown in Appendix 6.2, no. 5, twin vessels are made of two cups, modelled separately, and then joined by the larger handle, as suggested by common fractures at the joint between the upper and lower handles of the two cups.

Domestic pottery (i.e., used for daily activities like storage or food processing) is predominantly represented by jars. As shown in Appendix 6.2, no. 3, both parallel cracks and undulations in the vessel wall clearly show the use of coils or slabs of around 4cm thickness to shape the whole vessel. This technique is also evident in the large number of sherds showing traces of coiling in the form of a U-shaped breakage section. Other stages in the forming process, such as handle application and flat base forming, were rarely observed due to the good state of preservation of the ceramic assemblage. In only one case, Appendix 6.2 no. 6, was it evident that the handle joint was made by inserting its protruding end into a perforation or depression in the vessel wall.

Only a small number of fragments from the Cerere cemetery show traces of manufacturing techniques, with a few sherds displaying the classic U-shape of the break due to coiling. In this context, it must be noted that shallow and small bowls do not show any recurrent breakage pattern, again suggesting the use of moulds to create homogeneous hemispherical shapes (Appendix 6.3, nos. 1 and 2). In one case (Appendix 6.3, no. 3), there is indication that an overhanging handle was affixed to the rim and to the vessel wall by simple spreading.

For Agorà Phase II, 83 fragments showed manufacturing traces. The high number compared to the other contexts may be due to the highly fragmentary state of the ceramic assemblage, which allowed more accurate observation of sections, but few conclusions regarding complete shapes. Coiling traces are evident in several sherds and show either a U-shaped, rounded or flat break, pointing to coiling by pinching as a shaping technique (Appendix 6.4, no. 3 and 4). Handle joints are common and are mostly formed by inserting a protruding end into a perforation or depression in the vessel wall (Appendix 6.4, no. 2). Only in one case, possibly a small vessel, was the handle affixed simply by spreading onto the surface of the vessel wall (Appendix 6.4, no. 1). Bases are generally formed from clay discs diagonally joined to the walls on their upper edge or around it (Appendix 6.4, no. 5).

Wall thickness

As shown in Figure 6.11, wall thickness does not show major variations across the four contexts, with mean measurements ranging between a minimum of 0.35 cm and 1.65 cm. The highest values registered in all contexts are for jars, large bowls and for large containers generally identifiable as large bowls or jars. The thickness distribution appears quite consistent among the four contexts and, when present, with similar values for the same type. Closed vessels attested only in Gaudo contexts also have quite homogeneous thicknesses among the different types (jugs, small jugs, *askoi* and flask vases, around 0.8 cm).

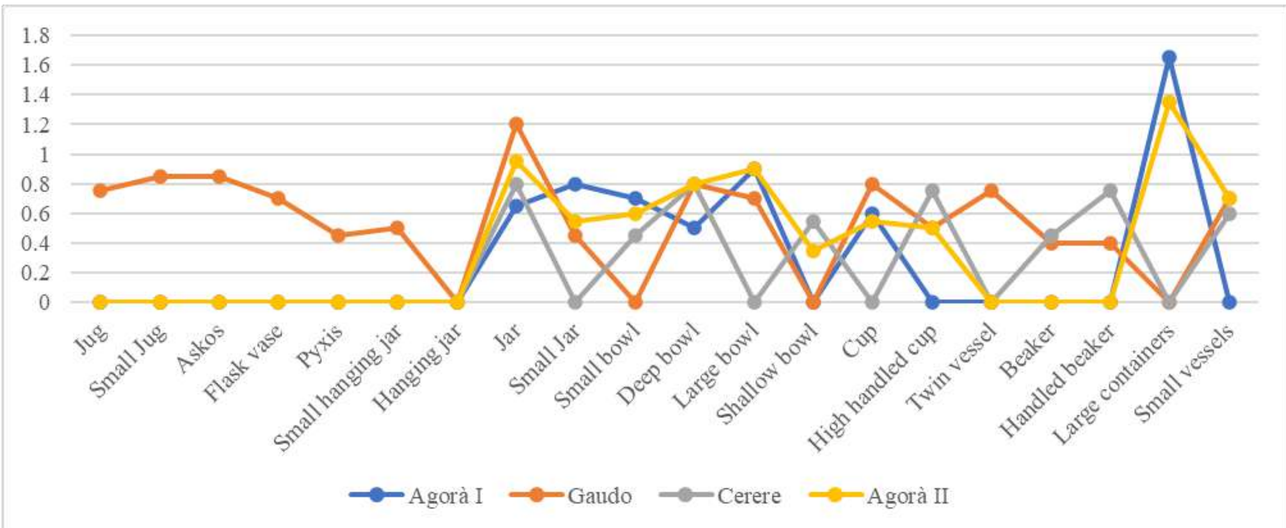


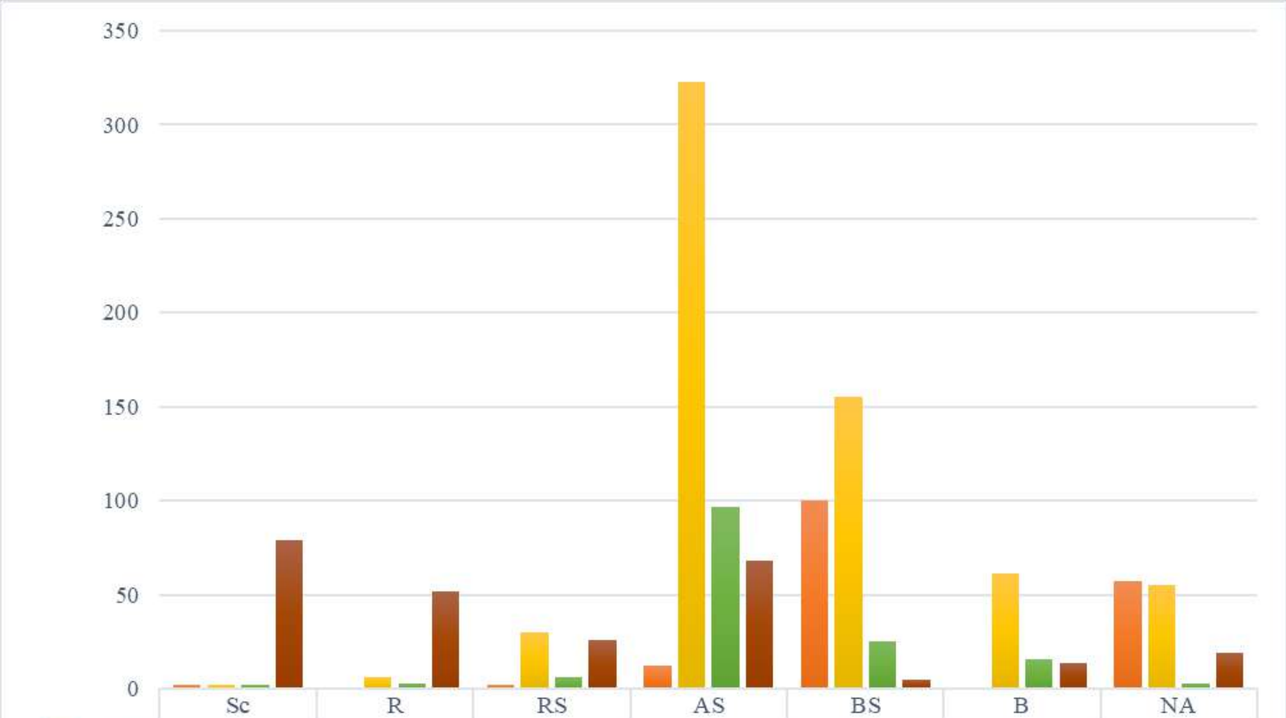
Figure 6.11. Paestum. Mean wall thickness (cm) distribution among ceramic vessel categories.

Surface treatment

As mentioned above, surface treatment was a particularly important step in Copper Age ceramic production. Figure 6.12 shows the distribution of the main surface treatments identified (as explained in Chapter 5) for the four contexts analysed, detailed in Appendix 7.

In Agorà Phase I, see Appendix 7.1, most vessel surfaces are poorly preserved, being completely or partially worn (33% are not identifiable). Smoothed/burnished finishes are the most common (57%), suggesting a partial burnishing or a post-depositional degradation of the burnished surface, followed by smoothed surfaces (7%). This is mostly documented for large containers, in most of the cases identifiable as truncated, cone-shaped, large bowls. It must be noted that burnished surfaces (1%) might be underrepresented due to post depositional alterations and partial or total loss of the shine (Ionescu and Hoek 2020: 204).

In the Gaudo cemetery, see Appendix 7.2, 51% of the vessels have an accurately smoothed surface treatment, 24% smoothed/burnished, 10% burnished, 5% roughly smoothed, only two sherds have scaled treatments, and 1% are rough. Looking at the occurrence of surface treatments in the different vessel categories it can be noted that, in general, the ratio between accurately smoothed, burnished and smoothed/burnished surfaces is quite consistent, especially for closed vessels, cups and beakers. The values generally range between 50 and 60% smoothed, about 30% smoothed/burnished, and 10–20% burnished surfaces. Bowls and small vessels are poorly attested and have only smooth surfaces. Jars are more variable: they are still mostly smoothed but include a few rough, roughly smoothed and scaled surfaces. The category of ‘Others’ is represented by lids, mostly with either a smoothed/burnished treatment, smoothed or, in only one case, roughly smoothed surface. The two miniature vessels show very rough shaping and treatment of the surfaces as quite common in this type of symbolic/ritual vessels.



	Sc	R	RS	AS	BS	B	NA
Agorà I	2	1	2	12	100	1	57
Gaudo	2	6	30	323	155	61	55
Cerere	2	3	6	97	25	16	3
Agorà II	79	52	26	68	5	14	19

Figure 6.12. Paestum. Distribution of surface treatments with respect to contexts. Keys: Sc = Scaled; R = Rough; RS = Roughly Smoothed; AS = Accurately Smoothed; SB = Smoothed/Burnished; B = Burnished; N/A = Not Available.

For Cerere (Appendix 7.3), 67% of the ceramics have an accurately smoothed surface, 19% are smoothed/burnished, 6% roughly smoothed, 2% burnished, 2% scaled and only 1% rough. In all the vessel categories most of the ceramics (50–90%) display an accurately smoothed surface with fewer smoothed/burnished examples. Burnished surfaces (slightly below 20%) are only attested on bowls. Jars have a greater variety of treatments.

For Agorà phase II (Appendix 7.4), a much greater variety of surface treatments is attested. The scaled treatment is the most common (30%), followed by accurately smoothed (26%), rough (24%), roughly smoothed (10%), and only a minor amount of smoothed/burnished (2%) and burnished surfaces (3%). Jars and bowls display a similar distribution of surface treatments, with rough and accurately smoothed surfaces the most represented. Bowls have a higher number of burnished surfaces, mostly linked to small bowls. Cups are also mostly accurately smoothed and burnished, but in one case scaled. This pattern suggests a more variable use of surface treatments, with accurately smoothed and smoothed/burnished surfaces preferred for small shapes such as small bowls and cups used for consumption. The high fragmentation of the ceramics from the Agorà Phase II context might also have caused an overrepresentation of large, coarse vessels in contrast to small, finer vessels represented by fewer sherds. All the vessels were reconstructed where possible, but over/under-representation cannot be ruled out.

Decoration

The decorative motifs on the ceramics are not very varied, being almost exclusively linear or geometric in character. The different techniques by which they were created can be grouped into three main categories: ‘plastic’ (plastic applications and scales), ‘incised’ (finely incised or grooved), and ‘impressed’. These are often combined to form more complex patterns. The distribution of the decorations across the contexts is summarised in tables and charts in Appendix 8.1.

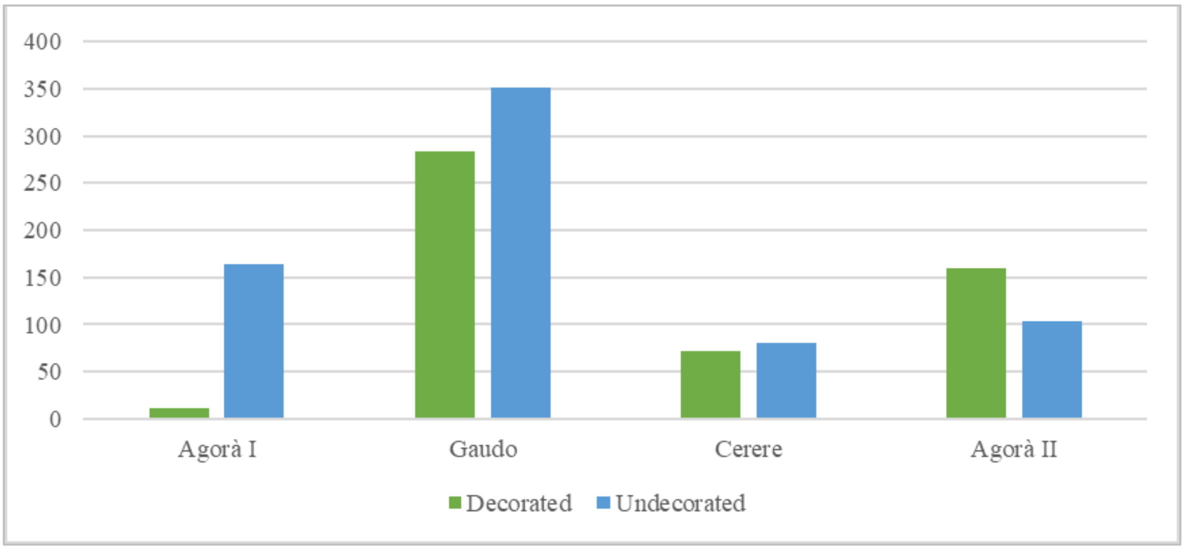
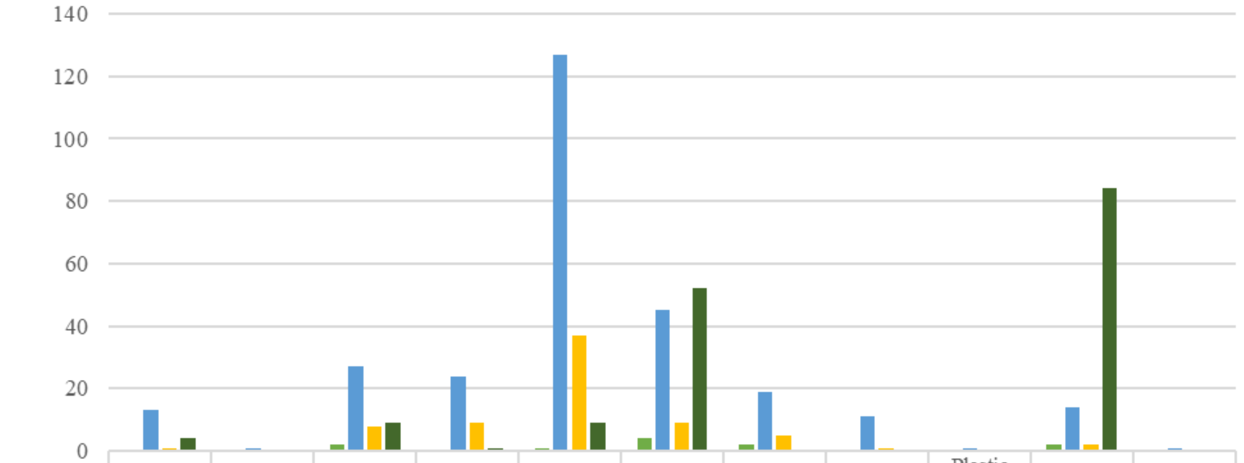


Figure 6.13. Paestum. Presence of decoration across the contexts analysed.

In the Early Copper Age Agorà Phase I ceramic assemblage, only 6% of the vessels are decorated (Figure 6.13, Appendix 8.1, no. 1), with very simple designs such as impressions of fingertips, plastic cordons with impressed fingertips or notches, or scaled decoration (Figure 6.13 and Figure 6.14, Appendix 8.1, no. 2). These simple decorations are generally associated with jars, bowls, cups, or large containers (Appendix 8.1, no. 3).

For the Gaudo cemetery, 45% of the ceramic assemblage is decorated (Figure 6.13, Appendix 8.1, no. 4). The techniques and motifs seem to be associated with particular vessel types. Closed vessels are the most decorated, followed by jars and cups. By far the most common technique used is incision, followed by plastic and impressed (Figure 6.14, Appendix 8.1, no. 5). The combination of more than one technique is quite common, with impressed and incised, and plastic and impressed motifs most often found together. The decorations are often arranged into more complex patterns, especially on pyxides where they tend to cover the whole body of the vessel and the lid. The extension of the decoration onto the base might be linked to hanging the vessels in a visible place. While scaled and plastic decorations are mostly reserved for jars and large containers, incised and impressed decoration is most common on closed vessels and cups (Appendix 8.1.6).



	Grooved	Grooved and incised	Impressed	Impressed and incised	Incised	Plastic	Plastic and impressed	Plastic and incised	Plastic incised and impressed	Scaled	Graffiti
Agorà I	0	0	2	0	1	4	2	0	0	2	0
Gaudo	13	1	27	24	127	45	19	11	1	14	1
Cerere	1	0	8	9	37	9	5	1	0	2	0
Agorà II	4	0	9	1	9	52	0	0	0	84	0

Figure 6.14. Paestum. Types of decoration across the contexts analysed.

As also noted in previous studies (Bailo Modesti and Aurino 2004), in the Gaudo repertoire there is a strict correspondence between decorative technique, motif, and vessel shape. Jars generally display from one to four rows of scales beneath the rim, in some cases combined with plastic cordons (plain or impressed) on the body. Jugs and small cups generally show an incised decoration of parallel horizontal lines on the neck and geometric motifs on the shoulder, sometimes accompanied by impressions. *Askoi* are generally decorated with plastic cordons and/or impressions.

Gaudo decorative motifs are generally linear and geometric, except in a few cases; anthropomorphic motifs have only been identified on only two pyxis lids and one pyxis from the cemetery of Paestum (Aurino 2004). These are from tomb T and tomb XIV chamber A respectively and show complex impressed and incised motifs. The lid from tomb T is decorated with incised lines framing dotted imprints. This pattern, which diverges from any other decoration attested, recalls the outer structure of a house with a large chimney, as does the lid shape itself (Aurino 2004: 83). In the case of the lid and pyxis from tomb XIV (Figure 6.15), the motif is anthropomorphic with a style that resembles contemporary Aegean and Sardinian human-shaped statues, e.g., Ancient Helladic II idols, Spedos and Dkathismata types or Ozieri female representations (Aurino 2004: 83, see also Chapter 2.4.3.1).

Figure 6.15. Paestum, Gaudo cemetery. Lid and pyxis from grave XIV chamber A, decorated with anthropomorphic figures.

For Cerere, 47% of the assemblage is decorated (Appendix 8.1.7). By far the most common decoration is incision (51%), followed by the combination of impressions and incisions (13%), and then plastic decoration (13%, Appendix 8.1.8). Incision is mostly found on bowls, which are the most decorated typological category (Appendix 8.1.9). Shallow and small bowls in particular show a characteristic decoration, with radial incised lines both inside and outside, and horizontal bands filled with incisions or impressions respectively. Plastic decoration is often represented by discs set on top of the handles of high-handled cups. A peculiar type of decoration is found on the only fragment of a Bell Beaker, found in tomb 1, which has classic Bell Beaker decoration below the rim (Chapter 2, Figure 2.27A). The type and shape of the impressions suggests this was created using a comb, a technique that is uncommon in the Laterza tradition (Lipowicz *et al.* 2008; Forte 2020: 57–68), but which is typical of the Beaker International style, widely attested in Central-North Italy, main islands and elsewhere in the Mediterranean region (Leonini and Sarti 2008: 90 fig. 3.2; 91: fig. 4.2–4.3; Fugazzola Delpino and Pellegrini 1999: fig. 49.30).

For Agorà Phase II, 60% of the ceramic assemblage is decorated (Appendix 8.1.10). The most common decoration is scaled (53%), followed by plastic (33%), with minor amounts of impressed (6%), incised (6%) and grooved (3%, Appendix 8.1.11) decoration. Decorative motifs are quite varied. Jars and bowls have mostly a plastic or scaled decoration (Appendix 8.1.12). Plain or impressed cordons are very common on jars and bowls. The scaled decoration generally differs from the typical Gaudo motif, which is not usually applied to the area below the rim; at Agora Phase II it covers part or all of the rest of the body. Plastic discs or appendages are common on the top of the handles. Lugs often occur on carinated vessels at the point of maximum expansion.

Colour and firing

Observation of the colour of the surface and in the sections of the ceramics allowed a generic estimation of the firing conditions of the pottery. The colour ranges for the four contexts are shown in Appendix 9.1–4 and percentages in Table 6.1.

For Agorà Phase I (Early Copper Age), 57% of the large bowls have brownish to blackish surfaces indicating partially reducing firing conditions. Oxidising conditions are indicated for small vessels which show a finer paste and yellowish colour, and for deep bowls and jars (17%). The remaining ceramics (6%) indicate irregular firing conditions, varying across areas of the same vessel.

For the Gaudo cemetery, darker or lighter patches on the majority of the vessels indicate a very irregular firing (58%). Only in a few cases does there appear to be a degree of control over the firing conditions, with few vessels being homogeneously dark- or light-coloured (9% oxidising, 17% reducing, 3% black core). The homogeneously brownish or blackish vessels are mostly closed forms, followed by cups, beakers and pyxides. A partly oxidising firing condition is indicated for large jars, characterised in most cases by a black core. This might be due either to an incomplete oxidation and/or to the presence of organic matter as confirmed by thin section petrography (Maritan *et al.* 2006).

The same high level of irregularity can be detected for the ceramics from Cerere (54% irregular firing), with partly reducing firing conditions mostly reserved to small bowls and shallow bowls (33%); jars also generally show reddish surfaces and a black core (10% oxidising, 1% black core).

For Agorà Phase II, the assemblage indicates that the firing conditions were irregular (41%), with a preference for reducing conditions (25%) and partly oxidising conditions shown by a black core (15%), but clear correspondence with vessel categories cannot be assessed.

In summary, all assemblages from all contexts indicate poor control of the firing atmosphere, with predominantly oxidising conditions used in the Early Copper Age contexts, but an increase in reducing atmospheres between Gaudo (14%) and Laterza (26%).

6.3. Pontecagnano

The two contexts analysed for the site of Pontecagnano are related to two different phases of the Copper Age and therefore to two different stages of occupation (as displayed in Figure 6.16). The Early Copper Age context, (hereafter ‘ANAS’,) described in Chapter 4.3.2.1, is related to domestic activities. In contrast, the Gaudo culture cemetery near the Picentino River dates to the Middle Copper Age and has a strictly funerary use.

The Early Copper Age context yielded a considerable amount of ceramic material. For the present study, a homogeneous context was selected: the main house (identified as UND002) and the layers representing its levels of occupation. In this way, the materials could be clearly linked to a specific structure. The ceramic assemblage selected was from Trenches 20 and 21 and the layers analysed were UUSS 20014, 20072, 20073, 20149 and 20179, plus the pit fills UUSS 20137 and 20140. All the main diagnostic material from these layers—a total of 314 ceramic vessels and fragments—was analysed and macroscopic data recorded. Typological identification of the main ceramic types attested was already available, carried out in a previous study (Aurino 2011).

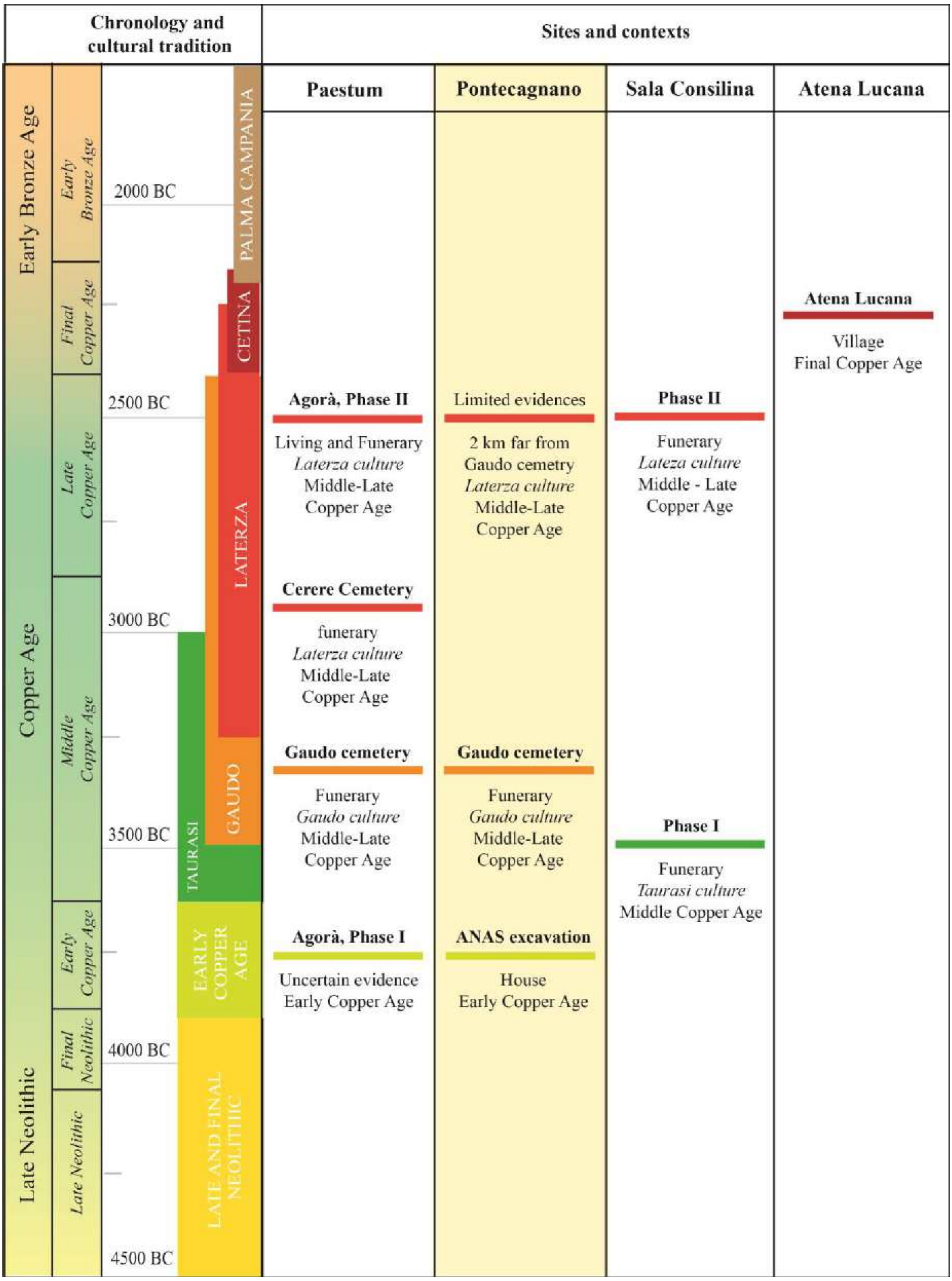


Figure 6.16. Synoptic table of the main sites and contexts considered with those for the site of Pontecagnano highlighted.

The Gaudo culture cemetery was thoroughly excavated and studied in the 1990s and provided the basis for the original typological classification of Gaudo culture pottery and for the interpretation of its complex funerary rituals (Bailo Modesti and Salerno 1998). The ten rock-cut tombs yielded 1406 vessels and ceramic sherds.

Furthermore, the few Middle-Late Copper Age evidences from S. Antonio locality in Pontecagnano, 2km south-est from Gaudo culture cemetery, will be also considered (tombs 1497, 551 and 548 and the deposits 632 and 654). The ceramic material yielded by these contexts has been macroscopically and typologically analysed.

Macroscopic data were collected for the entire ceramic record, as the cemetery represents an excellent case study, given its recent excavation and the accurate documentation available. The existing typological analysis (Bailo Modesti and Salerno 1998) was used as a basis for the simplified typological classification used in this research and was integrated with further functional observations and broader typological considerations. The analysis of the ceramic complex will be presented according to chronological and cultural criteria, starting with evidence from the Early Copper Age ANAS context, and moving to the Gaudo culture cemetery, allowing a comparison between the two.

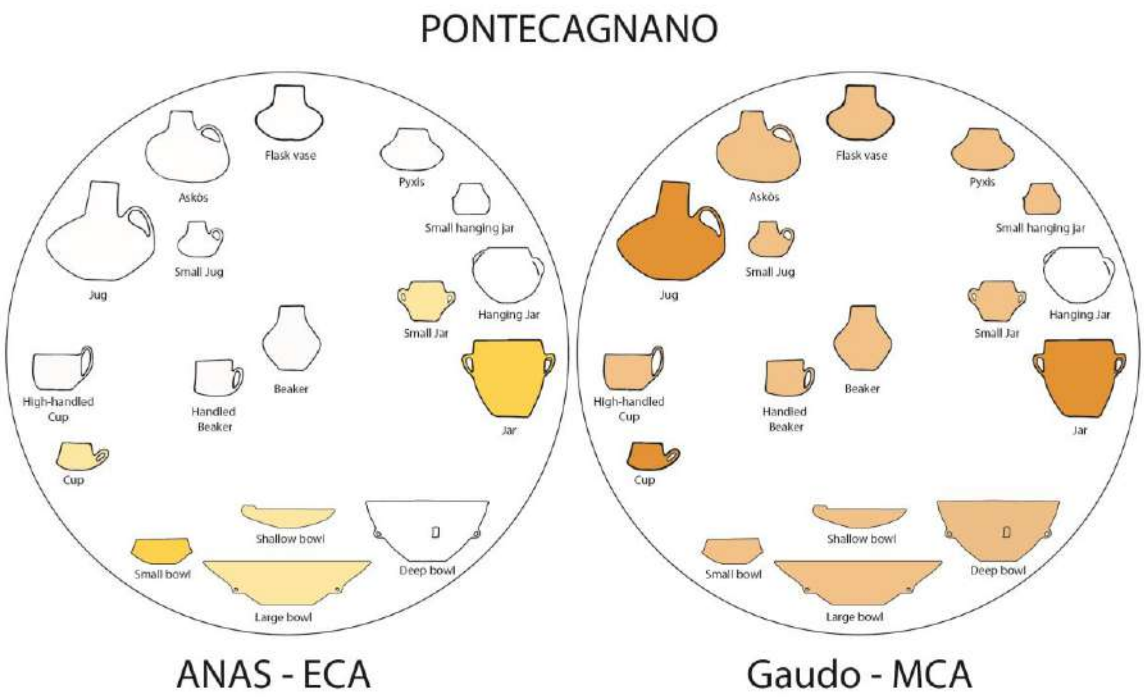
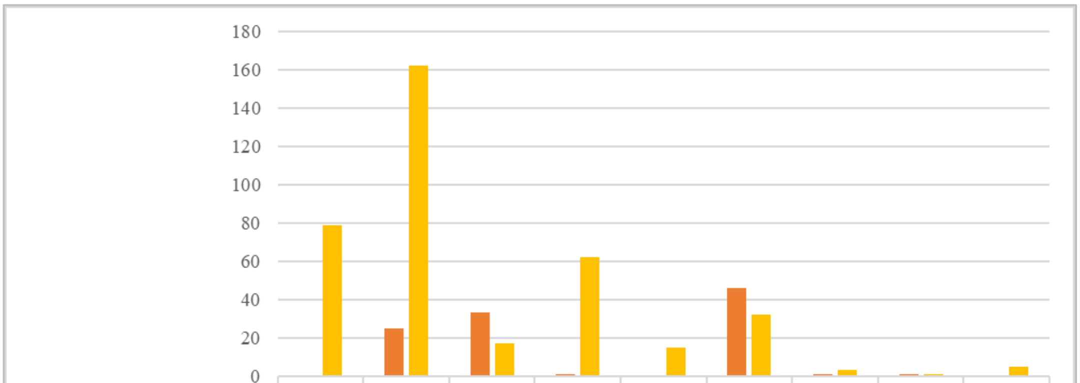


Figure 6.17. Pontecagnano. Occurrence of the forms in the two contexts analysed. The darker shading corresponds to a higher frequency shapes for each. The relative percentages and absolute numbers of occurrence of the types can be found in Figure 6.19.

6.3.1. Form

The two contexts show clear differences in their respective material culture and especially in their ceramic assemblages. As at Paestum, the Early Copper Age is characterised by a smaller and simpler ceramic repertoire, very different to the large and composite Gaudo culture pottery forms (Figure 6.17). The different function of the contexts must also be taken into consideration alongside this chronological difference in comparing the two. The Gaudo culture cemetery at Pontecagnano is also characterised by very specific vessel types which are exclusive to this context, such as jugs, small jugs, *askoi*, pyxides, small hanging jars, high handled cups, twin vessels, beakers and handled beakers. In contrast, the Early Copper Age ANAS context is characterised exclusively by small bowls, shallow bowls, small jars and jars. Overall, the ANAS context has a predominance of large containers, followed by bowls and jars, while the Gaudo culture cemetery has mostly jars, followed by closed vessels and cups.

There are clear differences between the two contexts in the types and frequency of forms (Figure 6.17 and Figure 6.18). The limited repertoire of the ANAS house is in marked contrast to the rich repertoire of the Gaudo culture cemetery. It must be noted that although jars are very common in the Pontecagnano Gaudo culture cemetery, only ten are whole, the others being highly fragmented and often come from the tomb shafts. Where possible, jars were carefully reconstructed by refitting sherds belonging to the same vessel (sherds from different areas of the tombs and between different tombs were also checked for matches). An overrepresentation of jars cannot be ruled out due to their larger volume and fragmentary state.



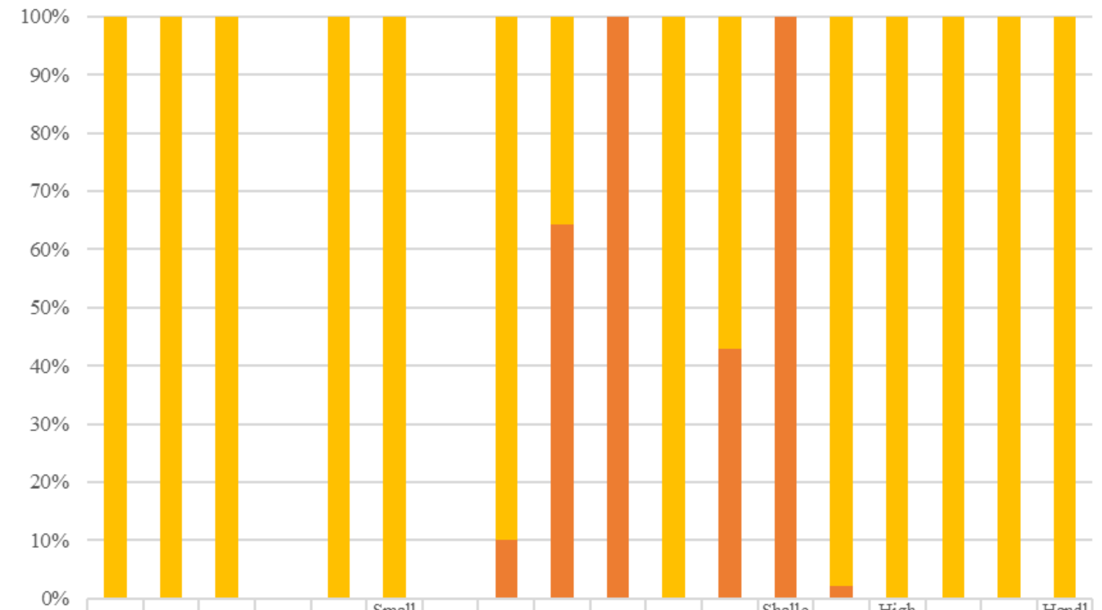
	Closed Vessels	Jars	Bowls	Cups	Beakers	Large containers	Small vessels	Technical	Other
ANAS - ECA	0	25	33	1	0	46	1	1	0
Cemetery - Gaudo culture	79	162	17	62	15	32	3	1	5

Figure 6.18. Pontecagnano. Distribution of the vessel categories within the two cultural contexts analysed.

Distribution of vessel types

Figure 6.19 shows the relative distribution of vessel types in the two contexts analysed. The ANAS repertoire is limited to a few shapes, particularly cups, large bowls, small jars and jars, with shallow bowls and small bowls exclusive to this context. In contrast, all the other type families are found in the Gaudo culture cemetery.

The category of 'Technical ceramic objects' includes two spindle whorls, each from a different context. That from the Gaudo culture cemetery is a small disc-shaped fragment found in the shaft of tomb 6513; the example from the ANAS structure is whole and has a biconical shape. The category of 'Others' includes three lids and two miniature vessels, all from the Gaudo culture cemetery. The miniature vessels are from the chambers of tombs 6514 and 6517 respectively. That from tomb 6514 (Figure 6.20.1) has a simple globular shape and measures 6.8cm in height with a 5.4cm diameter; the example from tomb 6517 (Figure 6.20.2) has an ovoid shape with two small, vertically perforated lugs at the sides. It measures 7.7cm in height with a 7.2cm diameter. Three examples of lids are attested in the cemetery. One is attributable to a pyxis, while the other two most likely belong to small hanging jars.



	Jug	Small Jug	Askos	Flask vase	Pyxis	Small hanging jar	Hanging jar	Jar	Small Jar	Small bowl	Deep bowl	Large bowl	Shallow bowl	Cup	High handled cup	Twin vessel	Beaker	Handled beaker
Cemetery - Gaudo culture	27	3	3	0	1	14	0	142	5	0	5	8	0	45	15	2	6	9
ANAS - ECA	0	0	0	0	0	0	0	16	9	18	0	6	3	1	0	0	0	0

Figure 6.19. Pontecagnano. Relative distribution of vessel types in the two contexts analysed.

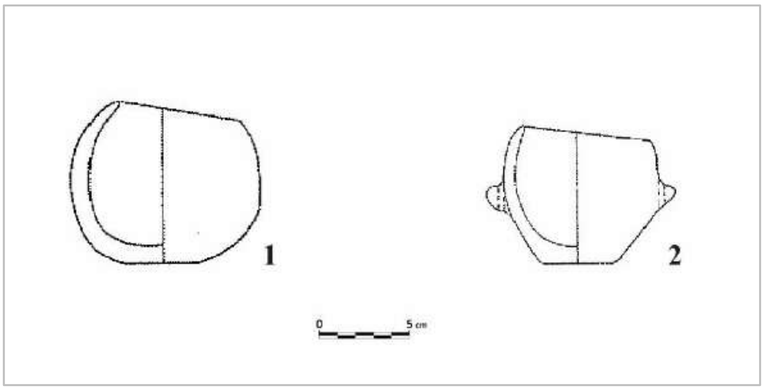
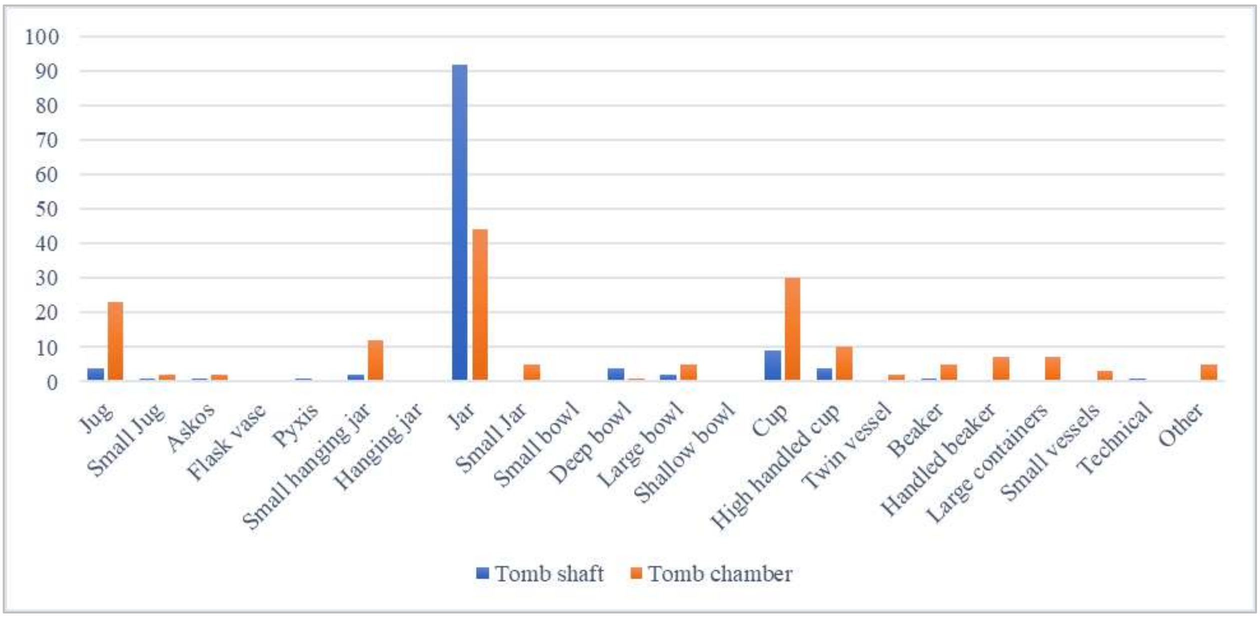


Figure 6.20. Miniature vessels from the burial chambers of tomb 6514 (1) and 6517 (2), Gaudo culture cemetery, Pontecagnano.

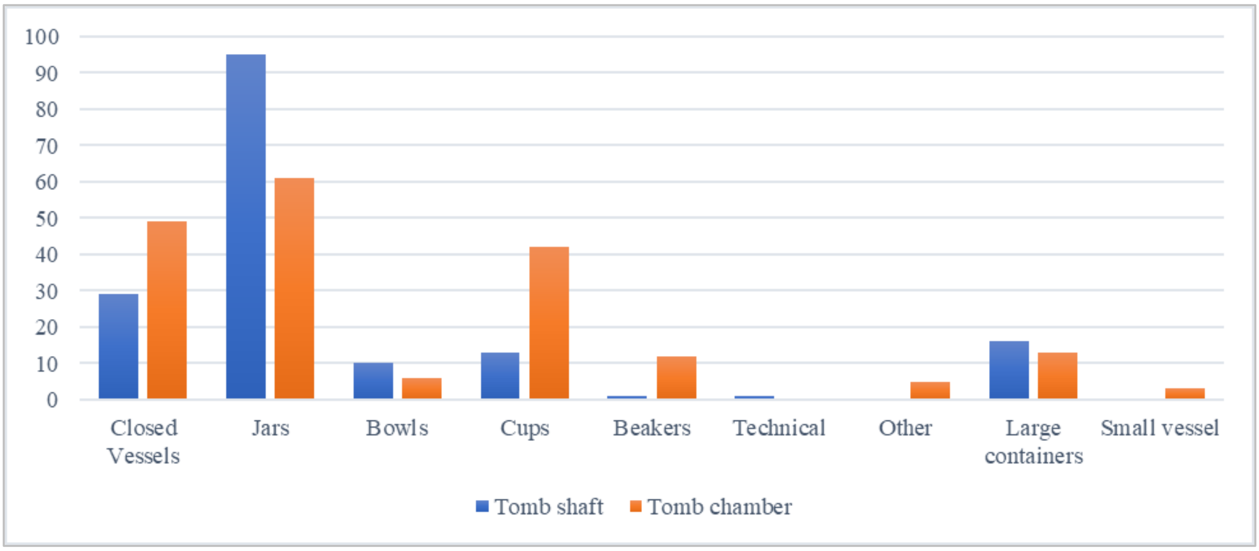
Distribution of vessel types in the Gaudo culture tombs

In the Gaudo culture cemetery at Pontecagnano, a distinction in the distribution of types can be made between the ceramic materials occurring in the tomb shafts and those in the burial chambers, as previously seen for Paestum (Section 6.2.1). In contrast to the latter, the Pontecagnano cemetery was carefully excavated, allowing the accurate collection and recording of all the fragments and whole vessels from both the shafts and the chambers. Furthermore, vessels were reconstructed taking into consideration fragments from different tombs to check possible connections between the burials. A strong connection was identified between tombs 6514 and 6512, where fragments of the same vessels—a jar and a handled beaker—were distributed between the chambers and the shafts of the two burials. Vessels were also reconstructed from different areas of the same grave (tombs 6512 and 6514): five jars, six cups, one handled beaker, one high handled cup, one large bowl, three large containers, and three that were not attributable to a particular type. This evidence has significant implications for the role and use of ceramics in Gaudo culture funerary rituals (Bailo Modesti and Salerno 1998: 198), which will be further explored in the discussion of the results in Chapter 8.

The distinction between the tomb shafts and tomb chambers is highlighted by the different occurrence of vessel types (Figure 6.21). Closed vessels, cups and beakers are dominant in the burial chamber, while jars and bowls are mostly represented in the shaft, as at Paestum. The vessels from the shafts are also mostly broken (only 2.6% are almost whole) and were reconstructed from several fragments. Jars were particularly easy to reconstruct since they were generally broken and deposited in a single place in front of the chamber entrance.



A



B

Figure 6.21. Pontecagnano. (A) Distribution of vessel types between tomb shaft and chamber. (B) Distribution of vessel categories in the Gaudo culture cemetery. Vessels reconstructed with fragments from more than one area of the tombs were not included.

In the tomb chambers, 15% of the assemblage was whole or partly whole. As previously noted, the quantitative and qualitative data from the Pontecagnano Gaudo culture cemetery are more reliable than those from Paestum due to the quality of archaeological excavation and documentation, therefore the higher number of fragments at Pontecagnano might point to a higher presence of fragments in the chambers more generally—something not detected archaeologically in the Paestum excavations.

Vessel morphology

Major morphological differences in each vessel type can be detected between the two contexts analysed. Again, the different functions of the two contexts, one domestic the other funerary, must be considered alongside the cultural and chronological differences. As at Paestum, the general trend shifts from simple geometric shapes in the Early Copper Age context to highly complex forms in the Gaudo culture context. The relative distribution and development over time and the cultural phase of each vessel category is summarised in Appendix 4.2, which illustrates the main types present in the two contexts.

As shown in Figure 6.18, the two contexts share only a few vessel categories, such as jars, bowls and cups. The Early Copper Age ANAS ceramic repertoire is restricted to a few simple shapes that are broadly multifunctional, falling mostly into the categories of jars and bowls, and one possible cup. Overall, jars have the same characteristics in both contexts: mainly ovoid with the decoration concentrated near the rim, either as scales or impressions, and, in the ANAS context, also as lugs. Small hanging jars are attested in both contexts, although with very different characteristics: ovoid or necked with small, vertically perforated lugs for the Gaudo culture mortuary context; simply ovoid with a large, vertically perforated handle near the rim for the ANAS domestic context. Bowls are mostly attested in the ANAS context, with a wide variety of types. Although always essentially geometric in shape, they vary from truncated cones to hemispherical to ovoid forms. Only a few bowls are attested for the Gaudo culture context, and these strongly resemble classic jars with scaled decoration beneath the rim, but have a wider mouth and a shallower body. As at Paestum, the other vessel categories for the Gaudo culture context are characterised by more complex shapes, generally resulting from the combination of more than one geometric form (Shepard 1956: 224–55; Bortolini 2016) in the same fashion as explained for Paestum's Gaudo cemetery (see section 6.2.1).

Laterza style pottery from Pontecagnano, locality of S. Antonio

Another piece of evidence to consider for the site of Pontecagnano are the finds from the locality of S. Antonio (described in Chapter 4.3.2.2). These find spots lie 2km from the Gaudo culture cemetery and comprise three graves (tomb 1497 rock cut, and two trench graves tombs 551 and 548) and two poorly defined material deposits or '*depositi*' (632 and 654). They all produced a pottery assemblage that shows strong parallels with the Laterza culture repertoire in Campania. Tombs 548 and 551 each yielded two small jars, placed as grave goods, and a cup. The ‘depositi’ yielded only pottery objects: one shallow bowl (*patera*) and one small jar. For tomb 1497, the shape of the rock-cut structure and the three ceramic finds (Figure 6.22.1–3) correspond to the classic Gaudo culture repertoire, however one high handled cup with a truncated cone shape and plastic decoration on the handle (Figure 6.22.4) closely resembles Laterza types and morphology, as highlighted in the Laterza contexts of Paestum (for parallels see Appendix 4.1 D, Cerere and Agorà II).

Figure 6.22. Pontecagnano, locality S. Antonio. Laterza style vessels from: A. tomb 1497; B. tomb 548 and 551; C. deposits 632 and 654.

The small jars from deposit 548 (Figure 6.22.5–6) are globular, in one case with a fake handle. The hemispherical cup from deposit 551 also has a morphology and decoration (incised zig-zag), including an axe-shaped handle (Figure 6.22.7), that find parallels in the Laterza repertoire. This handle shape is similar to that on a cup from Paestum’s Gaudo cemetery tomb P (see above, Figure 6.9). Deposit 654 yielded a handled cup and a small bowl with radial incised decoration (Figure 6.22.8–9), the morphology and decoration of which are also strongly linked to the Laterza repertoire (for parallels with the site of Paestum see Appendix 4.1 D and C). The most typologically striking find is undoubtedly the shallow bowl from tomb 632 (Figure 6.22.10), widely considered as diagnostic component of the Laterza cultural tradition and which is completely extraneous to the Gaudo repertoire (for parallels see Appendix 4.1 C, Cerere). As with Paestum, the morphology of the pottery repertoire from these tombs is characterised by much simpler forms than the composite types of the Gaudo cemetery but at the same time with less codified attributes (e.g., type of handles, shape of the rim) and decorations. The presence of Laterza style pottery in Gaudo contexts or in their proximity will be further explored in combination with other lines of evidence in Chapter 9, when addressing the relationship between the Gaudo and Laterza cultural traditions.

6.3.2. Technology

Technological observations on the pottery assemblage for each context are summarised in Table 6.2.

Pontecagnano – contexts Chronology	Shaping of the body	Shaping of the handle	Surface treatment	Decoration	Firing
ANAS **Early Copper Age** **3900-3650 BC**	Coiling also for bowls	Handle attached by spreading or by piercing the vessel wall	0% Burnished 0% Smoothed/Burnished 43% Accurately Smoothed 43% Roughly Smoothed 5% Rough 2% Scaled 7% NA	Decorated (11%) Undecorated (89%)	34% Oxidising 9% Reducing 47% Irregular 8% Black core 1% Overfired 2% NA
Gaudo culture cemetery **Middle-Late Copper Age, Gaudo** **3500-2500 BC**	Coiling and slab building Moulding of lower body	Handles attached by piercing the vessel wall	7% Burnished 8% Smoothed/Burnished 76% Accurately Smoothed 3% Roughly Smoothed 0% Rough 3% Scaled 2% NA	Decorated (15%) Undecorated (85%)	6% Oxidising 14% Reducing 47% Irregular 31% Black core 0% Overfired 2% NA

Table 6.2. Summary of the technological results for the site of Pontecagnano.

Wares

For the Pontecagnano site, two different wares were recognised which correlated with the respective domestic and mortuary uses of the two contexts.

For the ANAS house, the same classification was used as for Paestum Agorà Phase I which was based on Late Neolithic wares (coarse, fine and depurated/figulina wares). No *figulina* ware was attested as will be clarified in Chapter 7, so the wares were identified as either semi-fine or coarse ware. In the ANAS assemblage the most common ware is coarse (77%), followed by a minor amount (22%) of semi-fine ware (Appendix 5.2). Large containers and jars are mostly made in coarse ware, bowls are mostly semi-fine, while cups and small vessels are exclusively of semi-fine ware, although represented only by one example of each vessel type.

For the Gaudo cemetery, the ceramic wares are more variable (Appendix 5.2). Rough ware is the most common (53%), followed by finished ware (38%). It should be noted that the rough ware is mostly associated with jars, large containers, and non-attributable sherds, and is generally highly fragmented, which might have led to an overrepresentation of this class. Scaled ware is attested on 2% of the ceramics and is mostly associated with jars and large containers such as large/deep bowls.

Graphic representations of the occurrence of each ware in relation to the two contexts, and of their distribution in relation to vessel categories are included in Appendix 5.2. In the Gaudo culture mortuary context, almost all the vessel categories are of finished ware with a smaller amount of rough and scaled wares. Jars and bowls are generally rough (80% and 72% respectively), but in some cases also finished and scaled (fewer than 10%). Closed vessels, cups, beakers, and small vessels are almost exclusively of finished ware. Large containers are mostly of scaled ware, with some of rough ware. Miniature vessels are attested in both rough and finished wares.

Shaping techniques

Macroscopic observations of ceramic sherds and vessels allowed the recognition of several fashioning traces, mostly visible in broken sections and breakage patterns. Examples are shown in Appendix 6.5–6 for each context.

In the ANAS assemblage, shaping traces could be identified on about 40 ceramic pieces. These were mostly related to coiling, with U-shaped fractures, probably shaped by pinching given the alternately rounded and U-shaped breaks (Appendix 6.5, no. 6), and most recurrent breakage patterns (Appendix 6.5, nos. 4 and 7). Coils vary between 4cm and 5cm in thickness and were probably flattened before being applied in the form of slabs. Near the rims, coils sometimes show a smaller dimension, about 2–3cm, probably due to a further addition to the vessel walls to build the rim. The handle forming technique appears to vary depending on the shape and size of the handle and container. Small handles, either vertically or horizontally pierced, were affixed to the body simply by spreading onto the vessel surface (Appendix 6.5, nos. 1 and 2). On one large container (Appendix 6.5, no. 5), the handle was applied by inserting the protruding end of the pre-shaped piece into a perforation in the vessel wall. In another case (Appendix 6.5, no. 3), the vessel wall was shaped and externally perforated, and clay affixed to the inside wall to create a small internal tunnel or 'subcutaneous handle'. This technique is very unusual and attested in just two cases, one related to a large bowl with the handle horizontally perforated, and a second, probably related to a jar, with the handle perforated vertically. In Appendix 6.5, example no. 6 shows a trace of a plastic cordon applied vertically to the vessel surface simply by pressure and spreading, which later fell off. In one case, shaping traces were also detected on a base (Figure 6.23) that was most likely built from a clay disc with an oblique coil added towards the perimeter. The superimposition of more clay layers might suggest the further addition of clay to strengthen the base, resulting in a layered section.

Figure 6.23. Pontecagnano, ANAS context. Base shaping by addition of an oblique coil to the edge of a clay disc, with the addition of further clay material to strengthen the joint.

In the Gaudo culture cemetery, about 60 vessels showed traces of manufacturing techniques. These were mostly identified on sherds or reconstructed vessels through their breakage patterns. As for the Paestum Gaudo cemetery, the good state of preservation of most of the ceramics and the extensive finishing of the surfaces did not allow further considerations for the rest of the assemblage. The shaping traces detected are mostly related to coiling and joints between different parts of the vessels. In closed vessels such as jugs, *askoi* and pyxides, and also in cups, the neck usually has a truncated cone shape and is generally joined to the body at the neck joint (Appendix 6.6, no. 1). This is evident in the recurrent breakage at the neck joint, while the joint is often marked by decoration in the form of a horizontal incised line.

Several features diagnostic of shaping could be detected in the assemblage, often suggesting a degree of variability depending on shapes, form complexity and dimensions. As at Paestum, the recurrent breakage pattern of large jugs suggests the use of a mould for the lower part and coils to build the upper part (Appendix 6.6 nos. 1, 4 and 5). A similar construction technique also seems to have been adopted to produce cups with a composite shape. Nevertheless, some exceptions could be detected. In the case of one large jug and a cup with a simple profile, there is evidence that the base was first shaped as a clay disc and then expanded through the addition of coils or slabs to its side, as for the jug in Appendix 6.6, no. 2. The shape of this jug is slightly squashed, with the maximum diameter lower down the body than usual. In this case, the breakage pattern shows no traces of joins at this point, in contrast to most other cases. Rather, the breaks (and consequently the joints) occur at points both slightly higher and slightly lower than the maximum diameter, excluding the possibility that the jug was built in two halves then joined, although the use of moulds as supports can still be hypothesised.

For other shapes with simpler profiles, most of the evidence points towards the use of coils or small slabs to build the whole vessel. An example is a small hanging jar (Appendix 6.6, no. 3) where traces of coils can be detected on the lower portion of the body, extending down to the base. In the case of cups with a simple truncated cone shape or ovoid profile, flat bases were built from clay discs and slabs, or coils joined near the edge.

As at Paestum, twin vessels are made of two cups, modelled separately, and then joined by the large handle, as suggested by the common fracture at the joint between the upper and lower handles of the two cups (Figure 6.24). In one case, the two cups are also joined by an applied decorative panel, formed by folding and modelling a clay sheet (Figure 6.24 right).

Figure 6.24. Pontecagnano, Gaudo context. Evidence of shaping techniques in a twin vessel. The arrows on the left show the junction between the handle and the cup body. The box shows the decorated panel and its section, displaying a clear fold of a single clay sheet joined to the handle by spreading onto the surface.

The domestic pottery mainly comprises jars, many of which were fragmented in antiquity then reconstructed post-excavation. Both parallel cracks and undulations in the vessel walls clearly show the use of coils or slabs of around 4cm thickness to shape the whole vessel. This technique is also evident from the large number of sherds with a U-shaped breakage section (Appendix 6.6, no. 11). An interesting case is a jar with scaled decoration near the rim (Appendix 6.6, no. 6). Small coils, about 1cm thick and poorly combined, have been applied to the inside of the rim, corresponding to the outer decoration. Their position was probably functional both to the shaping of the rim, which curves slightly inwards, and to the creation of the scaled decoration, produced by dragging the clay on the outer surface.

Other forming techniques and stages, such as handle application and flat base creation, could also be observed. Handles were mostly joined by inserting a well-shaped protruding end into a perforation in the vessel wall (Appendix 6.6, nos. 7–10). As mentioned above, when not clearly produced in a mould (Appendix 6.6 no. 4), bases were generally built by using clay discs, diagonally joined to the walls on their upper edge (Appendix 6.6, nos. 12–14) or, in the case of rounded bases, around it (Appendix 6.6, no. 2). In some cases, (Appendix 6.6, nos. 12 and 14), the addition of clay material at the joint between the base and wall might have been used to strengthen the base and increase its resistance to shock (Forte 2014: 76–80).

Wall thickness

As shown in Figure 6.25, wall thickness does not show major variations in either of the main contexts at Pontecagnano. Jars and large containers generally identifiable as large bowls or jars have the thickest walls.

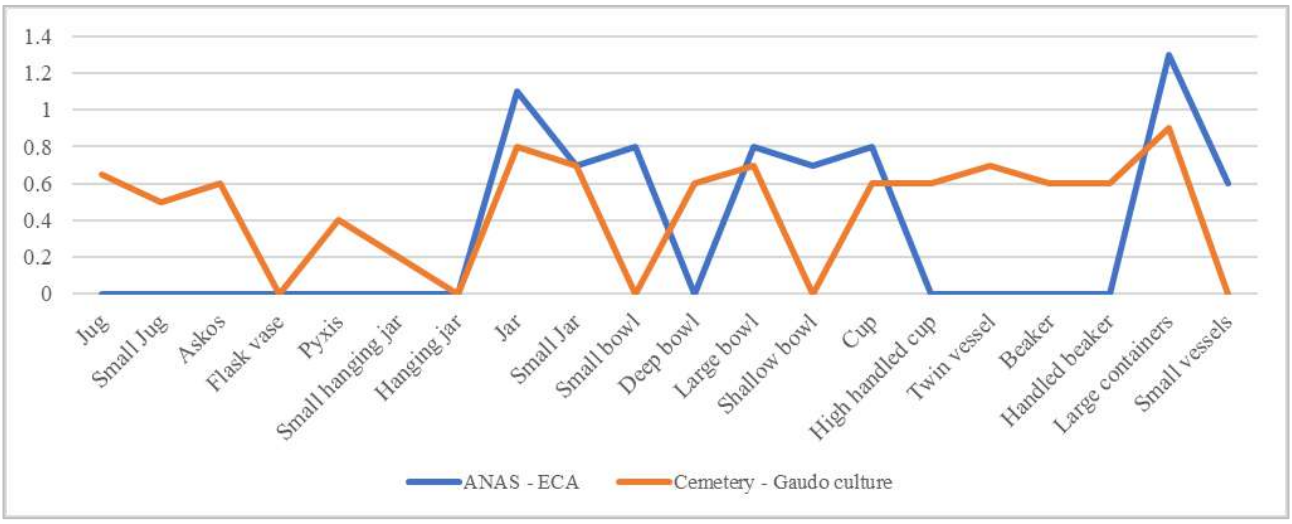


Figure 6.25. Pontecagnano. Mean wall thickness (cm) distribution among ceramic vessel categories for the two contexts studied.

The thickness distribution appears quite consistent across both the Early Copper Age (ANAS, domestic) and Gaudo culture (mortuary) contexts with similar values for the same vessel type where present in both contexts. Jars, large bowls, large containers, and cups show slightly higher values in the ANAS context (1.1 vs. 0.8 for Gaudo culture cemetery). Closed vessels, attested only in the Gaudo cemetery, have a quite consistent thickness among the different vessel types (jugs, small jugs and *askoi*, all ranging between 0.5 and 0.65 cm).

Surface treatment

As previously noted, surface treatment is a particularly important feature of Copper Age ceramic production. Figure 6.26 shows the distribution of the main surface treatments detected (as explained in Chapter 5) for the two contexts analysed, detailed in Appendix 7.

For the ANAS domestic context, most vessels show either a roughly smoothed (43%) or accurately smoothed (43%) treatment, with only a few (5%) having rough surfaces. As shown in Appendix 7.5, most of the bowls, cups and small vessels are accurately smoothed, while jars and large containers are roughly smoothed. Scaled treatment is only attested on jars, while a few bowls have a roughly smoothed treatment.

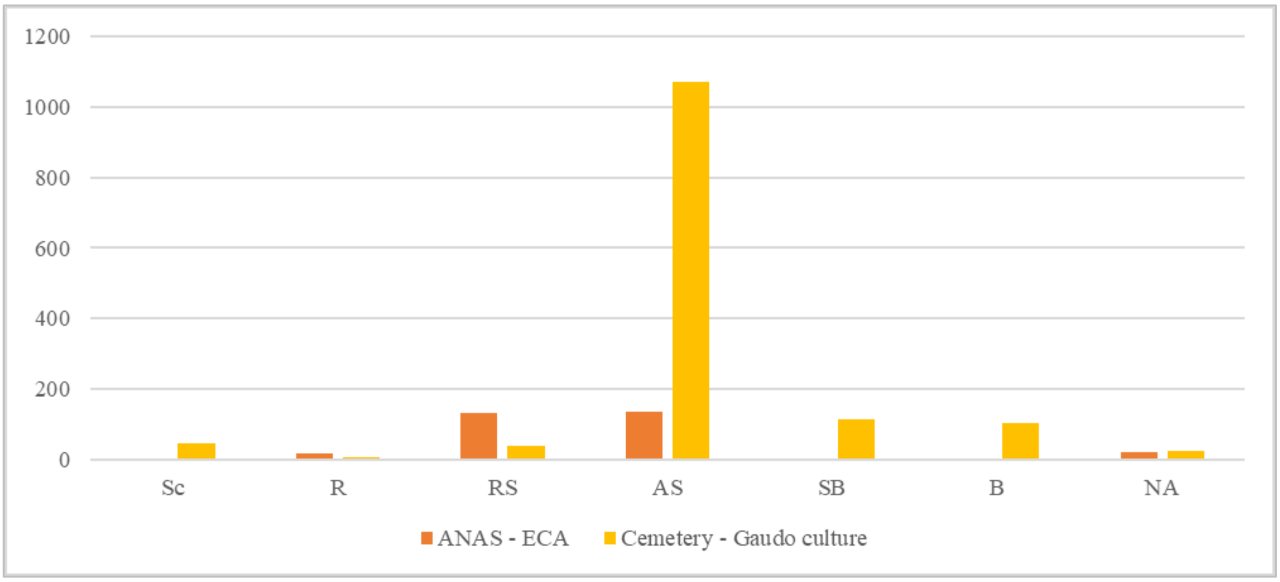


Figure 6.26. Pontecagnano. Distribution of surface treatments across the two contexts. Keys: Sc = Scaled; R = Rough; RS = Roughly Smoothed; AS = Accurately Smoothed; SB = Smoothed/Burnished; B = Burnished; N/A = Not Available.

For the Gaudo culture cemetery, 76% of the vessels have an accurately smoothed surface treatment, 8% are smoothed/burnished, 7% are burnished, 5% are roughly smoothed, only 2% have a scaled surface, and 1% are rough (Appendix 7.6). Burnishing is especially common on closed vessels and cups, and is the treatment most attested on beakers. These three vessel categories show a similar ratio between accurately smoothed (30%), burnished (50–60%) and smoothed/burnished (20–30%) surfaces. This contrasts with Paestum's Gaudo cemetery where, in the same categories, the most common treatment is accurately smoothed rather than burnished, suggesting a slightly variation in potting tradition. Bowls are mostly smoothed, and small vessels are smoothed/burnished. Jars show the full range of surface treatments except for rough, with a predominance of accurately smoothed surfaces. The category of 'Others' comprises lids, mostly with an accurately smoothed treatment and only a single roughly smoothed example. One of the two miniature vessels is rough, while in the other is accurately burnished.

Decoration

The decorative motifs of the ceramics are not particularly variable and are almost exclusively linear or geometric in character as already seen for Paestum. The relative frequency of decorated pieces in the two contexts is summarised in displayed in Figure 6.27 and in Appendix 8.2.

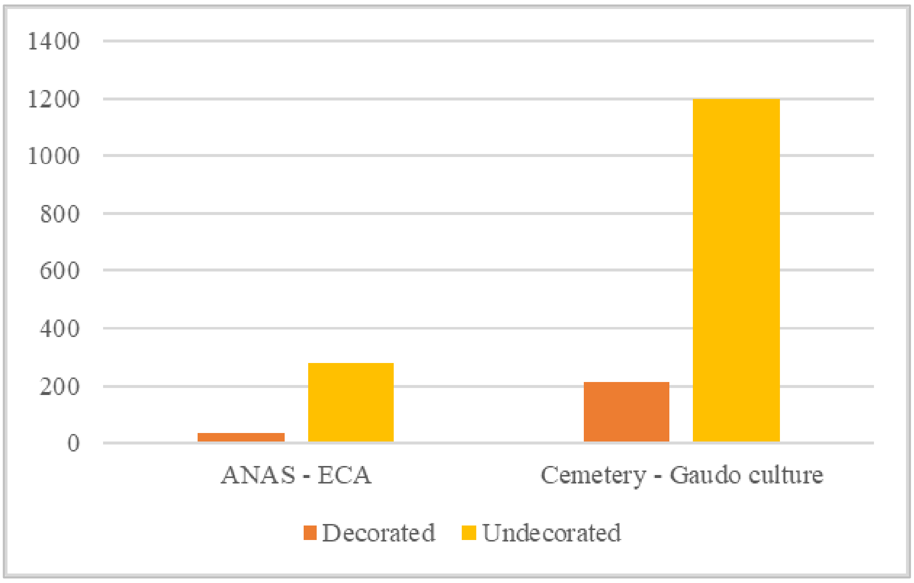
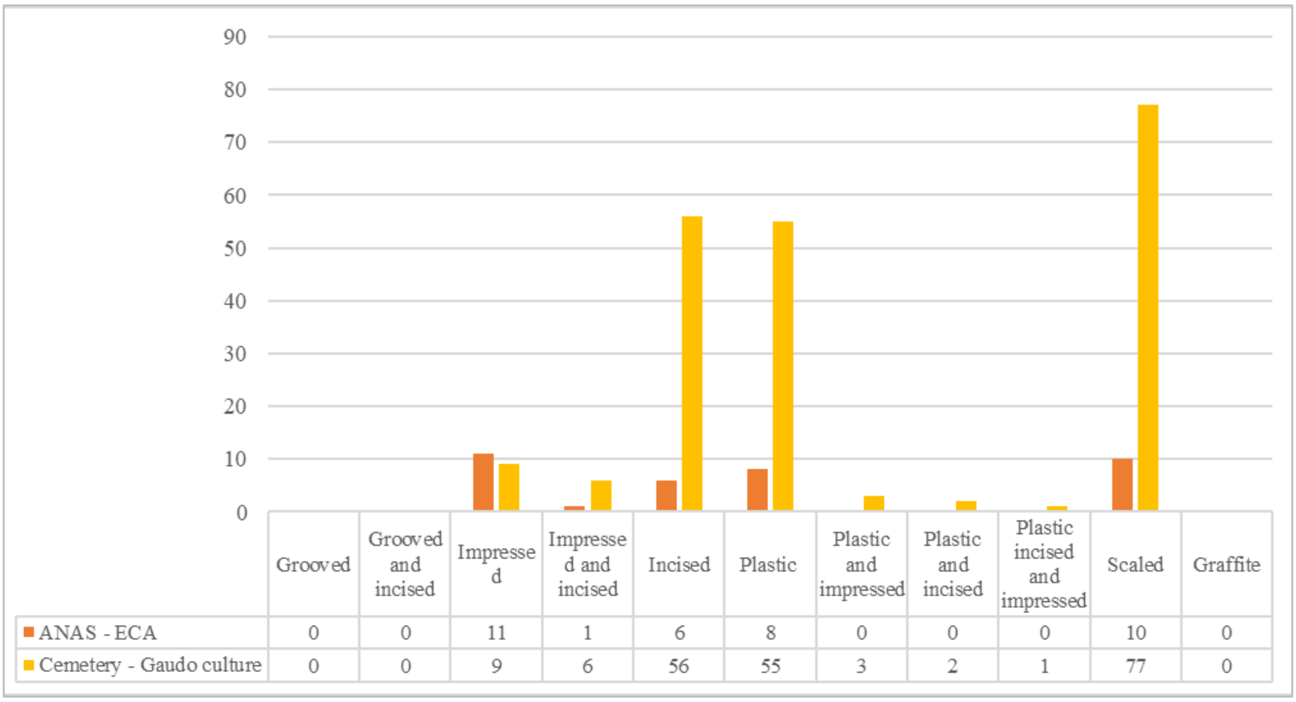


Figure 6.27. Pontecagnano. Frequency of decoration in the two contexts analysed.

In the Early Copper Age ANAS house context's ceramic assemblage, only 11% of the vessels are decorated (Appendix 8.2, no. 1), and include mostly jars, large containers or non-attributable sherds (Figure 6.27; Appendix 8.2, no. 2). Overall, the decorations attested here are relatively simple, homogeneous and repetitive and are mostly limited to jars and small jars (Appendix 8.2, no. 3). The most frequently represented techniques are impressed, scaled, plastic and incised (Figure 6.28), with one example showing a combination of impressed and incised decoration, with rounded impressions framed by incised lines. Plastic cordons also show circular or ovoid impressions, probably made by fingertips. Jars are generally decorated near the rim with three or more rows of scales, conical lugs, one row of impressed circles (probably made with fingertips), or one row of impressed fingernails. Fingertip impressions also occur on the vessel rim, and on plastic cordons near the rim or on the body, in some cases on more than one cordon.

For the Gaudo culture cemetery, ceramic decorations show a marked standardisation related to vessel shape. Only 15% of the vessels are decorated - mostly jars, followed by non-attributable sherds, closed vessels, large containers, cups, bowls and beakers. The decorations are occasionally arranged into complex patterns and follow the same style outlined for Paestum's Gaudo cemetery.



	Grooved	Grooved and incised	Impressed	Impressed and incised	Incised	Plastic	Plastic and impressed	Plastic and incised	Plastic incised and impressed	Scaled	Graffite
ANAS - ECA	0	0	11	1	6	8	0	0	0	10	0
Cemetery - Gaudo culture	0	0	9	6	56	55	3	2	1	77	0

Figure 6.28. Pontecagnano. Distribution of types of decoration across the two contexts analysed.

Colour and firing

Observation of the colour on the surface and in sections of the ceramics allowed an approximate estimation of the firing conditions of the pottery. The colour ranges for the two contexts are shown in Appendix 9.5 and percentages in Table 6.2.

For the ANAS context, most vessels indicate an irregular firing condition due to unevenness in the surface and section colours. Of the ceramic sherds, 34% show colours ranging between brownish, reddish and orange, suggesting that they were fired in oxidising conditions. Only 9%, often bowls and jars or small jars, show darker colours, between dark brown and blackish. In a few cases, a black core is also evident in association with jars or bowls (8%).

For the Gaudo culture context (Appendix 9.6), most vessels show a very irregular firing, with darker or lighter patches (47%). Only in a few cases does there appear to have been a degree of control over the firing conditions, with few vessels being homogeneously dark- or light-coloured. Homogeneous brownish or blackish vessels include mostly closed vessels, jugs, small jugs and *askoi*, followed by cups, beakers and pyxides. Only 6% of the ceramics displays homogeneously oxidising conditions with reddish colours while 31% displays a black core, indicating a partly oxidising firing condition, due either to incomplete oxidation or to the presence of organic matter—an aspects that was further examined through thin section petrography, presented in Chapter 7. Some vessels (14%) also show partially reducing conditions. These are mostly closed vessels, and vessels for consumption, generally also displaying burnished surfaces.

Taken together, the ceramics from both contexts indicate a limited control of the firing atmosphere, which was predominantly oxidising in the Early Copper Age ANAS context, with an increase in reducing atmospheres and black cores in the Gaudo context.

6.4. Sala Consilina

As explained in Chapter 4.3.3, two main phases of mortuary activity dating to the Copper Age were identified at the site of Sala Consilina (see Figure 6.29), represented by: a cremation burial site with stone structures assigned to the Taurasi culture, dating to the second half of the 4th millennium BC (Phase I), and a small cemetery of trench graves radiocarbon dated to the first half of the 3rd millennium BC (Phase II).

The site yielded a relatively modest number of ceramic fragments and, for the purpose of this research, only vessels and sherds from clearly defined contexts such as the cremation burials and trench graves were considered, creating a total sample of 88 pottery sherds. Most of these (80) come from the cremation burial contexts, while only eight almost whole vessels were yielded by the five trench graves. As explained in Chapter 4.3.3, at Sala Consilina the Laterza culture graves are characterised by their minimal grave goods (one or two vessels when present) with only a few fragments of pottery found, but possibly not left intentionally, in the fill. Macroscopic observations were carried out on the 88 vessels and fragments, which were all documented photographically (a sample of which is presented in Appendix 4.3).

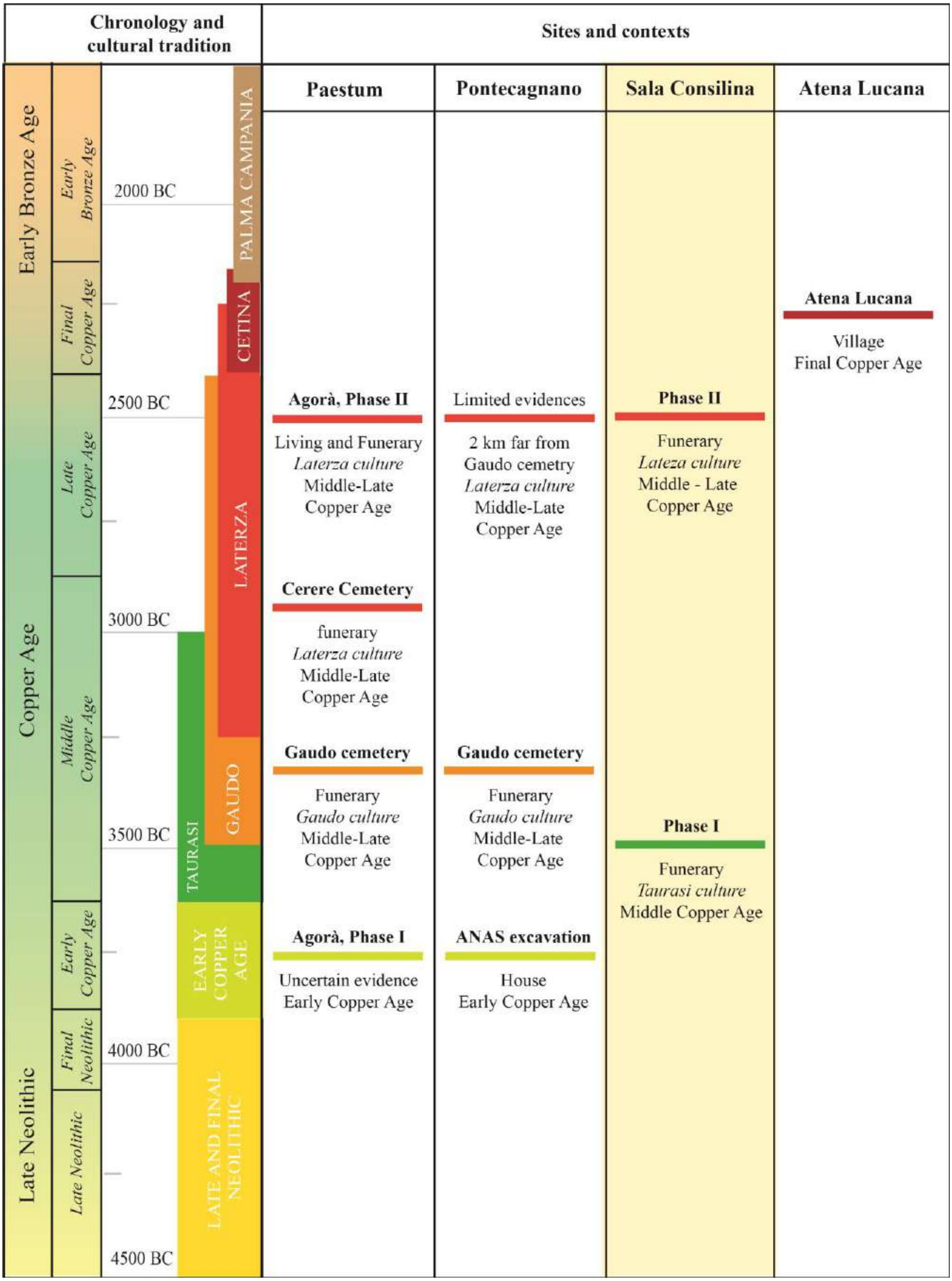


Figure 6.29. Synoptic table of the main sites and contexts considered. The contexts considered for the site of Sala Consilina are highlighted.

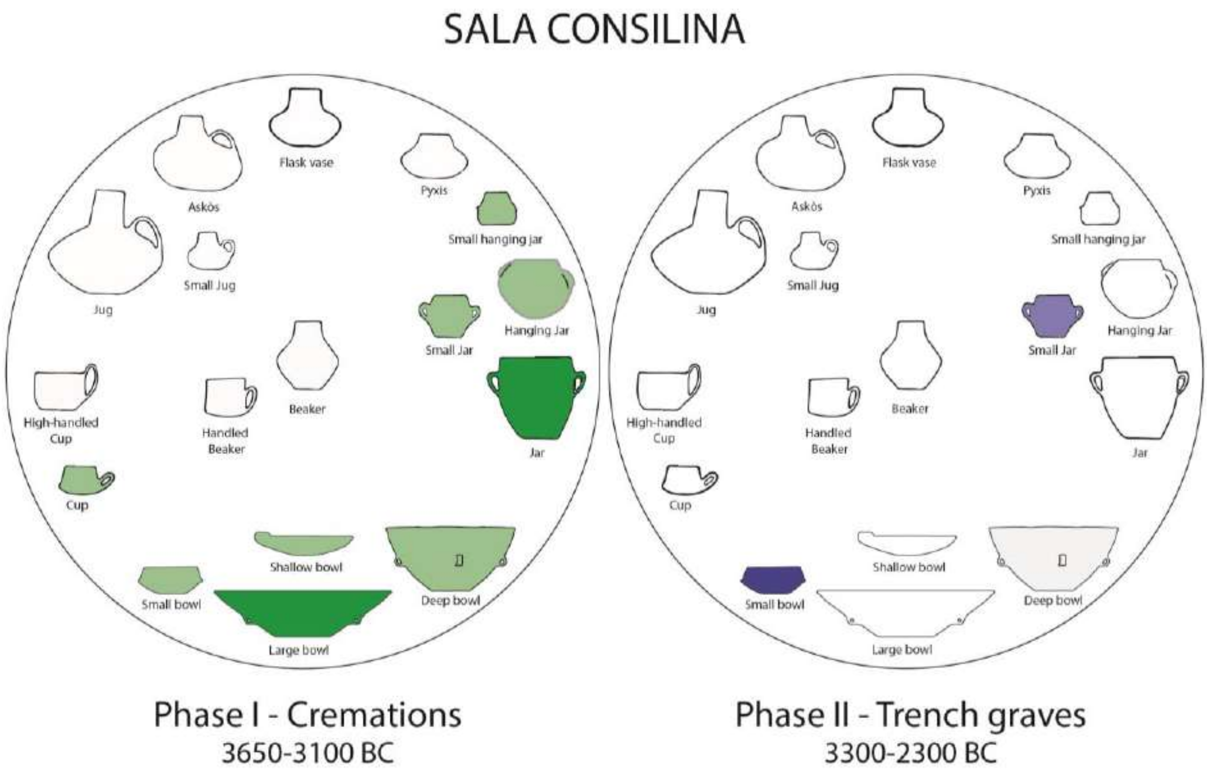


Figure 6.30. Sala Consilina. Occurrence of vessel types in the two contexts analysed. The darker shading corresponds to a higher frequency shapes for each. The relative percentages and absolute numbers of occurrence of the types can be found in Figure 6.32.

6.4.1. Form

The two contexts have very different ceramic records (Figure 6.30). Comparison is, of course, hindered by the limited ceramic evidence for the Phase II mortuary site, but some consideration of the typological repertoire can be made.

The cremation burial context (Phase I, Taurasi culture) has a wider repertoire, mostly composed of jars and bowls, with only one carinated cup (Figure 6.31 and Figure 6.32). The Laterza culture graves yielded only small jars and small bowls (Figure 6.31 and Figure 6.32), suggesting a clear selectivity in the use of ceramics in the mortuary rituals. As with Early Copper Age contexts attested in the region, the most common vessel types for the Middle Copper Age Phase I context are jars and large bowls. Particularly notable is the presence of large ovoid hanging jars characterised by vertical tunnel handles for hanging. The large bowls with a truncated cone shape often display small horizontal tunnel handles. These handles may also have been used for suspension, since they have only one handle on the body, making hanging possible only from one side.

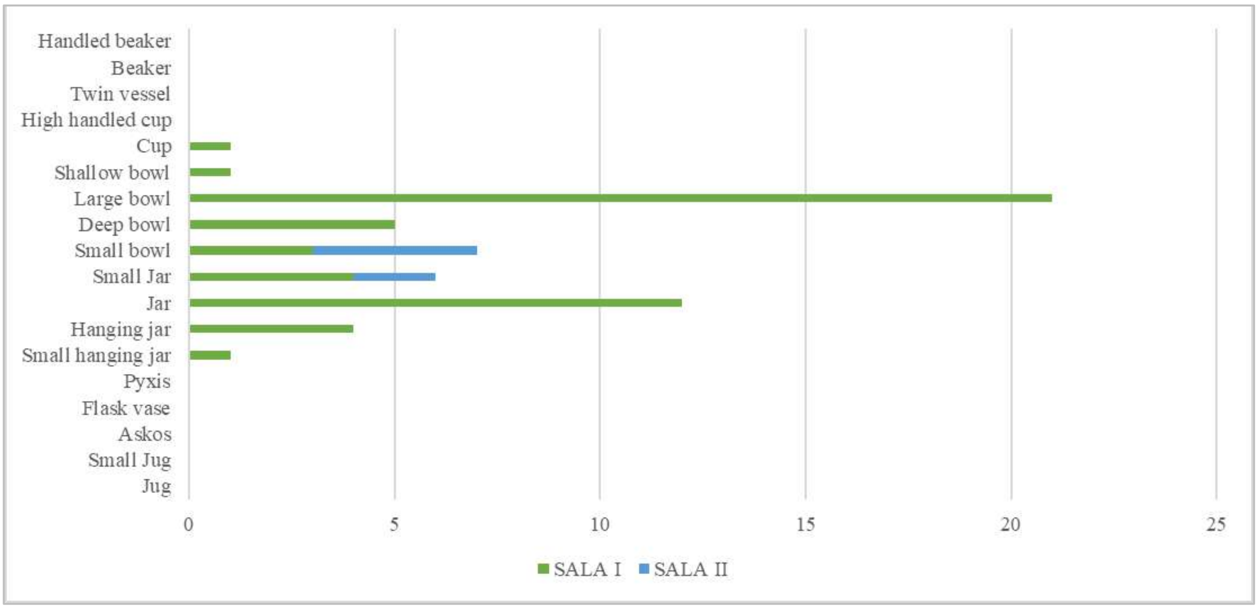
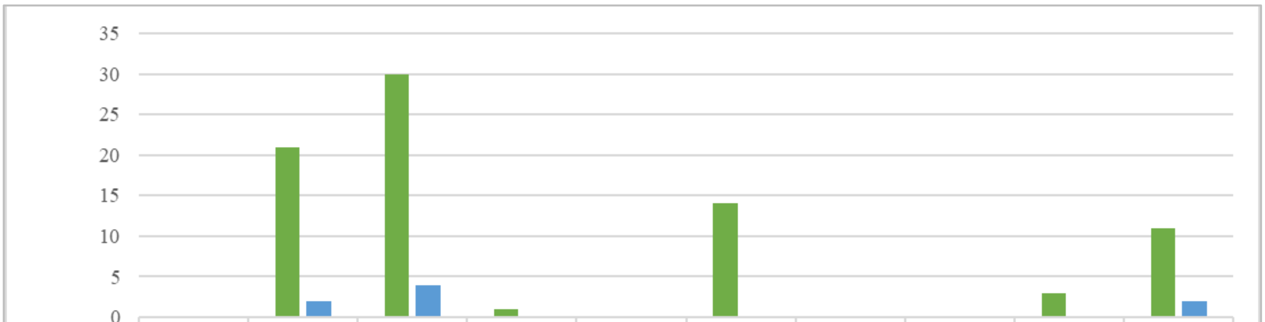


Figure 6.31. Sala Consilina. Distribution of the vessel types across the two cultural contexts.



	Closed Vessels	Jars	Bowls	Cups	Beakers	Large containers	Small vessels	Technical	Other	NA
SALA I	0	21	30	1	0	14	0	0	3	11
SALA II	0	2	4	0	0	0	0	0	0	2

Figure 6.32. Sala Consilina. Distribution of the vessel categories across the two cultural contexts.

A preference for jars and bowls can be noted in both contexts. Large jars and hanging jars (both small and large), are attested only from the Phase I contexts. These are characterised by ovoid or globular shapes with a small neck and can be found either without handles or with vertically holed tunnel handles, generally two on opposite sides, but in one case three (Appendix 4.3 A). Large ovoid jars without necks, with vertical loop handles, and with scaled decoration beneath the rim are also attested. Two small jars have a slightly different morphology. A small hanging jar from Phase I has a squashed shape, a longer neck and three subcutaneous (embedded below the surface) vertically holed handles. A second small jar is characterised by an ovoid shape and two small angular loop handles near the rim. This is comparable to two small jars from

Phase II (Appendix 4.3 A) that show two loop handles on the shoulder of the vessel, although the body shapes are, in one case, globular with no neck, and in the other, ovoid with a small neck.

While hanging jars recur in Phase I, their absence from the Laterza contexts does not surprise, since so far no such vessel has been reported from any Laterza or Late Copper Age context in Campania, and more generally in Southern Italy. Simple truncated cone-shaped bowls, and small bowls with a sinuous profile (Appendix 4.3 B) are also common. From Phase II, bowls are either hemispherical, slightly carinated or have a sinuous profile (Appendix 4.3 B). They rarely have other morphological attributes or decorations. In one case, an imitation handle is outlined on the vessel surface - a type of decoration typical of the Laterza repertoire.

The typological repertoire of Sala Consilina Phase I also includes three fragmented ceramic objects that may be either conical lids or pedestals. Their fragmentary state does not allow a clearer morphological identification, but two show uncommon incised or impressed decoration. Similar conical lids are rare, but are attested at a few Copper Age sites, such as those of the Rinaldone facies in central Italy and in Sardinia (Negroni Catacchio and Miari 1999: 196; Canino *et al.* 1999: 252).

The morphological comparison is limited to the vessel types attested in both contexts. Given the partial nature of the record, it must be noted that these represent only a restricted sample of a wider repertoire. Nevertheless, the ceramic types attested appear highly comparable with the broader repertoires attested in Early Copper Age Taurasi and Middle-Late Copper Age Laterza contexts in Campania and more broadly in south-central Italy.

6.4.2. Technology

Technological observations on the pottery assemblage for each context are summarised in Table 6.3.

Sala Consilina – contexts Chronology	Shaping of the body	Shaping of the handle	Surface treatment	Decoration	Firing
Phase I – cremations **Middle Copper Age, Taurasi** **3650-3000 BC**	Coiling, also spiral coiling Moulding for bowls	Horizontal tunnel handle applied externally	9% Burnished 35% Smoothed/Burnished 43% Accurately Smoothed 8% Roughly Smoothed 3% Rough 1% Scaled 3% NA	Decorated (19%) Undecorated (81%)	7% Oxidising 3% Reducing 83% Irregular 3% Black core 1% Overfired
Phase II – trench graves **Middle-Late Copper Age, Laterza** **3100-2300 BC** **(C14 of the graves: 2884-2573 cal. 2σ)**	Coiling and slab building Moulding of lower body	Handles attached by piercing the vessel wall	0% Burnished 75% Smoothed/Burnished 0% Accurately Smoothed 13% Roughly Smoothed 12% Rough 0% Scaled 0% NA	Decorated (12%) Undecorated (88%)	0% Oxidising 12.5% Reducing 75% Irregular 12.5% Black core 0% NA

Table 6.3. Summary of the technological results for the site of Sala Consilina.

Wares

The ceramic assemblage from Sala Consilina was divided into the ware categories employed for full Copper Age ceramics. A preference for finished ware can be identified in both contexts: 52% in Phase I and 75% in Phase II. This is followed by the rough ware: 31% in Phase I and 25% in Phase II; while scaled ware is attested only in Phase I. The occurrence of each ware in the two phases and their distribution in relation to vessel categories is displayed in Appendix 5.3. For Phase I, the vessel categories are mostly finished wares with a smaller amount of rough and finished/rough wares. The only cup attested is in finished ware, while large containers are exclusively of rough ware. The few scaled wares detected could not be linked to a clear vessel category but probably belong to large containers. In Phase II, all jars and bowls are of finished ware, while only two non-attributable sherds, probably belonging to large containers, are of rough ware.

Shaping techniques

Macroscopic observation of ceramic sherds and vessels allows the recognition of manufacturing traces, mostly detectable in broken sections and breakage patterns. Examples are displayed in Appendix 6.7–8.

For Phase I, features diagnostic of shaping techniques could be identified on about ten pieces. These mostly relate to coiling, with U-shaped fractures, probably shaped by pinching (Appendix 6.7, nos. 1 and 2). Complementary information is provided by common breakage patterns (Appendix 6.5, nos. 4–7). Coils vary between 4cm and 5cm in thickness and, given their height and small width, were probably flattened before they were applied in the form of slabs. In the case of jars no. 4 and 5 (Appendix 6.7), the orientation of the breaks could also suggest the use of spiral coiling. In other cases, especially jar no. 6 (Appendix 6.7), the regular, parallel, horizontal cracks clearly imply the use of flattened coils. Forming techniques used for handles could be detected only in one case: a vertical tunnel handle on a small jar. As shown in fig. 3 of Appendix 6.7, the handle was formed by applying an additional body of clay to the outside of the vessel, attaching it by spreading, and then vertically piercing it to create the tunnel handle. The breakage pattern of large bowls suggests the use of coils for the upper part and of a mould for the lower part (Appendix 6.7, no. 8).

The small repertoire of the Phase II assemblage did not allow a complete observation of possible forming techniques, however jars show similar traces of coiling based on their breakage patterns (Appendix 6.8, n. 3). In one case it is possible to observe how the walls were joined to a base by obliquely attaching the coil to a flat disc, possibly with material added to the inside to ensure a stronger joint (Appendix 6.8, n. 1). The morphology of the bowls and the absence of a breakage pattern suggests these were constructed by pinching or were formed in a mould rather than made by coiling (Appendix 6.8, n. 2).

Wall thickness

The wall thickness in the ceramic assemblage from the two phases can barely be compared due to the limited evidence from Sala Consilina Phase II. As shown in Figure 6.33, for Phase I the wall thickness shows no major variations, with slightly higher values for hanging jars, jars and large bowls. For Phase II, values are available only for small jars and small bowls, which show the same mean thickness, which is slightly lower than that for Phase I (on average 0.1 cm) .

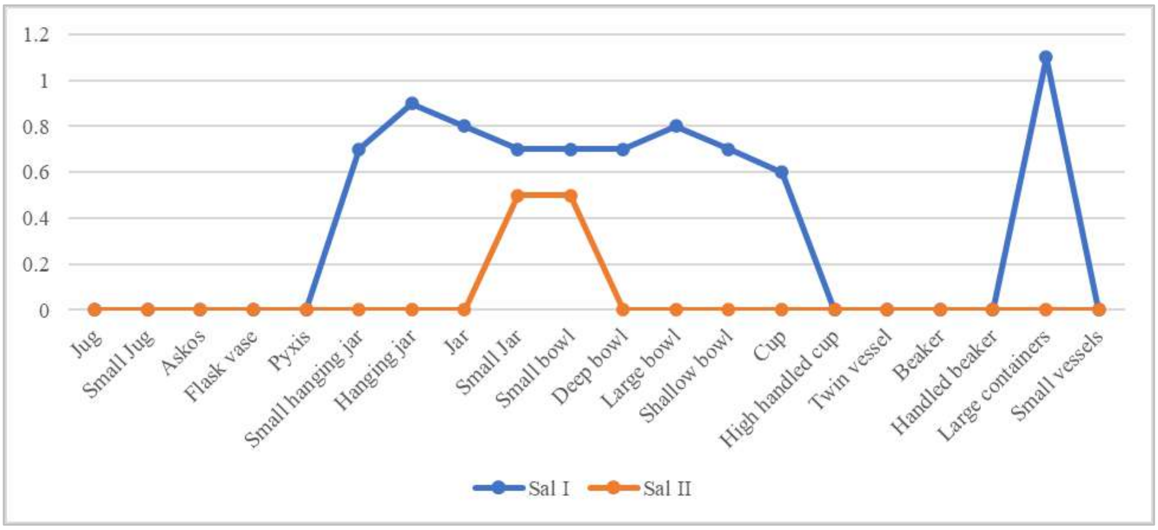


Figure 6.33. Sala Consilina. Distribution of mean wall thickness (cm) among ceramic vessel categories.

Surface treatment

As displayed in Figure 6.34, for Phase I, all forms of surface treatment are represented, with a high representation of accurately smoothed (43%) and smoothed/burnished (35%). Burnished surfaces are also common (9%) while other treatments are attested only in small amounts. For Phase II, smoothed/burnished surfaces dominate (75%), with minor amounts of roughly smoothed (13%) and rough (12%) treatments.

Appendixes 7.7 and 7.8 show the distribution of each surface treatment with respect to the main vessel categories. For Phase I, there is no clear correspondence between surface treatment and shape. Jars have all types of surfaces, with slightly more accurately smoothed surfaces. Bowls are mostly smoothed/burnished, with a small number of accurately smoothed, burnished and rough surfaces. The only cup attested is burnished, while large containers are mostly accurately smoothed. The Phase II ceramics show a clear preference for smoothed/burnished surfaces, attested on all the whole vessels, with only a few fragments being either rough or roughly smoothed.

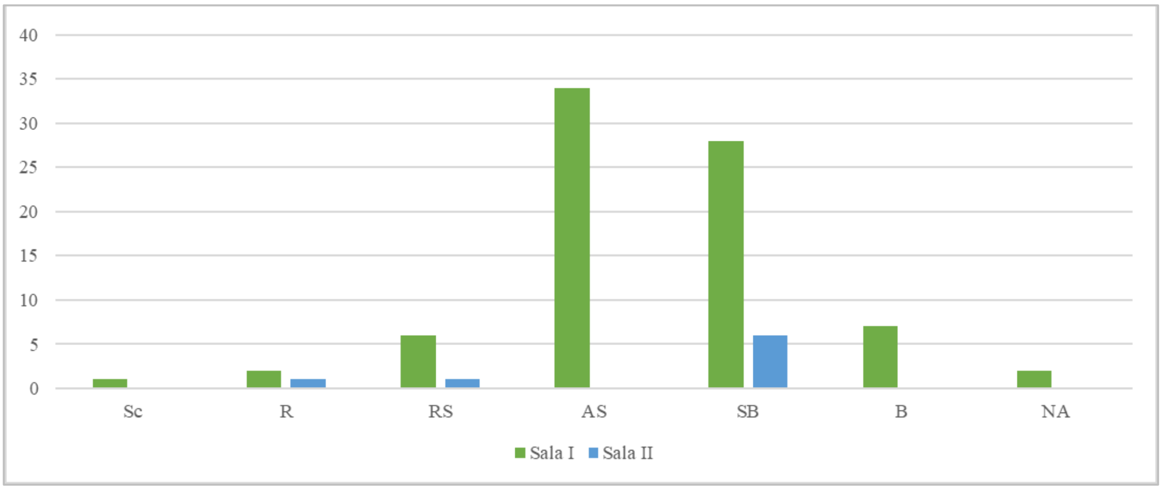


Figure 6.34. Sala Consilina. Distribution of types of surface treatment in the two contexts analysed. Keys: Sc = Scaled; R = Rough; RS = Roughly Smoothed; AS = Accurately Smoothed; SB = Smoothed/Burnished; B = Burnished; N/A = Not Available.

Decoration

Decoration, though scarce, is most common on the Phase I ceramics (Figure 6.35, Appendix 8.3), while only one vessel from the trench graves displays a plastic decoration mimicking a handle without holes, outlined on the vessel surface through the addition of clay.

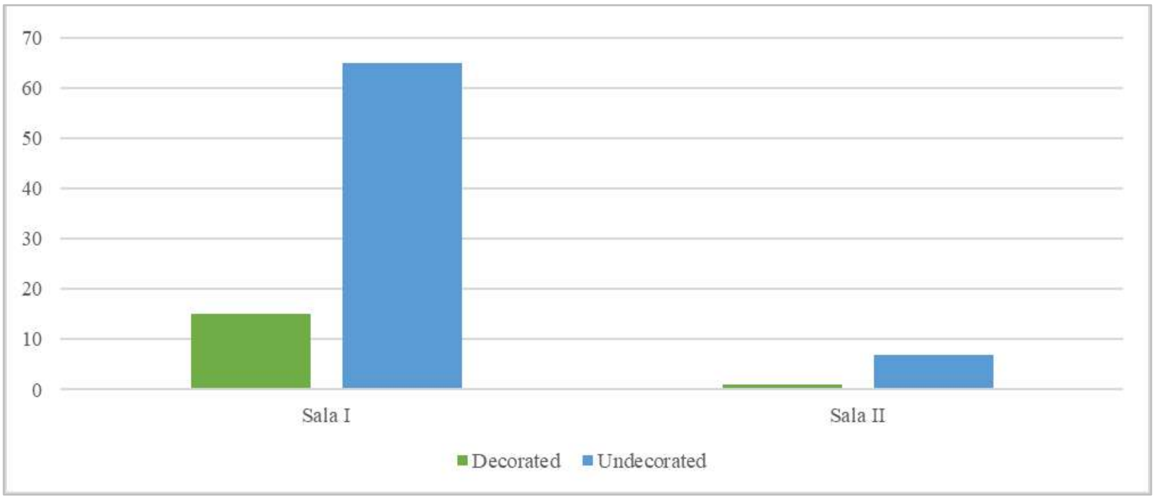


Figure 6.35. Sala Consilina. Distribution of decoration for the two contexts analysed.

Decoration is more frequent on the vessels from the cremation burials, occurring on 19% of them (Appendix 8.3, no. 1). The most common is delicate grooves on the vessel surface, followed by scales, incised and plastic decorations (Appendix 8.3, no. 2). A significant example of decoration occurs on an ovoid jar, with a motif of parallel grooves and hanging triangles near the tunnel handle. Grooves are present in two other cases, added to the inside rim of large bowls. The most complex decoration, created by incision, and in one case also by impression, was detected on the two lids mentioned above. Scales are mostly attested on jars, forming three or more rows near the rim (Appendix 8.3, no. 3).

Colour and firing

The colour ranges for the two contexts are shown in Appendix 9.7-8 and percentages in Table 6.3. For Phase I of the occupation of Sala Consilina, besides a few exceptions detailed below, most vessels show evidence of irregular firing conditions (83%), indicated by colours ranging from blackish, to reddish brown, and occasionally brown. Only three vessels show possible reducing firing conditions (3%). Two fragments of a large bowl have a light grey colour with darker surfaces, probably suggesting the use of a different clay material, as will be further explored in the following Chapter 7. Several fragments of a highly decorated lid also show blackish surfaces, probably due to firing in partially reducing conditions. In contrast, three jars and two bowls have homogeneously reddish surfaces, indicating oxidising firing conditions. The small hanging jar displays evidence of unusual exposure to fire, possibly due to overfiring, as suggested by cracks on the surfaces, the presence of pores, and the soapy feel of the ceramic body. This overfiring could have occurred either during the firing process or, most likely, during the cremation rite.

For Phase II, all but one vessel show evidence of irregular firing (75%), with brownish to reddish brown colours. One hemispherical small bowl has a homogeneous blackish colour which suggests firing in partly reducing conditions, and a fragment of a large container has a black core, due either to incomplete oxidation of the core or to the presence of organic material.

6.5. Atena Lucana

The site of Atena Lucana, in the locality of Fossa Aimone, was included in this research as its ceramic assemblage is generally considered to have a Balkan connection or influence (Figure 6.36). As explained in

Chapter 4.3.4, the large amount of archaeological data generated still requires comprehensive analysis and more complete interpretation. This includes the large pottery assemblage, which has so far received only preliminary typological analysis undertaken on a selection of the most recognisable Cetina style pieces (D'Agostino 2020).

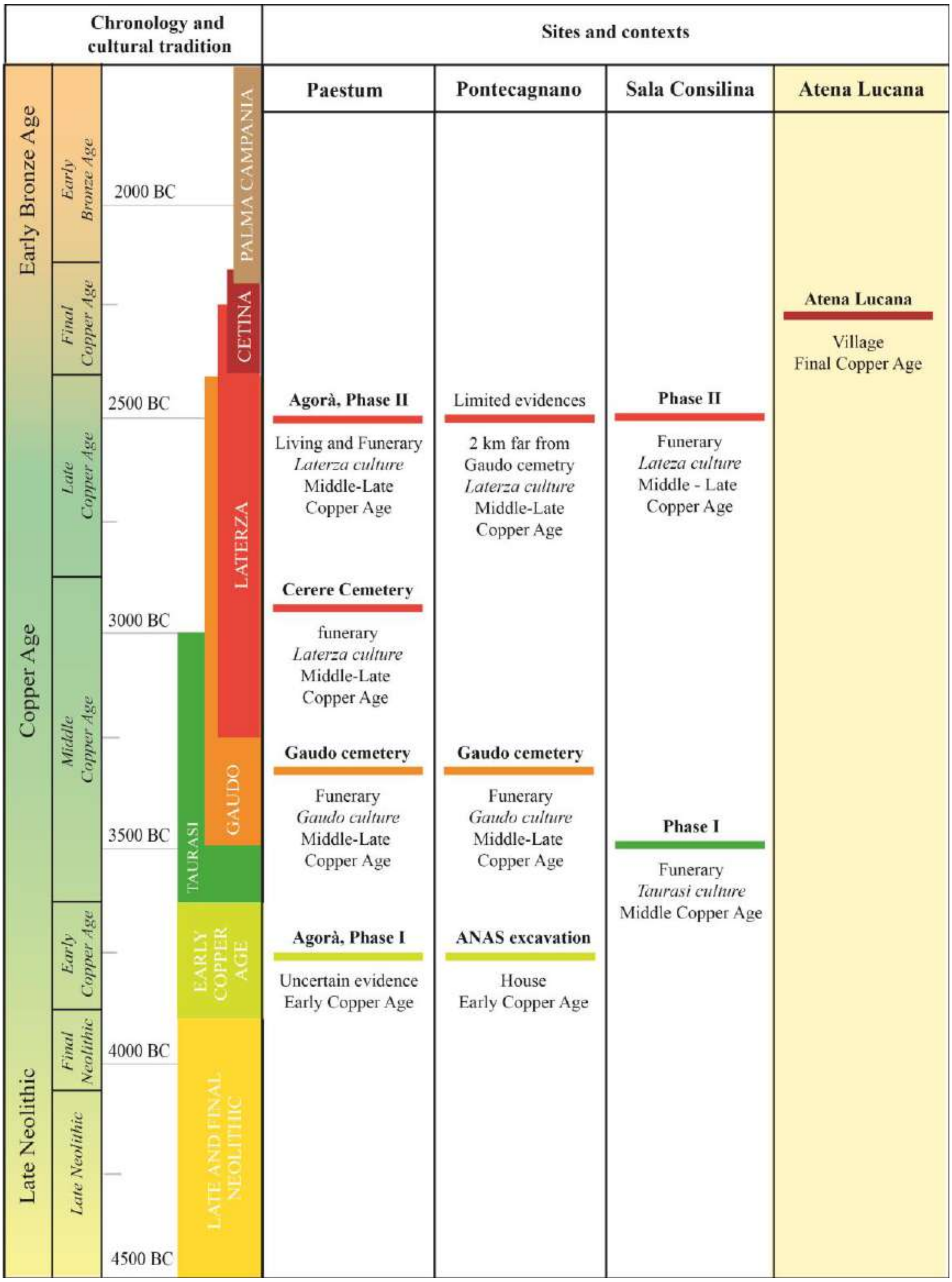


Figure 6.36. Synoptic table of the main sites and contexts considered. The context considered for the site of Atena Lucana is highlighted.

For the present research, only a basic characterisation of the ceramic fabrics and composition was undertaken. Macroscopic analyses were carried out only on the diagnostic ceramics sampled for archaeometric analysis, which included the vessels of a style clearly attributable to Cetina influences.

6.5.1. Form

Preliminary analysis highlighted the presence of Cetina style pottery, especially as finished ware, while a large assemblage of coarse/rough ware is less clearly attributable to a specific style. Highly decorated forms typical of the Cetina style stand out for the type and technology of their decoration and for their distinctive morphologies. Among these, the most representative form is a handled beaker with globular body, cylindrical neck and everted rim (Figure 6.37, no. 1). A large, deep bowl displays a shape and decoration typical of Cetina style pottery, but at the same time a single elbow shaped handle typical of the local repertoire, testifying to local adaptation of this style (Figure 6.37, no. 2). These two emblematic vessels find close comparison with ceramics both from south-east Italy (Recchia 2020: 13 figs. 3, 4 and 5) and central Dalmatia (Gori et *al.* 2018: 213, figs. 2 and 3). In addition, several sherds show an impressed or incised decoration typical of the Cetina style; these are mostly attributable to small vessels such as small bowls, cups and beakers intended for consumption activities (see Figure 6.39A).

Figure 6.37. Atena Lucana. Two vessels diagnostic of the Cetina tradition. 1. Handled beaker (or tankard). 2. Large bowl with impressed and incised decoration.

Alongside the finished pottery, abundant coarse pottery is documented at the site. Large containers with thick walls and rough surfaces are common and were probably used for storage and processing. Examples include large, squat ovoid jars (in one case whole) with notches impressed on the rim and lugs (Figure 6.38, no. 1), plates and several ceramic tools such as spoons, spindle whorls, loom weights, a sieve and a tuyère. The presence of ceramic tools fits well with the interpretation of the site as a village with productive areas that, in some cases, were clearly exposed to fire.

Figure 6.38. Atena Lucana, Fossa Aimone. Examples of coarse/rough pottery. 1. Squat ovoid jar with everted rim. 2. Small conical cup.

As already seen in the Middle-Late Copper Age Laterza culture repertoire, there is a preference at Atena Lucana for open shapes, but with innovative forms such as the handled beaker with incised motifs framing the handle, and the large hemispherical bowl with a thickened rim. The form of a large ovoid jar with a low neck is not attested in any of the previously examined contexts (for a comparison with the other sites see Appendix 4).

6.5.2. Technology

Technological observations on the pottery assemblage are summarised in Table 6.4.Table 6.3

Atena Lucana – contexts Chronology	Shaping of the body	Shaping of the handle	Surface treatment	Decoration	Firing
Final Copper Age-Early Bronze Age **Cetina style** **2300-2100 BC** Atena Lucana, Fossa Aimone	Coiling and slab building Not available	Not available	Percentage not available	Percentage not available	Homogeneous firing either in oxidising or reducing conditions Percentage not available

Table 6.4. Summary of the technological results for the site of Atena Lucana.

Given the preliminary nature of the work performed on this context, only a few technological observations can be made. The pottery record seems consistent with the set of ceramic wares devised for other periods of the Copper Age. Rough wares are common, especially for storage and processing vessels like jars. These have thick walls (1.3–1.5cm) and roughly smoothed or accurately smoothed surfaces. Finished ware is mostly associated with small vessels such as handled beakers and small bowls, characterised by finer walls ranging between 0.3cm and 0.8cm and by an accurate smoothed or burnished surface treatment. The large, decorated bowl is finished with an accurately smoothed/burnished surface treatment.

Evidence of coiling or slab building could be detected on some of the reconstructed vessels, such as the large bowl and large jar, with the breakage pattern suggesting the use of large coils or slabs to build the ceramic body.

The decoration is very unusual in the Campanian context and is mostly made by impression and incision. Triangular or wedge-shaped stamps are often used near the inside rim of beakers and small bowls (Figure 6.39A.1–3) or combined with incisions to form more complex motifs (Figure 6.39A.4, 6 and 7). Rounded and circular stamps are also attested, forming different motifs and sometimes combined with incision

(Figure 6.39A.8–9). These types of stamps are extremely rare at the other sites and for previous Copper Age periods in the region. Incision is also common and used for angular and lattice patterns (Figure 6.39A.9–10). These motifs and techniques closely resemble those attested in Dalmatia (Figure 6.39B, and Gori *et al.* 2018) and in south-east Italy (Recchia 2020).

Impressed cordons (Figure 6.39A.11) and notches on the rim (Figure 6.38.1) are generally associated with jars and large containers, and with very coarse fabrics, in line with the trends seen at other Copper Age sites in Campania. Scaled decoration is also present on a few sherds.

Figure 6.39. Atena Lucana. A. Decorated sherds from the excavation. B. Examples of Cetina-style pottery from Dalmatia and Croatia (after Gori *et al.* 2018 figs. 2 and 3).

The vessels indicate quite homogeneous firing conditions with surfaces mostly a regular reddish or blackish colour suggesting a relatively high degree of control. A preference for oxidising conditions can be noted for the large bowls and jars, while reducing conditions were used for the typical Cetina handled beaker (or tankard after Recchia 2020 and Gori *et al.* 2018) and the small bowls with impressed decoration inside the rim.

Overall, this preliminary analysis of ceramics from Atena Lucana indicates that the ceramics are consistent with the evidence from the previously examined Copper Age sites, although clear contrasts and elements of novelty can be detected in the decorative techniques and patterns, and in the repertoire of shapes. The composition of the ceramics will be described in the following Chapter 7. Further studies involving detailed macroscopic and typological analysis will be needed in the future to clarify the qualitative and quantitative aspects of this ceramic repertoire.

6.6. Preliminary discussion of the macroscopic results

The combined observations regarding typology, morphology and technological features have allowed the construction of a general picture of ceramic production through time for the four sites analysed. This will be integrated with the archaeometric analyses in Chapter 8. Typologically, the four sites are characterised by a ceramic repertoire that presents important changes in the occurrence and frequency of vessel types depending on the context and chronological phase and/or cultural tradition. As highlighted in Figure 6.40, alongside vessel types of *long durée* such as large bowls, small bowls, jars, small jars and cups, there are types with a more restricted occurrence.

The *long durée* types are also the most common in the Final Neolithic and continue right through to the Early Bronze Age, albeit with some morphological changes. Closed vessels (*askoi*, jugs, small jugs and flask vases) and pyxides occur only in Middle-Late Copper Age Gaudo culture cemeteries (Paestum and Pontecagnano). Jugs are also attested in the Middle Copper Age Taurasi mortuary context (see Chapter 2.4.1.2). Hanging jars appear in Taurasi culture cremation burials (Sala Consilina Phase I), and in Early Copper Age contexts in Campania, such as Casalbore (Gangemi 1988) and Grotta dell'Ausino, and continue in the Gaudo repertoire in a smaller version and with a different morphology. Jars and pyxides with vertical handles suitable for hanging or carrying by cords are completely abandoned in Middle-Late Copper Age Laterza culture and later contexts. Closed necked vessels suitable for pouring are also extremely rare in both Laterza and later contexts. This significant change in vessel types suggests an important shift in the material culture, possibly reflecting different habits, both in the daily use of ceramics, and in the ritual sphere (especially given the presence of pouring vessels, mostly in graves). The only vessel type which has a later occurrence, from Laterza contexts onwards, is the shallow bowl (*patera*) generally found both in funerary contexts (e.g., the cemetery near the Temple of Cerere) and in settlement contexts such as Foglianise, loc. S. Maria a' Peccerella (Langella *et al.* 2008).

The main technological macroscopic observations for each context, grouped by period and cultural tradition are summarised in Table 6.5 and will be further addressed in Chapter 8. Based on the typological and macroscopic examination (where possible) of the whole ceramic assemblage, a subset of samples was selected in order to investigate the raw material used for pottery making and to identify further technological aspects, in particular the processing of the ceramic paste and the firing temperatures. The results of these investigations are presented in Chapter 7.

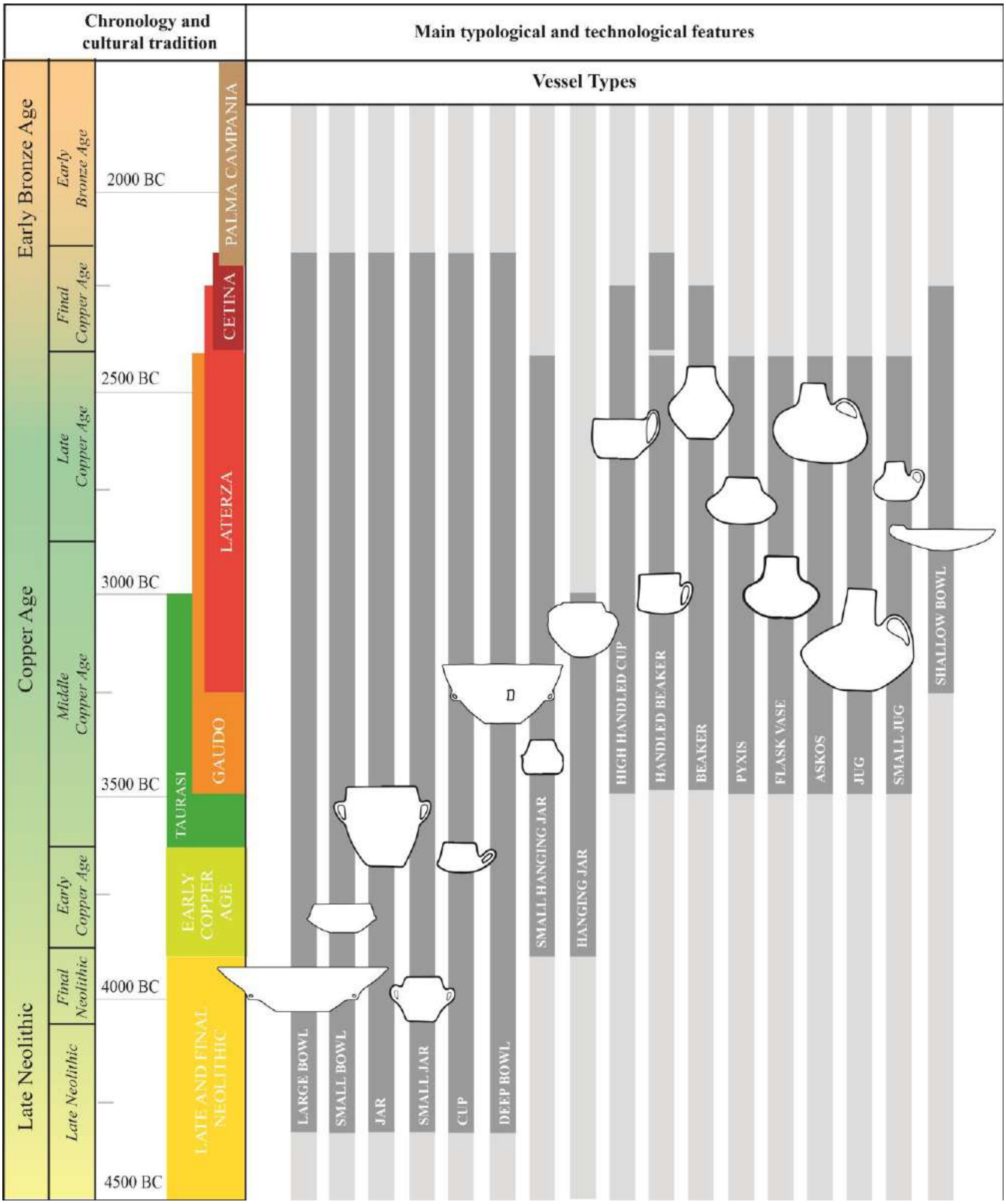


Figure 6.40. Occurrence of vessel types in the four sites investigated from Early to Final Copper Age.

Chronology, cultural tradition and context	Shaping of the body	Shaping of the handle	Surface treatment	Decoration	Firing
Early Copper Age **3900-3650 BC** • Pontecagnano Anas • Paestum Agorà I	Coiling also for bowls	Handle attached by spreading or by piercing the vessel wall Horizontal tunnel handle applied internally	0% Burnished 21% Smoothed/Burnished 30% Accurately Smoothed 28% Roughly Smoothed 4% Rough 1% Scaled 16% NA	Decorated (10%) Undecorated (90%)	24% Oxidising 26% Reducing 43% Irregular 5% Black core
Middle Copper Age, Taurasi **3650-3000 BC** • Sala Consilina phase I	Coiling, also spiral coiling Moulding for bowls	Horizontal tunnel handle applied externally	9% Burnished 35% Smoothed/Burnished 43% Accurately Smoothed 8% Roughly Smoothed 3% Rough 1% Scaled 3% NA	Decorated (19%) Undecorated (81%)	7% Oxidising 3% Reducing 83% Irregular 3% Black core 1% Overfired
Middle-Late Copper Age, Gaudo **3500-2500 BC** • Pontecagnano Gaudo cemetery • Paestum Gaudo culture cemetery	Coiling and slab building Moulding of lower body	Handles attached by piercing the vessel wall	8% Burnished 13% Smoothed/Burnished 68% Accurately Smoothed 4% Roughly Smoothed 1% Rough 2% Scaled 4% NA	Decorated (24%) Undecorated (76%)	5% Oxidising 14% Reducing 43% Irregular 22% Black core 14% NA
Middle-Late Copper Age, Laterza **3100-2300 BC** • Paestum Agorà I • Paestum Temple of Cerere • Sala Consilina phase II • Pontecagnano loc. S. Antonio	Coiling and slab building Moulding for bowls	Handle attached by spreading or by piercing the vessel wall	7% Burnished 9% Smoothed/Burnished 39% Accurately Smoothed 8% Roughly Smoothed 13% Rough 19% Scaled 5% NA	Decorated (55%) Undecorated (45%)	6% Oxidising 26% Reducing 48% Irregular 15% Black core 2% Overfired 1% NA
Final Copper Age-Early Bronze Age **Cetina style** **2300-2100 BC** • Atena Lucana, Fossa Aimone	Coiling and slab building Not available	Not available	Percentage not available	Percentage not available	Homogeneous firing either in oxidising or reducing conditions Percentage not available

Table 6.5. Summary table of the technological macroscopic observations undertaken on the ceramic assemblage analysed, organised by chronology/cultural tradition.

Chapter 7 – Results: archaeometry

7.1. Aims of this chapter

This chapter presents the results of the archaeometric analyses, organised by site and method of analysis as detailed in Chapter 5. Chronological and cultural distinctions will be taken into consideration in section 7.7 in the combination of the results and further discussed in Chapter 8. A detailed list of the samples collected, their provenance, main features and analyses performed can be found in Appendix 10. The various methods applied targeted specific research questions: petrographic analysis in thin section was used to clarify compositional and technological processes in the ceramic manufacturing; analysis by XRD reinforced the mineralogical identification and provided important information about temperatures reached during firing; and targeted SEM-EDS analysis answered specific questions and further clarified the chemical composition of particular minerals and of the clay matrix of the samples from Paestum and Pontecagnano.

Section 7.6 discusses the chemical composition of the samples from all the sites analysed using Principal Component Analysis (PCA) and bivariate analysis of element ratios. This statistical treatment, used to find patterns and clusters in the data, has greater validity when large amounts of data are compared, therefore information from all four sites was combined for this purpose and then discussed separately for each site. Conclusions regarding the provenance and processing of the pottery raw materials are presented in Section 7.7.

7.2. Paestum

A total of 169 samples was collected for the site of Paestum, representing each context as summarised in Figure 7.1. The 91 samples from the Gaudo cemetery were from fragmented materials recovered from the entrance shafts and, in smaller amounts, from the burial chambers (where mostly whole vessels were preserved). Due to sample destruction issues, fragmented materials were preferred. Although these were from the entrance shafts, they are still representative of the main ceramic types and wares attested at the site. Samples of each macroscopic ware from each tomb were selected in order to detect similarities and differences between the assemblages in different burial contexts which, in some cases, were located in different areas of the cemetery and potentially represent variations in chronology and ritual practices.

A total of 45 samples was collected from the cemetery near the Temple of Cerere. In this case, the macroscopic analysis and sampling process were carried out only on finds that could clearly be assigned to the Copper Age based on their diagnostic features or that were clearly linked to a closed context (see Chapter 5). As with the Gaudo cemetery, representative samples of each macroscopic ware were collected from each tomb.

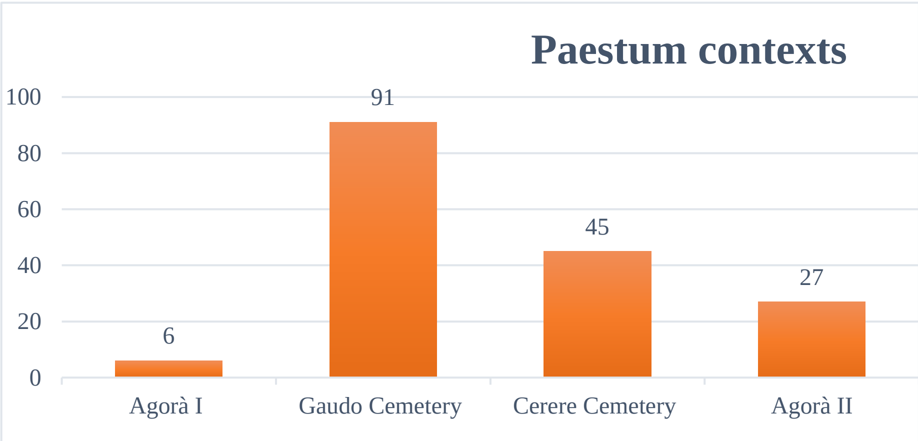


Figure 7.1. Paestum. Chart with representation of the number of samples collected for each context.

The context of the Agorà is the most recently excavated, allowing a more comprehensive definition of the pottery assemblage (see Chapter 4). Samples were selected on the basis of the main macroscopic vessel types and wares. To detect variations through time, samples were collected from both Agorà Phase I (Final Neolithic/Early Copper Age) and Agorà Phase II contexts (Middle–Late Copper Age). This allowed a diachronic comparison both with Gaudo (Early–Middle Copper Age) and Serra d'Alto-Diana (Middle-Late Neolithic) productions (near the Temple of Cerere, Muntoni *et al.* 2015). In total, 33 samples were collected, six for Phase I and 27 for Phase II. Of these, 27 were from vessels, three from portable slabs, one from a tuyère, and two from possible boiler lids, identified through typology. The analyses undertaken are summarised in Table 7.1 and detailed in the following subsections.

Method of analysis	No. of samples analysed
Petrography in thin sections	130
XRD	83
XRF	117
SEM-EDS	8

Table 7.1. Methods and number of samples analysed for the site of Paestum.

7.2.1. Petrography in thin section

Thin section petrography was carried out on a subset of 130 samples (27 from Agorà, 32 from Cerere, 71 from Gaudo). These were selected based on macroscopic observations, generally on a fresh cut section (freshly broken or sawn), providing representative samples of each ware (see Section 5.2.2). Provenance, shape, and specific characteristics were also considered. Seven main petrographic fabrics were identified, based on compositional and textural criteria (Figure 7.2). Subgroups generally reflect differences in sorting and grain size. The occurrence of each petrographic fabric is shown in Figure 7.2, divided by context/cultural tradition, and summarised in Table 7.2; detailed petrographic descriptions are provided in Appendix 11.

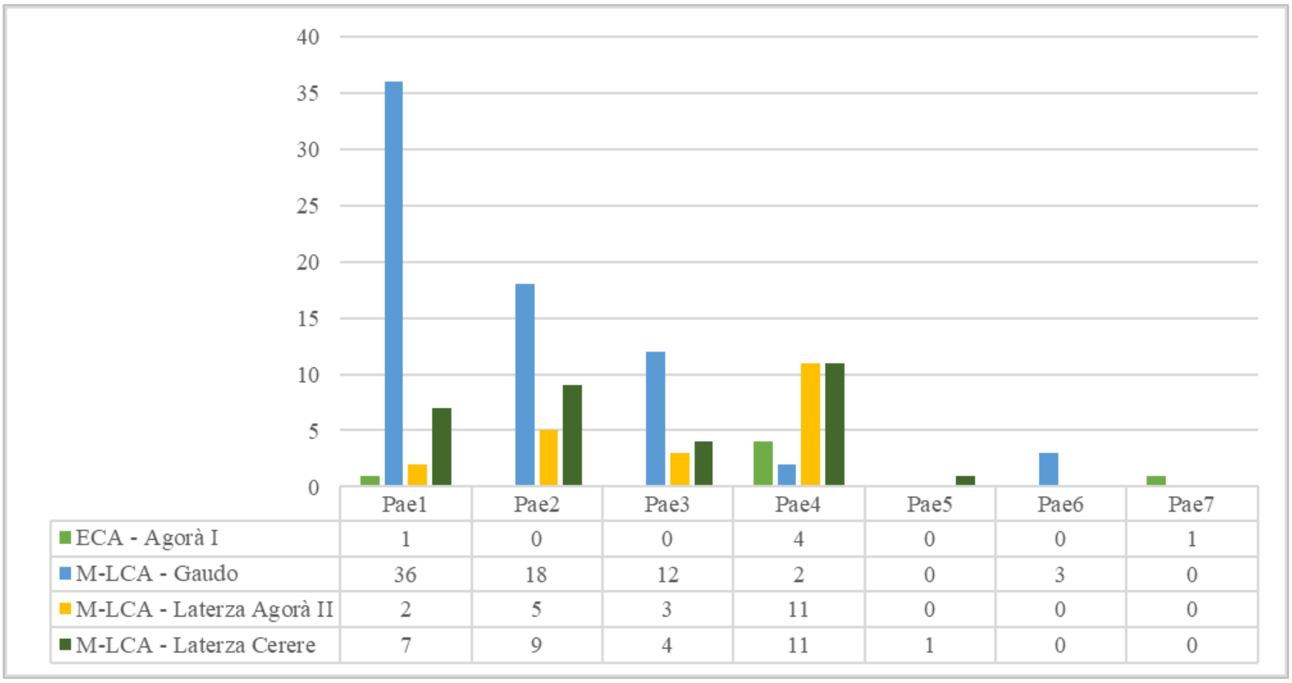


Figure 7.2. Paestum. Number of samples per fabric analysed by optical microscopy in thin section, divided by chronology/cultural tradition.

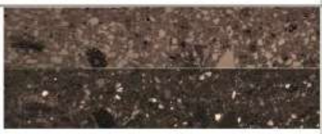
Fabric	Sub-group	Thin section photograph (ppl and xpl)	Main features
Pae1	***Pae1a***		**Quartz-feldspathic with grog** *30% inclusions – 65% matrix – 5% voids* Heterogeneous matrix, optically active. Dominant fine quartz, frequent feldspars, common coarse grog and opaques, few volcanic rock fragments (VRF) and rare sedimentary ones (SRF). Single spaced, poorly sorted. **10 samples**
	Pae1b		**Quartz-feldspathic with grog and carbonate inclusions** *30% inclusions – 65% matrix – 5% voids* Homogeneous to inhomogeneous matrix, optically active. Rounded carbonatic inclusions and secondary calcite. Single spaced, moderately sorted. **2 samples**
	Pae1c		**Quartz-feldspathic with grog** *35% inclusions – 60% matrix – 3-7% voids* Heterogeneous matrix, optically active. Dominant quartz, frequent polycrystalline quartz, k-feldspars and grog/arf, common plagioclase, VRF and opaques. Few chert, pyroxene and RF. Coarse grains, poorly sorted. **34 samples**
Pae2	***Pae2***		**Bimodal quartz-feldspathic with grog** *25% inclusions – 70% matrix – 5% voids* Homogeneous to heterogeneous, optically active. Coarse fraction dominant quartz and angular feldspars, common grog and volcanic rock fragments, few chert and pyroxenes. Bimodal distribution. **33 samples**
Pae3	***Pae3***		**Quartz-feldspathic sand with grog** *35% inclusions – 60% matrix – 5% voids* Homogeneous matrix, moderate optical activity. Dominant quartz, frequent feldspars, common ARF, few SRF, VRF, plagioclase, opaques, chert and mica. Poorly aligned to margin. Slightly bimodal **19 samples**
Pae4	***Pae4a***		**Quartz-feldspathic sand** *40% inclusions – 57% matrix – 3% voids* Homogeneous matrix, low optical activity. Medium to fine and size quartz-feldspathic inclusions often angular, common volcanic rock fragments. Moderately sorted. **20 samples**
	Pae4b		**Quartz-feldspathic medium sand** *40% inclusions – 57% matrix – 3% voids* Homogeneous matrix, low optical activity. Well-rounded medium sand sized quartz-feldspathic inclusions, frequent polycrystalline quartz and common volcanic rock fragments. Well sorted. **4 samples**
	Pae4c		**Quartz-feldspathic fine and very fine sand** *40% inclusions – 57% matrix – 3% voids* Homogeneous matrix, low optical activity. Fine to very fine sand sized quartz-feldspathic inclusions. Well sorted. **4 samples**
Pae5	***Pae5***		**ARF** *40% inclusions – 57% matrix – 3% voids* Heterogeneous matrix, optically active. Dominant sedimentary rock fragments/ARF and clay pellets, common quartz, VRF, few k-feldspars, mica, chert, fine and medium grained sub-rounded mudstones and sandstones. Slightly bimodal. **1 sample**
Pae6	***Pae6***		**Organic temper** *5% inclusions – 75% matrix – 20% voids* Heterogeneous, optically active. Scarce inclusions, frequent clay pellets and textural features, common fine quartz, few k-feldspars and opaques. Rich in voids due to possible organic temper. **3 samples**
Pae7	***Pae7***		**Carbonatic** *17% inclusions – 80% matrix – 3% voids* Homogeneous calcareous matrix, optically active. Finer fabric with dominant quartz, frequent grog, k-feldspars, chert, common VRF, plagioclase and SRF. Few carbonate rock fragments and spathic calcite. Moderately bimodal. **1 sample**

Table 7.2. Overview of the fabrics and subgroups attested at Paestum.

***Fabric Pae1* – Quartz-feldspathic with grog (46 samples)**

This non-calcareous fabric is dominated by quartz and feldspar inclusions and grog is common. Three subgroups were identified based on variations in grain size and sorting. Subgroup Pae1a (ten samples) is characterised by fine inclusions with coarser grains of grog common and a few rock fragments also present. Pae1b (two samples only) has the same composition but with additional rounded micritic calcite inclusions alongside calcite (possibly secondary) in the clay matrix. Pae1c (34 samples) is characterised by frequent coarser grains and very poor sorting and shows a wider variety of inclusions. In subgroups Pae1a and Pae1b, sub-rounded to sub-angular quartz are dominant and angular to sub-rounded k-feldspars are frequent components, with grog commonly present, generally angular to sub-rounded and in some cases with relic surfaces or sintered.

Opaques (generally Fe-Ti oxides, as identified by SEM-EDS) and rock fragments are common. Other mineral inclusions detected are a few sub-rounded volcanic lithics and mica, while sub-rounded sedimentary rocks (both sandstones and siltstones), biotite, chert, clinopyroxenes, plagioclase, pisoliths and calcedony are rare, and layered metamorphic rocks are rare/absent. Subgroup Pae1c shows a similar composition but with a higher percentage of inclusions (35%), frequent polycrystalline quartz, common plagioclase and mica, and rare/absent hornblende. A possible variation is detected in two samples (PAE.G.IX.3 and PAE.G.VII.5) showing micaceous Argillaceous Rock Fragments (henceforth ARF) with high optical activity and parallel mica orientation. These could be interpreted as a highly micaceous grog fired at low temperature, or as a clay- and mica-rich ARF.

The matrix is rich in silt size inclusions and varies from homogeneous to heterogeneous, showing a moderate to low (in only a few cases high) optical activity. The b-fabric is mostly strial in Pae1a, not distinguishable in Pae1b, and striated or speckled in Pae1c. In some cases, textural features and clay bodies suggest an uneven clay mixing. Voids are mainly planar, meso and macro vughs with moderate alignment to margins. Burnt organics were detected in all the samples. The tuyere fragment is attributed to subgroup Pae1c. It displays a composition similar to the other samples except for the presence of a pebble-sized, rounded, calcareous micritic grain, probably naturally present given their random sorting. The matrix shows a low optical activity suggesting firing at a high temperature, and it has a speckled b-fabric. A low optical activity is also attested in other samples from subgroup Pae1c, indicating that, despite the likely regular exposure of the tuyère to high temperatures, it was produced in the same way as the ceramic vessels (Figure 7.3). Nevertheless, it must be noted that due to conservation issues, only the fragmentary bottom part of the cone (likely the further from heat exposure) was sampled.

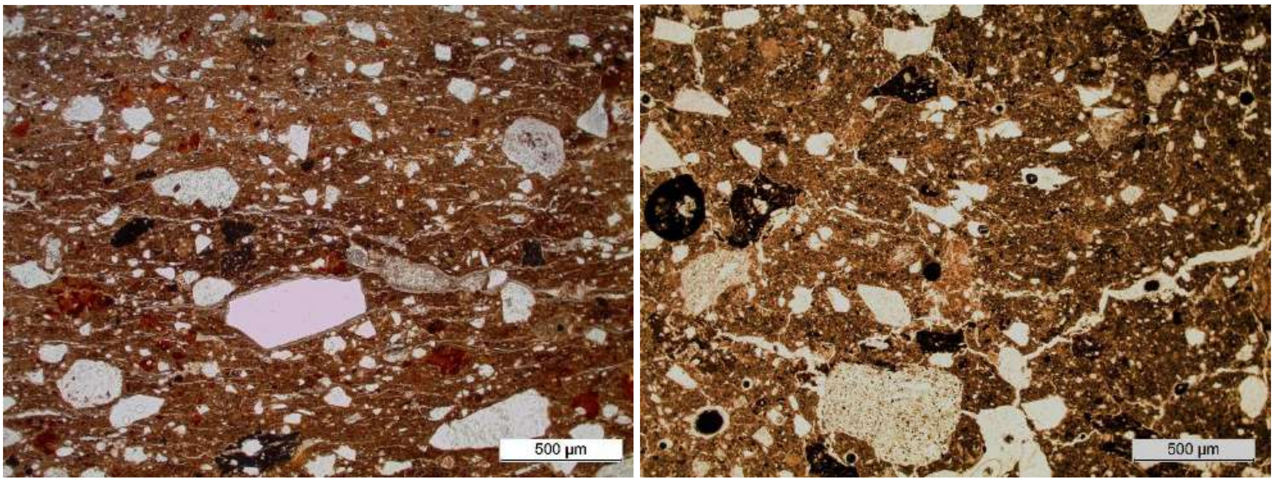


Figure 7.3. PPL images of fabric Pae1c, on the left a vessel fragment (PAE.G.XI.1), on the right the tuyère (PAE.A.III.26).

The poor sorting and irregular distribution of inclusions suggests their natural presence in the clay or the addition of sand/sediments with different coarseness. The frequent presence of angular feldspars, and sometimes of quartz, suggests in any case the use of moderately weathered sediments. The differences between the subfabrics can be explained either as a natural variability in clay deposits fed by similar supply basins, or as different degrees of refinement (possibly by hand picking) of the same ceramic paste. The grog is clearly an addition, as temper. It occurs with different characteristics and in different quantities but is always present.

The possible natural variability of the supply basins could be tested by sampling and analysing the clay sources available in the area. As mentioned in Chapter 4, work to characterise the clay sources in the Plain of Paestum have been carried out recently (De Bonis 2018) but the results are not yet fully published.

***Fabric Pae2* – Bimodal quartz-feldspathic with grog (32 samples)**

This non-calcareous fabric is dominated by quartz-feldspathic inclusions and grog frequently occurs**.** Its composition is similar to fabric Pae1 but differs in its bimodal distribution of the inclusions and scarce fine fraction. The coarse fraction is dominated by quartz, with frequent sub-angular to sub-rounded grog/ARF (Figure 7.4). In some cases, grog is distinguishable by the sintering of the matrix and the presence of relic surfaces. Angular k-feldspars and volcanic rock fragments (trachyte) are common, and a few chert, plagioclase, pyroxenes, opaques, mica and rock fragments are also attested. Rock fragments are mainly sub-rounded, elongated trachyte, but sandstone, mudstone and rare metamorphic rocks are also found. There are very few/rare microcline, hornblende, calcedony or calcareous inclusions. The non-calcareous, optically-active matrix is mostly homogeneous with a strial or striated b-fabric, in some cases showing irregular clay mixing. Silt size inclusions are rarer compared to the previous fabric (Pae1) suggesting the use of a different base clay.

Two of the functional slabs (PAE.A.III.23 and PAE.A.III.24) are fashioned from this fabric (Figure 7.4 right). They do not show any petrographic difference from the pots, suggesting the use of the same paste both for vessels and for work surfaces.

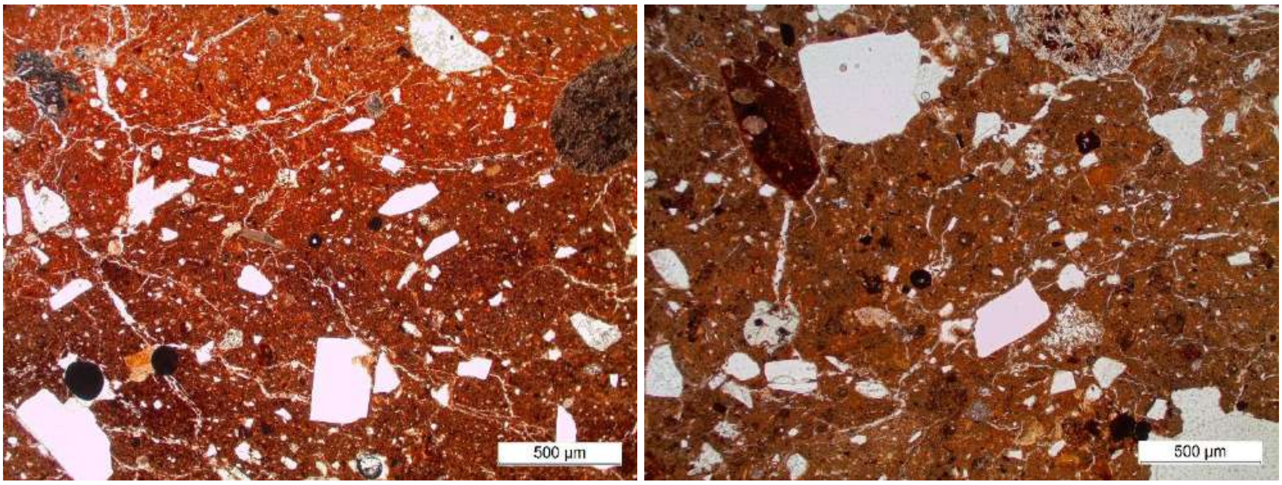


Figure 7.4. Plain polarised light (PPL) images of fabric Pae2, on the left from a vessel (PAE.A.III.21), on the right from one of the portable slabs (PAE.A.III.23).

Only two vessel samples have traces of sintering (PAE.C.1.3 and a sintered core in PAE.C.4.3). Voids are mainly meso and macro elongated and equant vughs, in some cases preserving charred remains inside vughs with burnt edges. In most samples, the large angular grains of feldspars, both k-feldspars and plagioclase, the abundant quartz and small amount of biotite may suggest an artificial temper based on crushed, unweathered, sedimentary and volcanic rocks and grog. Fragments of parent rocks with the same composition can also be detected.

***Fabric Pae3* – Quartz-felspathic sand with grog (19 samples)**

This fabric is characterised by a non-calcareous clay matrix with dominant and frequent quartz-feldspathic sandy inclusions; grog is common. The quartz-feldspathic grains are mainly fine, sand-sized and moderately sorted, with a few coarser inclusions, generally either grog or sedimentary rock fragments. The presence of ARFs and clay pellets in some cases makes the grog difficult to distinguish from the ARFs. Nevertheless, the angularity, the presence of relic edges and the optical inactivity in some samples, point towards the probable addition of different kinds of crushed ceramics (Figure 7.5), or in some cases unevenly wet and poorly mixed clay.

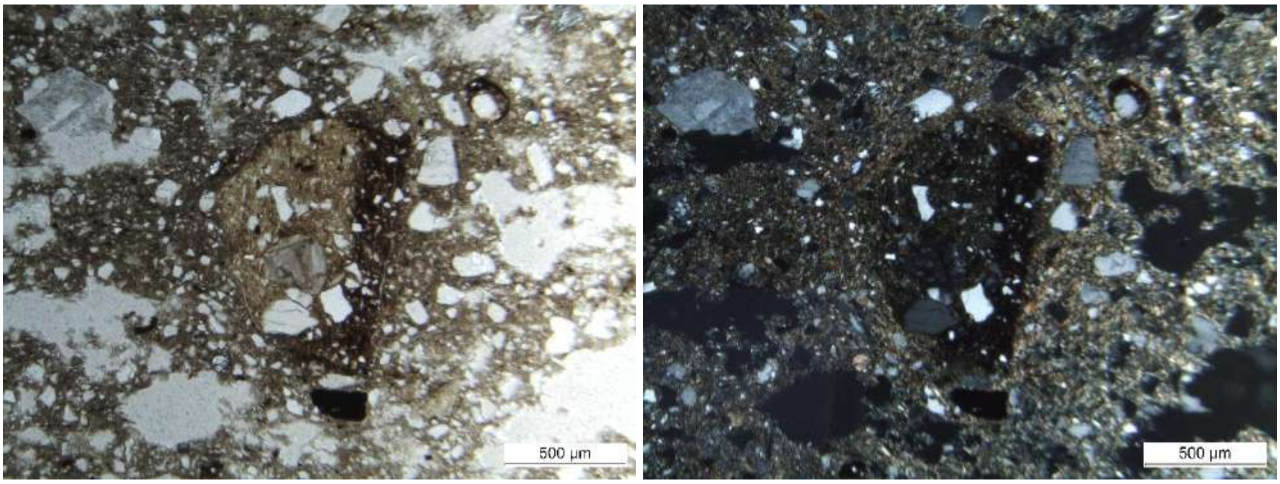


Figure 7.5. Grog fragment seen in plain polarised light (PPL) and crossed polarised light (XPL) in sample PAE.G.IV.4, fabric Pae3, sandy with grog.

Rock fragments are also present. These are mainly volcanic (trachytic) but also fine sandstones and siltstones, while metamorphic rock fragments are rare to absent. Igneous rock fragments are particularly frequent in sample PAE.G.T.01. Mineral inclusions also comprise a few plagioclases, chert, mica/biotite, opaques and rare pyroxenes, pisoliths, hornblende and microcline. The matrix is mainly homogeneous with a low to moderate optical activity and a b-fabric that is variously strial, striated or speckled. Two samples (PAE.G.VII.2 and PAE.A.III.19) show traces of sintering. Voids are mostly parallel planar and meso vughs, and occasionally vesicles or channels.

A fragment of boiler lid (PAE.A.III.25) is attributed to this fabric, characterised by the same sandy composition as the vessels but with large grog/ARF fragments. The latter are characterised by a different optical density, a finer fabric similar to the clay matrix for the fine fraction, but they lack the coarse, sandy fraction. This suggests their identification as ARF, or unevenly wet and mixed clay pellets, rather than grog.

Two main interpretations can be put forward for the raw materials used for this petrographic fabric. Grog is clearly added to the paste resulting in a slightly bimodal distribution of the grains (coarse grog and finer, sand-sized quartz and feldspars). The base clay can be interpreted either as a naturally sandy clay, in some cases accurately refined given the relatively good sorting of the grains, or as a finer base clay to which a sandy sediment was added as temper. Both interpretations could be valid, and difficult to distinguish petrographically. In must be noted that in some of the samples ARF are similar in composition to the clay matrix but show only silt-sized grains. This might point to the use of a finer clay to which coarser sandy and grog grains were added and not completely mixed.

***Fabric Pae4* – Quartz-feldspathic sand (28 samples)**

This non-calcareous fabric is characterised by moderately well sorted, quartz-feldspathic sandy inclusions; grog is very rare to absent. Subgroups can be detected based on the size and shape of the grains. Pae4a (20 samples, Figure 7.6 left) has moderately well sorted, sand-sized quartz-feldspathic inclusions that are often angular, and rock fragments are common. Pae4b (four samples, Figure 7.6 centre) has clear, well-rounded and well-sorted, medium sand-sized inclusions. Pae4c (four samples, Figure 7.6 right) has well-sorted fine to very fine sand-sized inclusions. Grog is generally absent, attested only in a few cases, such as PAE.A.III.20, where it is sintered. Sub-rounded to sub-angular quartz is dominant, followed by frequent sub-angular k-feldspars, mainly sanidine and/or orthoclase and polycrystalline quartz, and rare microcline, attested mainly in Pae4c. Volcanic rock fragments and igneous rock fragments are also commonly attested, especially in Pae4a. Mineral inclusions include few/very few plagioclase, chert, hornblende, pisoliths, opaques and pyroxenes, rare calcedony and sphene (detected by SEM-EDS), sedimentary and metamorphic rock fragments, the latter mainly composed of layered quartz. The matrix is mainly homogeneous with a low optical activity, and a mostly strial b-fabric. Voids are macro to micro planar and vughs are mostly parallel to margins, often with traces of burnt organics.

The base paste is similar to the previous fabric Pae3 but lacks any grog temper. In this case, the three subgroups might imply slight technological variations. The clearly rounded inclusions in Pae4b and in Pae4c, with well-sorted medium and fine to very fine sand size, indicate the selection and addition of a well sorted sand temper in these two subgroups. In the case of Pae4a, the angularity of the minerals may suggest either the use of a less weathered sand or the crushing of sedimentary rocks for tempering, although the lack of parent rocks supports the first of these hypotheses.

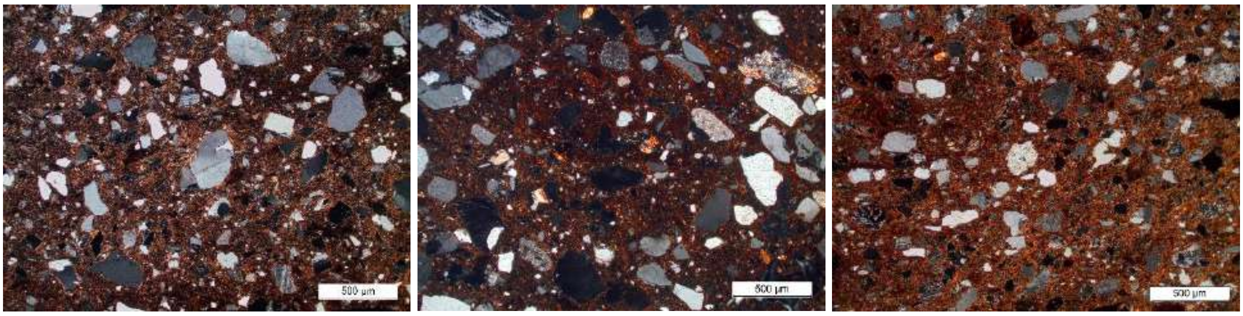


Figure 7.6. XPL thin section photographs of fabric Pae4 subfabrics: left Pae4a (sample PAE.A.III.07); centre Pae4b (sample PAE.A.II.4); right Pae4c (sample PAE.G.IX.1).

A portable slab (PAE.A.III.22) and a fragment of daub (PAE.A.III.27) were assigned to this fabric group. They do not show any petrographic difference from the pots but the pores are indicative of their purposes. In the movable slab, the planar voids are particularly aligned to the margins, with an undulating orientation suggesting an irregular pressure to form the flat surface. The fragment of daub shows large irregular vughs indicating the presence of organic material, as would be expected. The petrographic composition suggests the use of the same paste for pots and for these 'technical' ceramic objects.

***Fabric Pae5* – ARF (one sample)**

This non-calcareous fabric is characterised by pebble-sized ARF/clay pellets, fine and medium grained sub-rounded mudstone and sandstone grains. Quartz and feldspars occur frequently, volcanic rock fragments are common, and there are a few calcedony, carbonatic rock fragments and clinopyroxenes. The sample is characterised by abundant sedimentary rock fragments, mainly mudstones.

The similarity between the texture of the clay matrix and of the sedimentary rock fragments makes it difficult to distinguish whether they are clay pellets that are unevenly wet or fragments of mudstone (Figure 7.7). SEM analysis helped further clarify their composition (see Section 7.2.4 below) suggesting their interpretation as shale or over-consolidated clay not properly crushed and wetted during the preparation of the paste. The matrix is heterogeneous with a moderate optical activity and striated b-fabric. Voids are mostly elongated meso vughs and planar voids with fluidal alignment.

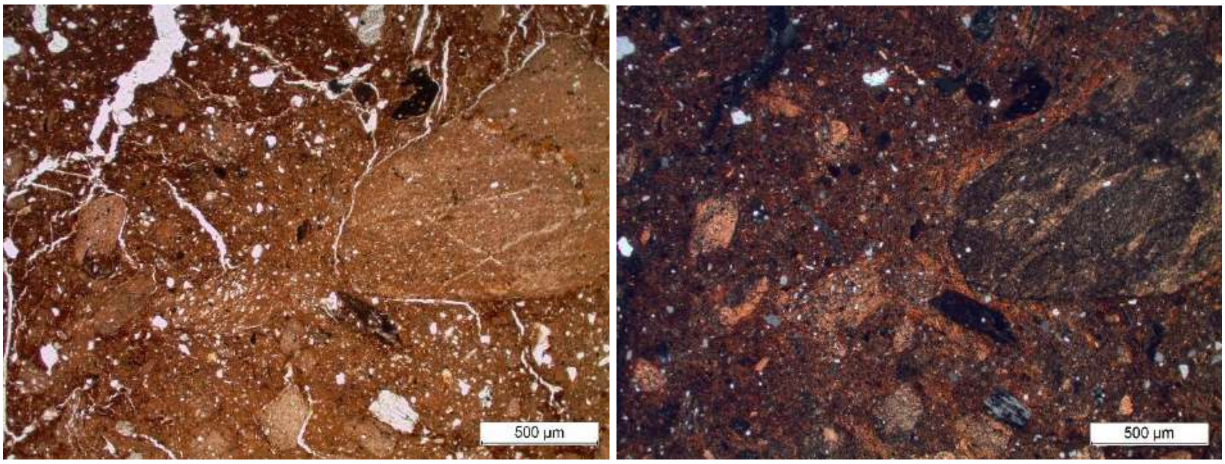


Figure 7.7. Detail of mudstones/clay pellets from sample PAE.C.2.01 seen in PPL and XPL, petrographic fabric Pae5, sedimentary.

This petrographic fabric can be interpreted as a coarse clay, rich in sedimentary rock fragments, which was unevenly wet during the paste preparation resulting in clay pellets (or over consolidated clay) with a heterogeneous concentration of inclusions (Ho and Quinn 2021). This hypothesis was further checked by SEM-EDS proving the similarity in the matrix between the clay body and the clay pellets.

***Fabric Pae6* – Organic temper (3 samples)**

This fabric is characterised by few inclusions except for frequently occurring, mostly coarse, sand-sized sub-angular ARF/grog, in some cases also identifiable as clay pellets (Figure 7.8). There is very little fine fraction, mostly represented by quartz which is common, and a few k-feldspars and opaques. Chert, plagioclase and mica are rare/absent. Very rare clinopyroxenes, pisoliths and calcareous inclusions are also attested. The main feature of this fabric is the dominant presence of meso- and macro-elongated and equant vughs and planar voids, generally moderately aligned to margins. The shape of the voids, their blackened edges and the presence in some cases of charred remains, points towards a fabric rich in organics, which were probably added as temper. The matrix is non-calcareous and heterogeneous, probably due to irregular clay mixing given the presence of incompletely hydrated clay pellets (Ho and Quinn 2021). The matrix is mostly highly optically active with a striated b-fabric.

This fabric displays a clear paste recipe, characterised by the use of a finer clay, probably slightly refined by hand picking of coarser inclusions, with the addition of organic material as temper.

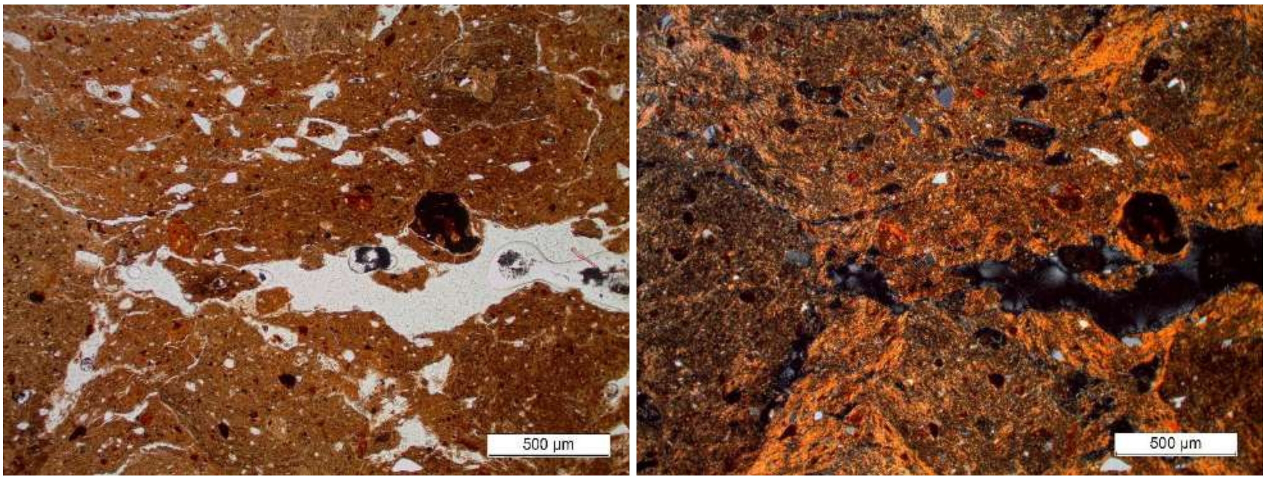


Figure 7.8. Detail of fabric Pae6, from sample PAE.G.XI.03 seen in PPL and XPL.

Fabric Pae7 **– Carbonatic with grog (one sample)**

This fine, calcareous fabric is characterised by grog temper. The main mineral phases attested are quartz, k-feldspar, plagioclase feldspar; rock fragments (mainly volcanic but a few sedimentary) are common. Grog is angular and can often be distinguished from the sintered matrix and relic edge; the crushed ceramics are rich in quartz and feldspars. A few rounded micritic inclusions and some euhedral and spathic calcite grains are also attested (Figure 7.9). The sedimentary rock fragments are mainly fine sandstones and mudstones.

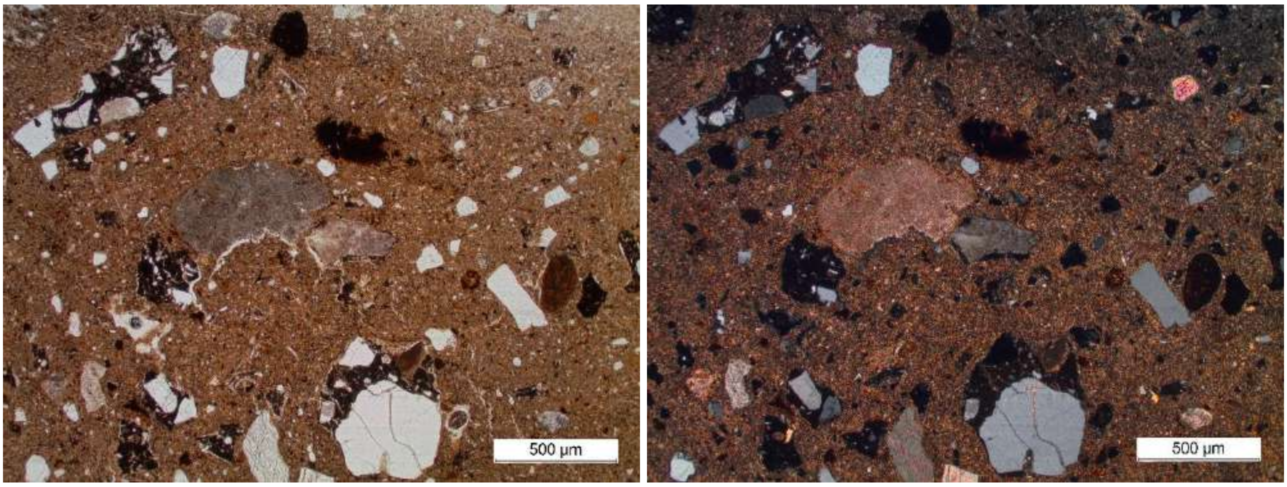


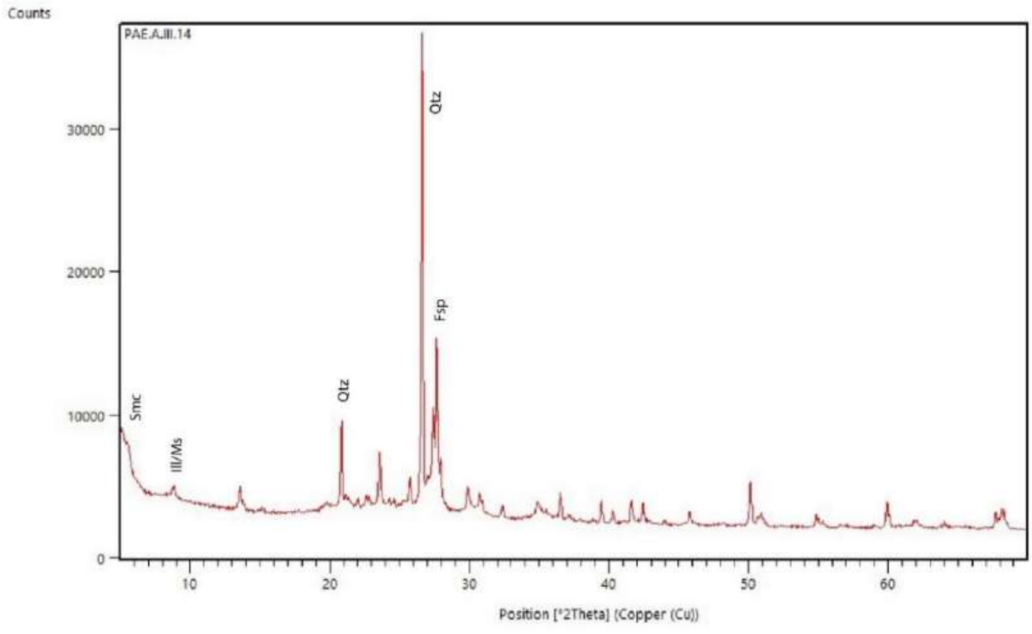
Figure 7.9. Details of the micritic and spathic calcite inclusions detected in sample PAE.A.II.01, petrographic fabric Pae7, carbonatic with grog.

This fabric is moderately bimodal, suggesting the addition of crushed ceramics to a moderately coarse clay matrix with a few poorly sorted rock fragments, probably present naturally. The matrix is calcareous and homogeneous with a few opaques and iron aggregates. It shows a low optical activity and a speckled b-fabric. The fabric shows a few voids, mainly pores/vesicles, and a few planar voids, randomly oriented. The composition points towards a different calcareous clay source compared to other fabrics.

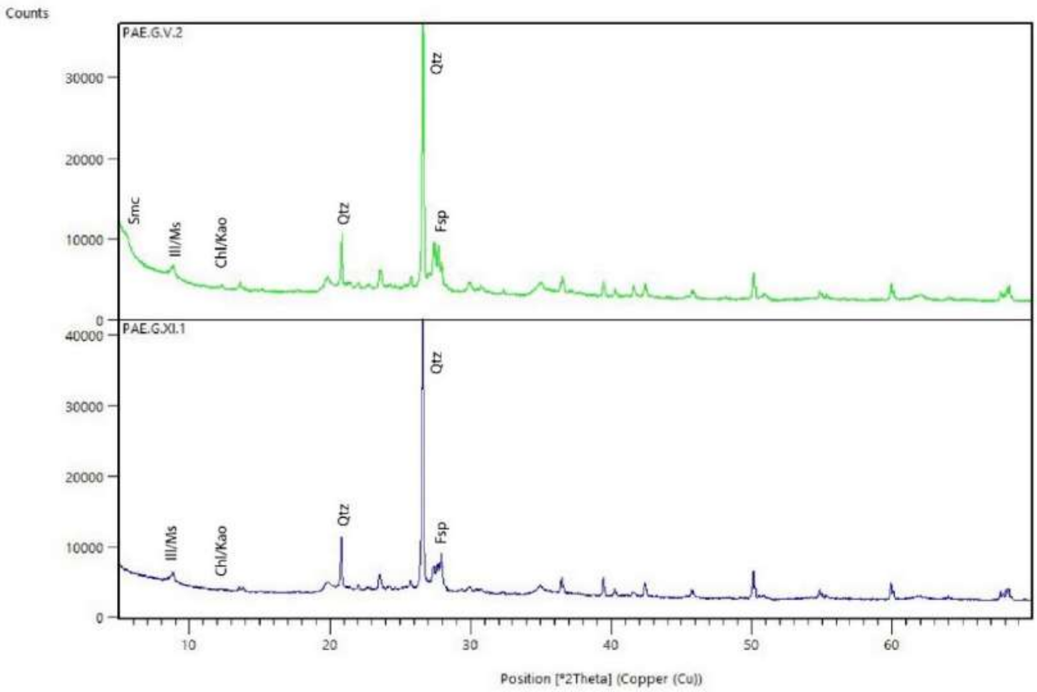
7.2.2. XRD

The same contextual approach applied to thin sections also guided the sampling for XRD analysis. A representative sample of each petrographic fabric was selected for each context. A total of 83 samples was analysed (20 from Agorà, 16 from Cerere and 47 from Gaudo).

The results illustrate the main mineral phases present in the samples (Appendix 12). The clay minerals are mainly illite/muscovite, often smectite and occasionally chlorite/kaolinite. Illite is attested in all the samples, although its identification can be hindered by the presence of muscovite (detected in thin sections), due to the overlap between the main illite and muscovite peaks (both have a main diffraction peak at 10Å d spacing). In 71 of the 83 samples, a possible smectite component is also identified from characteristic peaks at around 15Å (Moore and Reynolds 1997: 241) and in some cases, a broader 10Å illite peak (Figure 7.10A). Only 12 samples lack a clear smectite peak. A further clay mineral phase, chlorite/kaolinite, occurs only in six samples: two for fabric Pae1c, two for fabric Pae2, and two for fabrics Pae4 and Pae6 respectively. These samples show a 7Å d spacing diffraction peak, in two cases with no associated 15Å peak (Figure 7.10B). This can be interpreted either as a kaolinite (001) peak or a chlorite (002) peak. The lack, in most cases, of a kaolinite (002) peak points towards the interpretation of the mineral phase as chlorite. In fact, the chlorite (001) peak could be also disguised by the smectite 15Å peak and plateau. This interpretation would only be problematic in the two cases where 14Å and 15Å peaks are absent, suggesting instead the interpretation of the 7Å peak as a kaolinite (001) peak or the disappearance due to firing of the chlorite (001) peak (Maritan *et al*. 2006).



A



B

Figure 7.10. A) Example of XRD spectrum with the most common mineral composition of Paestum samples. B) XRD spectra from Paestum samples showing presence of chlorite/kaolinite. Key: Ill: illite; Ms: muscovite; Smc: smectite; Chl: chlorite; Kao: kaolinite; Qtz: quartz; Fsp: feldspars; Cal: calcite.

The other main mineralogical phases detected through XRD analysis are quartz, k-feldspar, plagioclase and in some cases haematite. In addition to samples of fabric Pae7, which is clearly calcareous, calcite was detected in only two other samples (PAE.G.XI.8, PAE.G.XI.1, Figure 7.11). Sample PAE.G.XI.8, of subfabric Pae1b, is characterised by small, rounded, calcareous inclusions, probably limestone fragments, alongside some secondary calcite, the latter interpreted as such based on observation in thin section of the calcite filling elongated and ring voids due to ground water action. Although observed in thin section, pyroxenes were detected only in sample PAE.C.T.2. This was probably due to their relatively rare occurrence, below the detection limit of the instrument.

The results of XRD were also used to estimate the Equivalent Firing Temperature (EFT; Tite 1969) of the pottery samples. Even though illitic, non-calcareous clays do not show great changes in mineralogy when subjected to the firing temperatures typically utilised for pottery (500–900°C; Maggetti 1982: 127), some conclusions can be drawn. The presence of haematite in four samples (PAE.A.II.04, PAE.A.II.06, PAE.A.III.21, PAE.G.II.7) might suggest the lower limit at which the pottery was fired in oxidising conditions (macroscopic observation of the sample registered a partially oxidising or irregular firing condition). As demonstrated by experimental firing and XRD analysis, haematite in non-calcareous clays fired under oxidising conditions could begin to nucleate at about 700°C (Nodari *et al.* 2007: 4668; Amicone e*t al.* 2020). The smectite component is always present in these samples, also suggesting temperatures lower than 800°C, which is when smectite generally decomposes (Maggetti 1982: 127; Cultrone *et al*. 2001: fig. 3).

The illite peaks can also suggest the maximum firing temperature, probably below 850–900°C, when the illite crystal structure collapses (Kulbicki 1958; Maggetti 1982: 127). The presence of calcite suggests that vessels made from the calcareous fabric, Pae7, could not have been fired at temperatures above 850°C, at which point calcite decomposes (Maritan 2004: 304; Maggetti *et al.* 2011: fig. 7); lower temperatures are also indicated by the fact that no high temperature phases could be detected, and because the samples generally show an optically-active matrix in thin section, with clear clay domains.

For some samples lower temperatures may be inferred given the presence of a chlorite (002)/kaolinite (001) peak. Given that kaolinite generally disappears between 500°C and 600°C (Maggetti and Rossmanith 1981: 185; Maggetti 1982: 127; Trinidade *et al.* 2010: tab. 2), and chlorite around 650°C (Maritan 2004; Maritan *et al.* 2006; Maggetti *et al.* 2011), for these samples, exposure to a lower temperature of between 500°C and 650°C is most likely. The presence of chlorite/kaolinite might be due either to the use of a different clay mixture or to a lower firing temperature for these samples. However, in the case of the samples lacking the smectite component, a higher firing temperature, above 850°C, might be inferred, even though the presence of chlorite/kaolinite in two samples lacking smectite might also suggest the use of a different, smectite-poor clay mix.

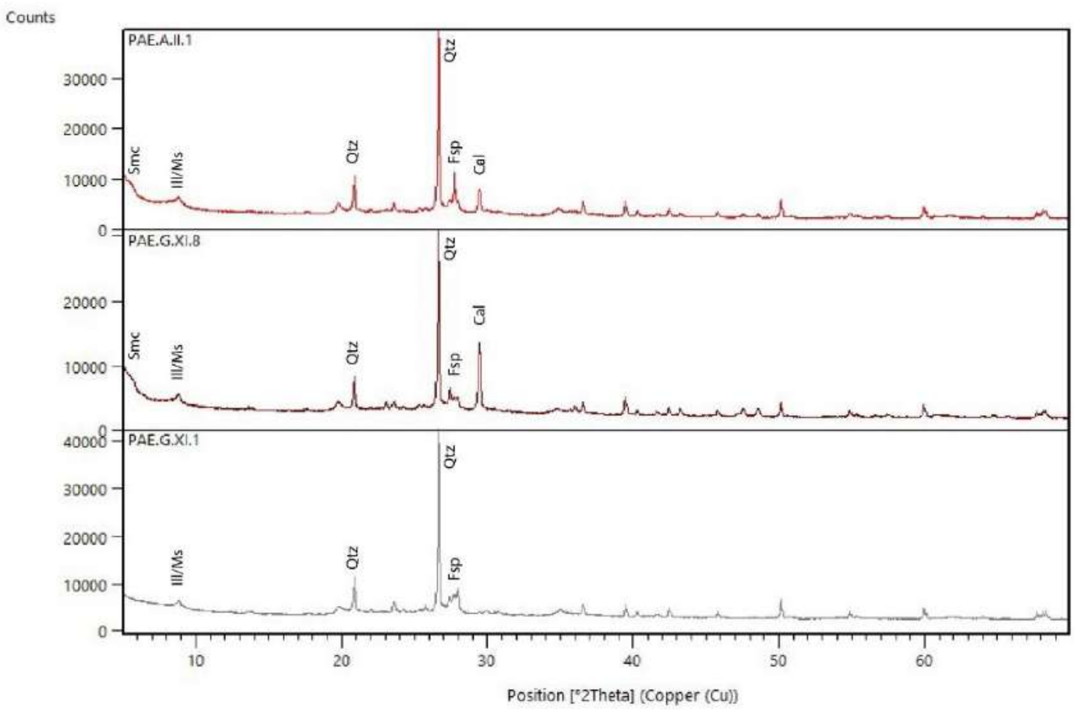


Figure 7.11. XRD spectra of samples showing presence of calcite (a weak peak in PAE.G.XI.1). Ill: illite; Ms: muscovite; Smc: smectite; Qtz: quartz; Fsp: feldspars; Cal: calcite.

Based on these observations, the maximum temperature reached for pottery firing at Paestum was no more than 850°C. Given the presence of clay minerals and neoformations, two main temperature ranges can be hypothesised:

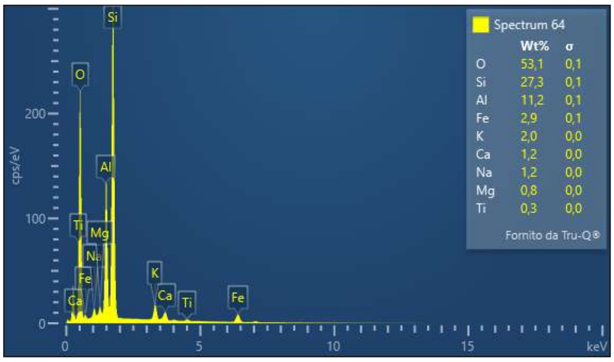
- 700–850°C, for the samples where haematite is present (4 samples, 5% of the total) and the samples with only illite/smectite (73 samples, 88% of the total);
- 500–650°C, for the samples where chlorite/kaolinite is attested (6 samples, 7% of the total).

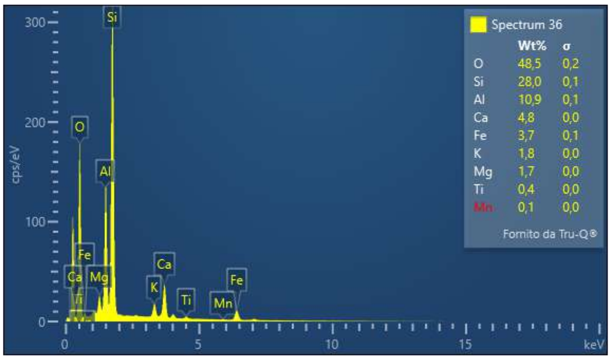
These temperatures are widely attested in the ceramic production of the period and will be further discussed in a broader context in Chapters 8 and 9.

No major correspondence between the mineralogical composition analysed by XRD and petrographic fabrics could be detected, besides the confirmation of the calcareous composition of fabric Pae7. Chlorite/kaolinite occurs exclusively in Gaudo samples corresponding to different petrographic fabrics (2 Pae2, 1 Pae4c, 1 Pae6 and 2 Pae1c). This variation in the clay minerals is likely due to a lower firing temperature of these samples, even though a difference in the clay raw material cannot be excluded. In the case of the samples lacking a smectite peak (12 samples) the use of a clay poor in smectite can be hypothesised since in two of these cases chlorite/kaolinite is also present, ruling out the possibility of a higher firing temperature.

7.2.3. SEM-EDS

Analysis by SEM-EDS allowed the acquisition of high-resolution BSE (Backscattered Electron) and SE (Secondary Electron) images and enabled a point and area analysis of the samples. This helped clarify the chemical composition of specific inclusions that, when considered with the XRD data, allowed a better understanding of their mineralogy. Chemical maps were also created, designed to answer specific questions arising during the analysis by optical microscopy in thin section.



A


B

Figure 7.12. SEM-EDS spectra of the clay matrices from samples PAE.G.IX.3 (A, Pae1c) and PAE.A.II.1 (B, Pae7), the second characterised by a higher calcareous content.

SEM-EDS analysis helped clarify the chemical composition of the clay matrix, which was rather homogeneous among the different fabrics and samples. The composition of the clay does not show major changes between the fabrics, except for the presence/absence of small quantities of Cl and Mn, variations which can also occur within the same sample (Figure 7.12). The composition of the clay in the carbonatic fabric sample, PAE.A.II.1, shows a Ca content that is generally around 5%, higher than the average for the other samples (around 2% or less). This confirms the slightly calcareous composition of fabric Pae7.

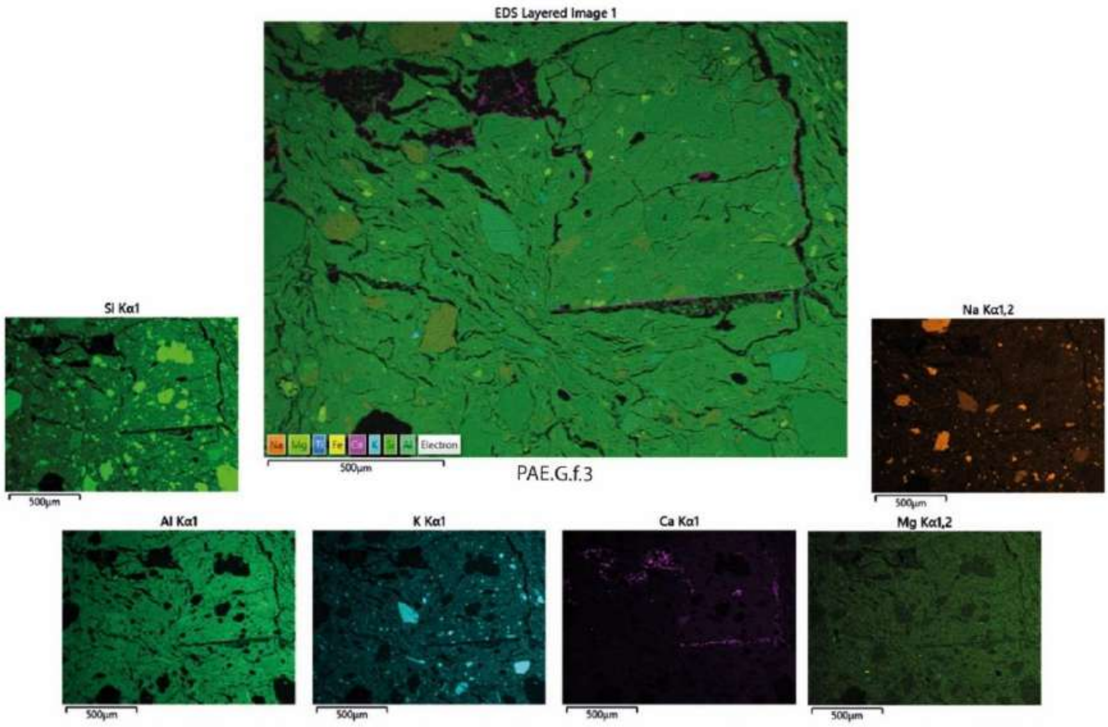


Figure 7.13. PAE.G.f.3. Elemental map produced by SEM-EDS, showing a large grog fragment with relic surface in the top right corner of the main image.

The composition of the grog fragments analysed for fabrics Pae1, Pae2, and Pae3 have mostly the same composition as the clay matrix (Figure 7.13). In some cases, the Ca content varies slightly, with higher values either in grog (sample PAE.G.f.3) or in the clay matrix (sample PAE.G.IV.2 and the carbonatic fabric, Pae7), at times suggesting a slightly different composition. In the case of Pae5, the clay-rich bodies identified by optical microscopy show a composition similar to the clay matrix except for a higher concentration of iron (Fe above 8% in the clay pellets, below 5% in the clay matrix; Figure 7.14). SEM-EDS analysis also helped to identify specific mineral inclusions and opaque bodies. In addition to clinopyroxenes, identified as augite (Figure 7.15A), opaques and iron-rich bodies are a recurring feature in the Paestum samples, mostly identified as Fe and Ti oxides (possibly rutile in sample PAE.A.III.20). Ilmenite was also detected, occurring occasionally in samples PAE.C.2.1 (sedimentary fabric Pae4, Figure 7.15B) and PAE.G.IV.2 (fabric Pae1a, Figure 7.15C).

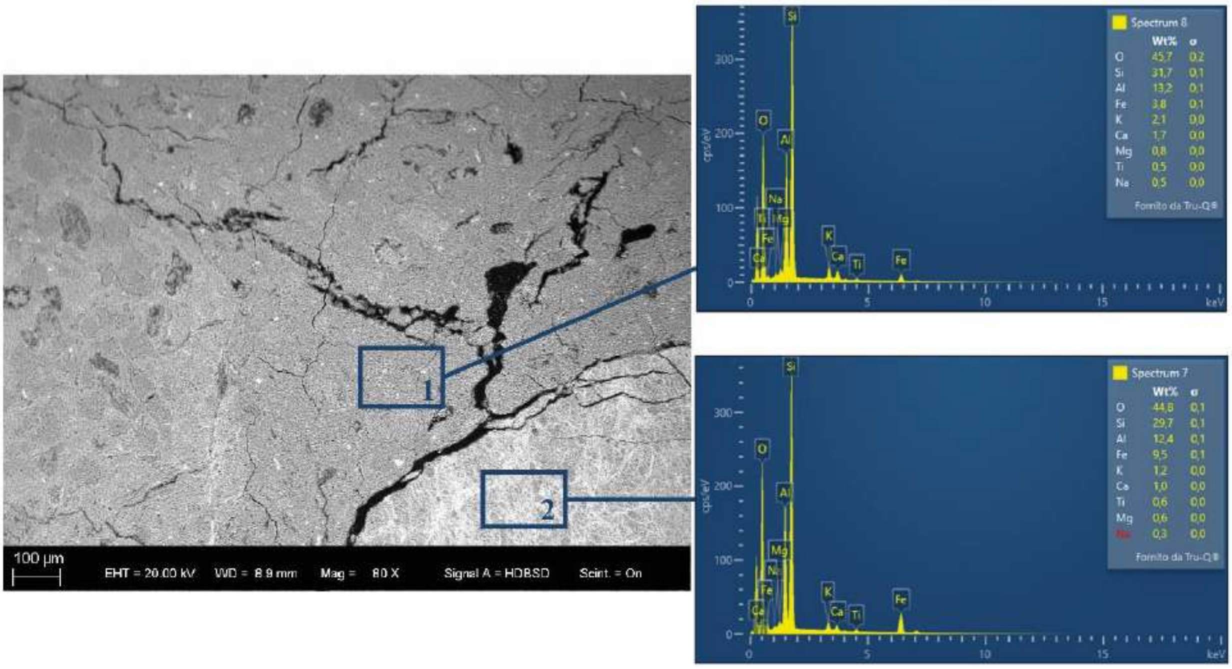


Figure 7.14. Sample PAE.C.2.1, fabric Pae4. BSE image and EDS spectra of the two areas indicated in the photograph: 1) clay matrix; 2) Fe-rich clay pellet.

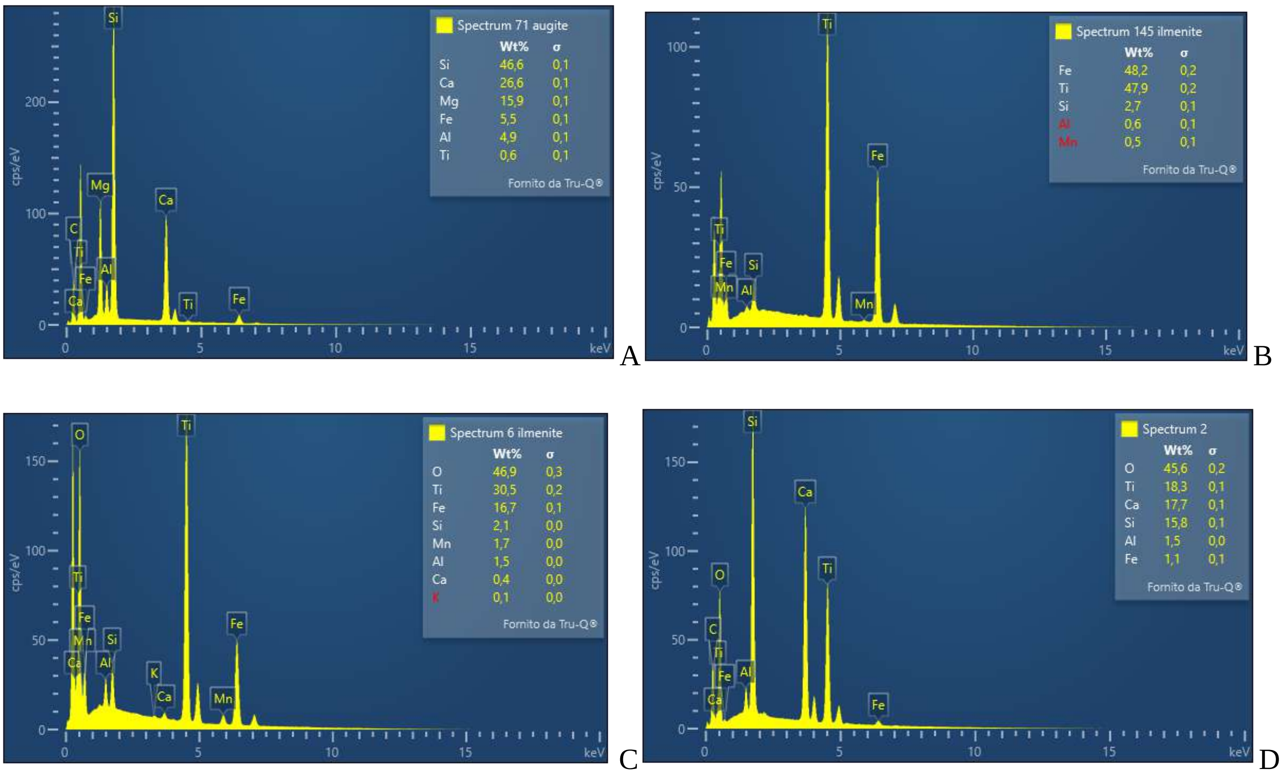


Figure 7.15. SEM-EDS spectra of Ilmenite: (A) in samples PAE.C.2.1; (B) PAE.G.IV.2; (C) augite in sample PAE.G.IX.3; and (D) sphene/titanite in sample PAE.A.III.20.

A further mineral phase identified by SEM-EDS is sphene in sample PAE.A.III.20 (fabric Pae4, sandy no grog, Figure 7.15D), a common accessory mineral in the volcanic products of the Phlegrean Fields alongside Fe-Ti oxides (Peccerillo 2005: 143). SEM-EDS data and maps also refined the identification by optical microscopy of more common mineral phases such as plagioclase and k-feldspars, and the composition of rock fragments and micas, as detailed in Section 7.2.1.

7.3. Pontecagnano

In total, 95 samples were collected for the site of Pontecagnano, including 37 from the ANAS house excavation area dating to an early phase of the Copper Age. The latter were selected based on their provenance from layers associated with the habitation phases of the main structure (UND002, Aurino 2011), and are representative of all the main macroscopic fabrics detected in this context. For the Gaudo culture cemetery, 58 samples were selected based on macroscopic observation, generally on a fresh cut section (freshly broken or sawn), with samples representative of each macroscopic ware (see Chapter 6.3.2) and macroscopic fabric. As with the Gaudo cemetery at Paestum, attention was paid to context, ensuring the analysis of a representative sample for each ware in each context. Samples were collected both from the entrance shafts and from the burial chambers of tombs, and shape and specific characteristics were also considered in order to better link the variety of fabrics to contexts and typology. The analyses are summarised in Table 7.3 and detailed in the following subsections.

Method of analysis	No. of samples analysed
Petrography in thin section	62
XRD	26
XRF	46
SEM-EDS	5

Table 7.3. Methods and number of samples analysed for the site of Pontecagnano.

7.3.1. Petrography in thin section

Thin section petrography was carried out on a subset of 62 samples (18 from the ANAS excavations, 44 from the Gaudo culture cemetery), representing the various macroscopic fabrics and wares in each context. One sample from the ANAS excavations was excluded since, based on its characteristic fine fabric, it was an intrusion from a later Greco-Roman phase. Six main petrographic fabrics were identified, based on compositional and textural criteria. Subgroups reflect differences in sorting and grain size. The occurrence of each petrographic fabric is shown in Figure 7.16 and summarised in Table 7.4; detailed petrographic descriptions are provided in Appendix 11.

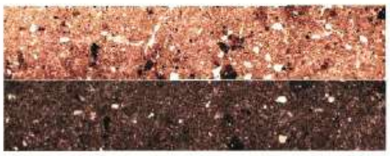
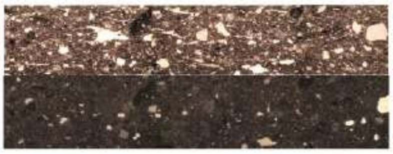
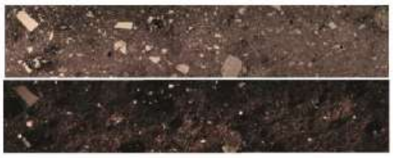
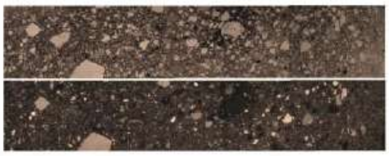
Fabric	Sub-group	Thin section photograph (ppl and xpl)	Main features
Pnt1	*Pnt1a*		**Grog and burnt organics** *20% Inclusions – 70% matrix – 10% voids* Homogeneous to heterogeneous matrix, moderate optical activity. Dominant grog and ARF, frequent iron oxides and opaques, fine quartz grains, weathered feldspars and volcanic rock fragments. Rich in burnt organics. Double to single spaced, poorly sorted. **33 samples**
	Pnt1b		**Grog, rich in quartz and feldspars** *20% Inclusions – 70% matrix – 10% voids* Mostly homogeneous matrix, optically active. Dominant grog and ARF, more abundant fine quartz and feldspars grains, few sedimentary rock fragments. Rich in burnt organics. Moderately sorted. **10 samples**
Pnt2	*Pnt2*		**Volcanic** *15% Inclusions – 80% matrix – 5% voids* Homogeneous matrix, generally low optical activity. Dominant angular feldspars and quartz, common clinopyroxenes, plagioclase and volcanic lithics. Single spaced, slightly bimodal. **12 samples**
Pnt3	*Pnt3*		**Sandy** *35% Inclusions – 60% matrix – 5% voids* Homogeneous matrix, moderate optical activity. Medium to fine sand size quartz-feldspathic inclusions often angular and common chert, few volcanic rock fragments, microcline, grog and mica. Single spaced moderately well sorted. **5 samples**
Pnt4	*Pnt4*		**Carbonatic** *30% Inclusions – 65% matrix –3-5% voids* Calcareous and slightly inhomogeneous matrix, low optical activity. Dominant carbonate inclusions, few shells fragments, frequent fine grained quartz, common volcanic lithics, few large SRF, k-feldspars and mica. Single spaced, poorly sorted. **1 sample**
Pnt5	*Pnt5*		**Sedimentary** *35% Inclusions – 58% matrix – 7% voids* Heterogeneous, no optical activity. Uneven clay mixing. Rich in sub-angular sedimentary rock fragments, fine and medium grained mudstones and sandstone, frequent quartz and large angular chert, few volcanic lithics and k-feldspars. Single to double spaced, bimodal distribution. **1 sample**

Table 7.4. Overview of the fabrics and subgroups attested at Pontecagnano.

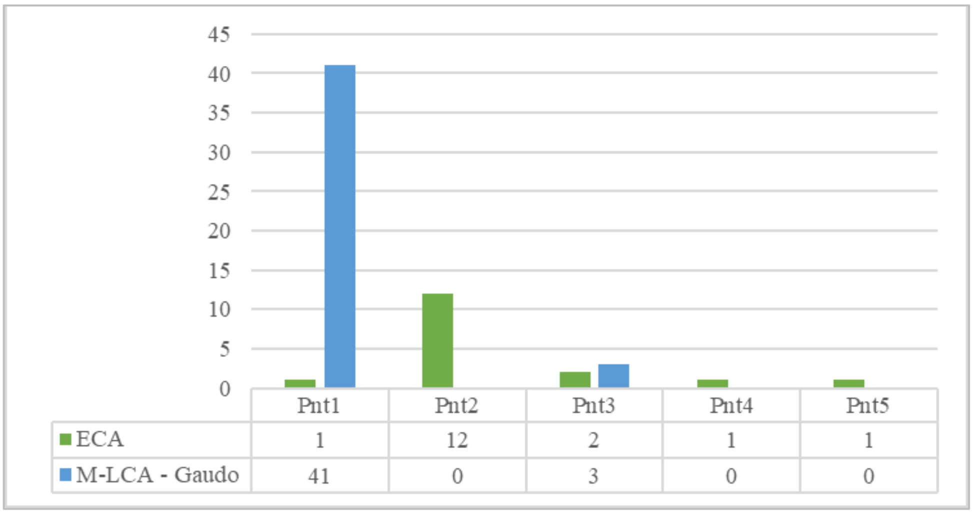


Figure 7.16. Pontecagnano. Number of samples per fabric analysed by optical microscopy in thin section, divided by chronology/cultural tradition.

Fabric Pnt1 – Grog and burnt organics (42 samples)

This coarse to fine fabric is dominated by sub-angular to sub-rounded ARF/grog, mostly clearly identifiable as grog due to the presence of relic surfaces. Non-plastic inclusions are as follows: frequent opaques (generally Fe-Ti oxides as clarified by SEM-EDS analysis) and subrounded quartz; common angular to sub-rounded feldspars, volcanic lithics and a few clinopyroxenes, mica, biotite and sedimentary rock fragments, generally sandstones. A very few to rare inclusions are also represented by chert, often altered, pisoliths, hornblende and very rare calcareous inclusions.

The non-calcareous matrix varies from homogeneous to heterogeneous with a low to high optical activity and strial b-fabric. Given their blackened edges, meso and macro vughs and planar voids are mostly due to burnt organics (Figure 7.17). A possible variant is represented by sample PNT.G.11a.2 which is richer in voids (40%) mostly parallel to margins.

This fabric is characterised by a strong homogeneity between samples suggesting the use of a clay rich in organics that were not eliminated during processing or, more likely, the addition to the base clay of varied organic materials, possibly plant remains, given the consistent amount of elongated charred voids. Grog was certainly added as temper, but ARF and clay pellets are also present, possibly due to irregular clay mixing. The poor sorting of other mineral inclusions suggests the use of a relatively coarse base clay that was poorly refined, with a coarser quartz- and feldspar-rich variant (Pnt1b).

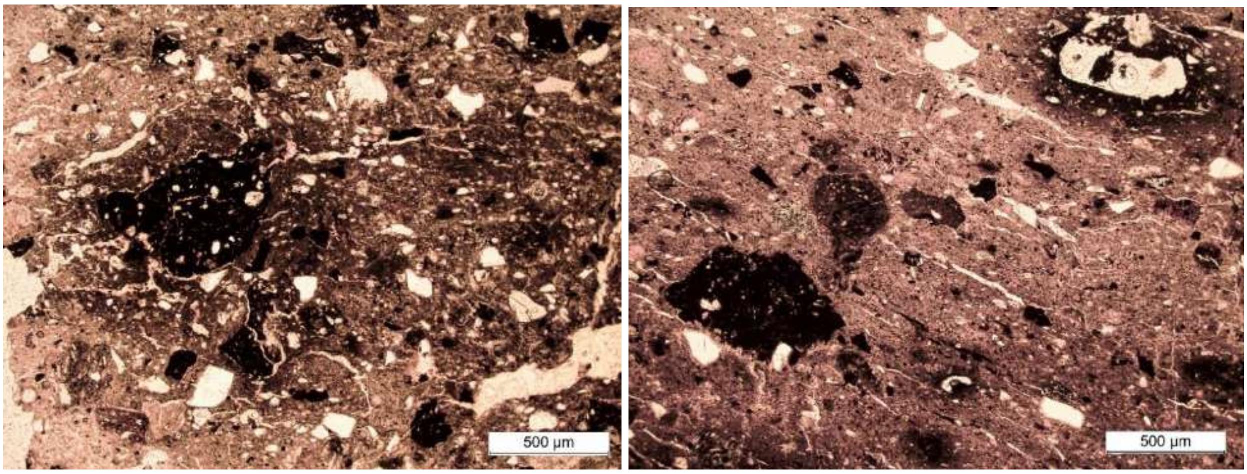


Figure 7.17. Fabric Pnt1. Details of grog and burnt organics (samples PNT.G.17b.2 and PNT.G.20p.1).

Fabric Pnt2 – Volcanic (12 samples)

This slightly bimodal fabric is dominated by coarser inclusions of angular to sub-rounded k-feldspars, while sub-angular clinopyroxenes and volcanic lithics such as trachyte are common (Figure 7.18). Further frequent inclusions are sub-rounded quartz, opaques, plagioclase feldspars, a few ARF, hornblende, muscovite, chert and a very few pisoliths, biotite, and sedimentary rock fragments. A single subfabric was distinguished based on its higher content of silt-sized quartz and feldspars and a few rounded carbonatic inclusions, possibly suggesting a different base clay. The matrix is mostly homogeneous, and in only a few samples slightly heterogeneous (PNT.A.20.19, PNT.A.20.28), with a moderate to low optical activity and striated b-fabric. Voids are mostly meso and micro vughs, randomly oriented.

This fabric is characterised by a high number of volcanic inclusions, often euhedral. The slightly bimodal grain size distribution, with larger, angular k-feldspar, pyroxene and trachyte grains, suggests either the addition of crushed volcanic rocks as temper or—more likely—it resulting from the weathering of pyroclastic flows, common in the area of Pontecagnano. Pisoliths and iron-rich features are particularly common and attributable to the base clay.

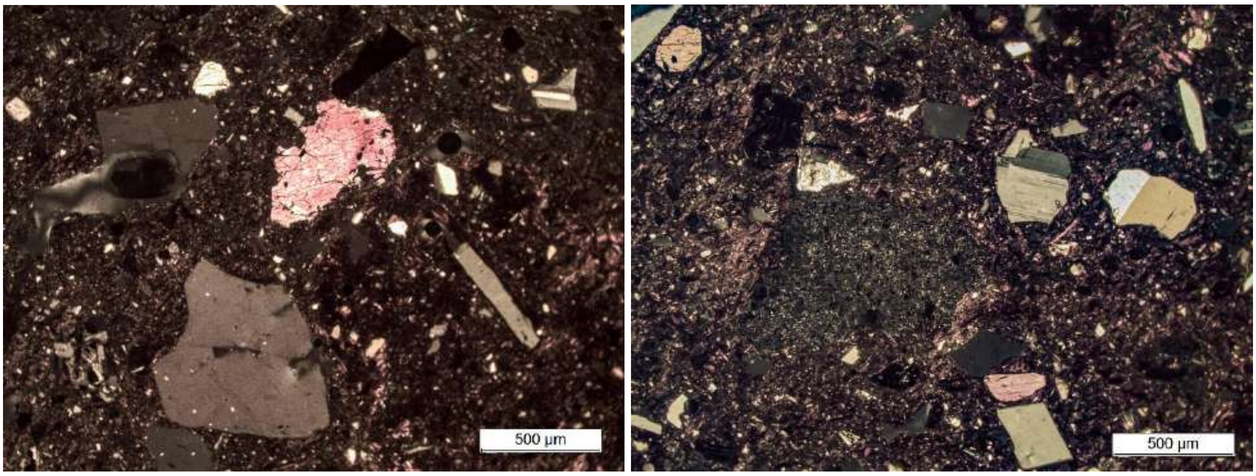


Figure 7.18. Fabric Pnt2. Details of volcanic inclusions (sample PNT.A.20.26).

Fabric Pnt3 – Sandy (five samples)

This medium to fine, sandy fabric (Figure 7.19) is characterised by mostly well-sorted, single-spaced, sub-angular quartz and feldspars inclusions (k-feldspars are frequent and plagioclase (often weathered) is common). A few chert, microcline, volcanic lithics, grog and mica inclusions also occur, together with rare clinopyroxenes, opaques and sedimentary rock fragments. A large grog grain with a relic surface is attested in sample PNT.G.13p.6. The non-calcareous matrix is homogeneous, with a moderate optical activity and speckled b-fabric. Meso and macro vughs are generally poorly aligned to margins, and only in sample PNT.G.17p.3 are both elongated vughs and planar voids aligned to margins. Only a few large, burnt organics are attested. Samples PNT.G.14p.3 and PNT.A.20.6 might represent a variant given the presence of larger rock fragments: feldspar-rich sedimentary (such as sandstones) and possibly metamorphic.

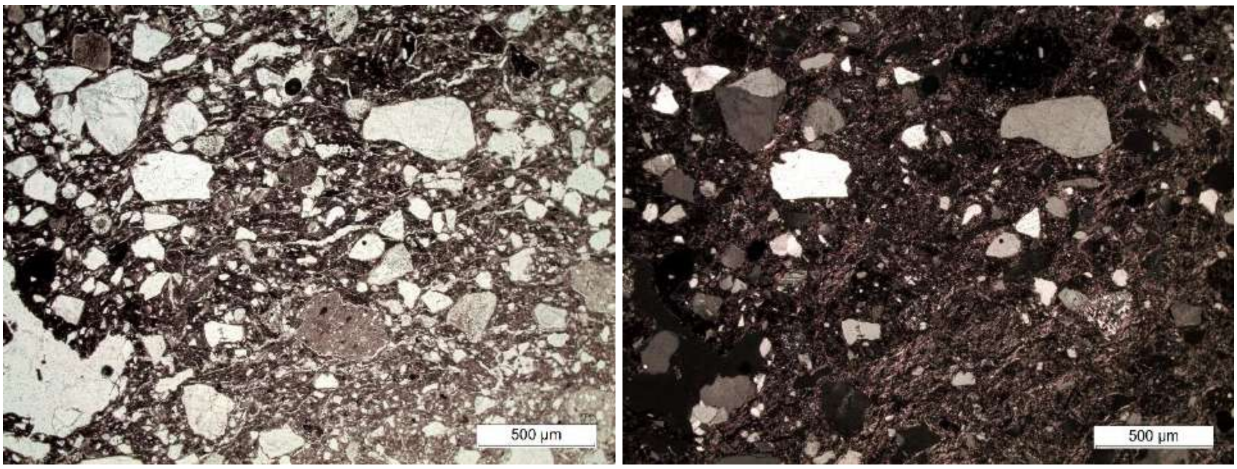


Figure 7.19. Detail of Fabric Pnt3 (sample PNT.G.13p.6) in XPL and PPL.

The well-sorted inclusions and their consistency suggest a degree of refinement of the paste by removal of the coarser fragments. The inclusions might derive either from a naturally sandy clay or from the addition of quartz-feldspathic sand to the base clay. The possible variant might also reflect the addition of crushed sedimentary rocks which would also account for the angularity of the inclusions.

Fabric Pnt4 – Carbonatic (one sample)

This carbonatic fabric is characterised by coarser grains of micritic calcite, varying from pebble- to silt-sized, and generally sub-rounded and elongated. Sand-sized inclusions are frequent; sub-angular quartz and volcanic lithics are common, and there are a few large sedimentary rock fragments, both mudstones and sand-to-siltstones, k-feldspars, mica and rare clinopyroxenes and plagioclase. A possible shell or bioclast is also present (Figure 7.20) and some iron-rich textural features. The matrix is calcareous, slightly heterogeneous and with a low optical activity. Voids are mostly elongated meso vughs and planar voids with moderate alignment to margins.

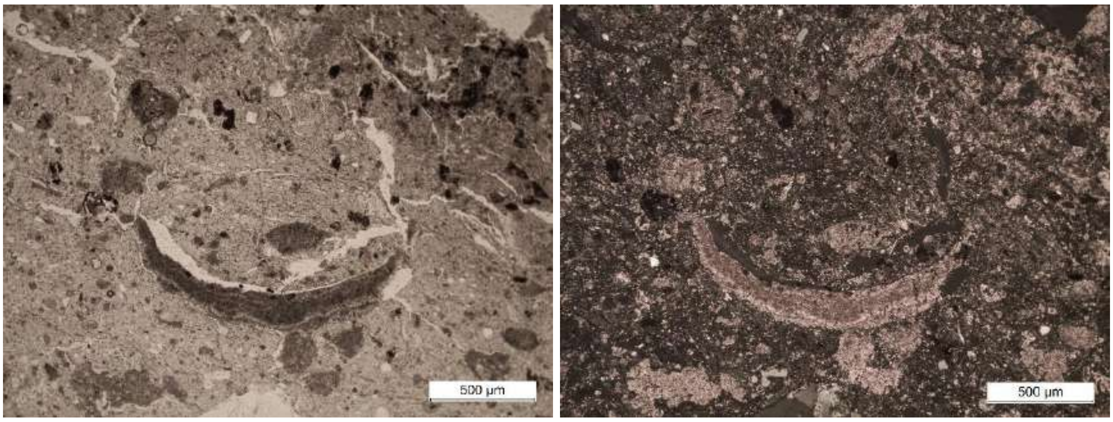


Figure 7.20. Fabric Pnt4, carbonatic: shell fragment.

A calcareous clay was used for this fabric and probably tempered with micritic calcareous inclusions including shell fragments. Large sedimentary and low-grade metamorphic rock fragments suggest that the coarse clay or added temper was not particularly refined, as coarser grains can still be found in the clay.

Fabric Pnt5 – Sedimentary (one sample)

This coarse fabric is characterised by large (pebble-sized) mudstone/clay pellets and angular chert (Figure 7.21), followed by finer mudstone fragments and frequent sub-angular quartz. Further inclusions include a few volcanic lithics, k-feldspars, mica and opaques, and occasional sedimentary and metamorphic rock fragments (Figure 7.21), clinopyroxenes and plagioclase. The non-calcareous matrix is heterogeneous, probably due to uneven clay mixing and the high number of ARF and clay pellets. Several iron-rich textural features are present. Voids are mostly macro and meso vughs, randomly oriented, and there are ring voids around some of the mudstone/ARF inclusions.

The angularity and abundance of the inclusions suggests possible tempering with coarse, crushed shales/mudstones and chert.

Figure 7.21. Fabric Pnt5, sample PNT.A.21.01. Left and centre details of sedimentary rock fragments (PPL); and right: chert (XPL).

7.3.2. XRD

A total of 26 samples representative of each petrographic fabric was selected for XRD analysis. The main mineral phases identified—quartz, plagioclase and k-feldspars, illite/muscovite and smectite (details in Appendix 12) —appear fairly homogeneous between fabrics. The amount and type of feldspars appear to be variable, especially in some cases showing lower plagioclase peaks, mostly in fabric Pnt1. Amphibole (hornblende) was identified in two samples, PNT.A.20.26 (fabric Pnt2) and PNT.G.13b.1 (fabric Pnt1a), by its principal characteristic peak at about *d* ~ 8Å (Figure 7.23).

The clay minerals identified point to the presence of illite/muscovite with a smectitic component in almost all the samples. Only two samples produced slightly different patterns. A 7Å peak (Figure 7.22, bottom) attributable to chlorite/kaolinite was identified in sample PNT.G.11a.2 (fabric Pnt1a). Distinguishing between the two mineral phases was hindered by a low peak to background ratio which did not allow the detection of a diagnostic peak between 3.52 and 3.57Å (Moore and Reynolds 1997: 234). In sample PNT.A.21.01 (fabric Pnt5) the 10Å peak typical of illite/muscovite is missing, while the smectite 15 Å peak persists. The absence of the (001) illite/muscovite peak might point to a higher firing temperature with a very weak smectite peak still visible or, more likely, the use of an illite-poor clay (Figure 7.22, top). Another possible interpretation is that the smectite is a post-depositional product (Maritan 2020). Calcite was detected in Pnt4, the only carbonatic fabric attested, in addition to the other mineral phases.

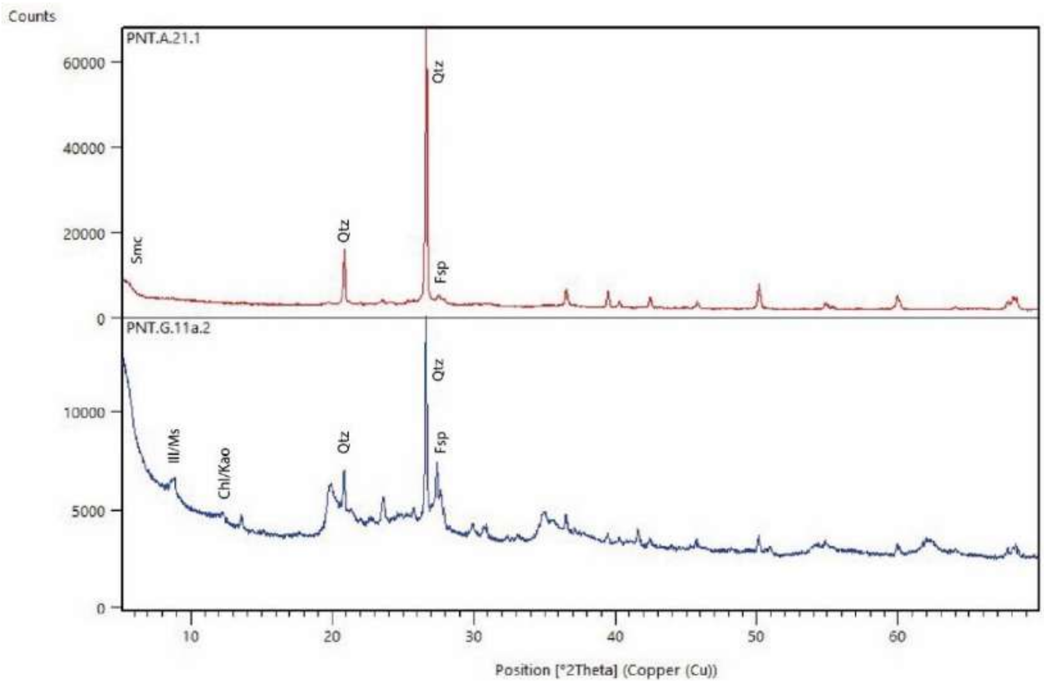


Figure 7.22. Pontecagnano. Samples with evidence of different clay minerals. Sample PNT.A.21.1 (top) shows only very weak illite and smectite peaks. Sample PNT.G.11a.2 (bottom) shows instead clear illite/muscovite and chlorite/kaolinite peaks. Ill: illite; Ms: muscovite; Smc: smectite; Chl: chlorite; Kao: kaolinite; Qtz: quartz; Fsp: feldspars; Cal: calcite.

As with the Paestum samples, the estimated firing temperature reached by these samples is based on only a few elements due to the use of illitic non-calcareous clays (Figure 7.23, top; Maggetti 1982: 127). The calcareous fabric, Pnt4, suggests the use of firing temperatures below 850°C due to the presence of calcite (Figure 7.23, centre). The presence of illite and smecticte peaks in other cases also indicates temperatures were probably below 850°C (Figure 7.23), as smectite generally decomposes at temperatures above this (Maggetti 1982: 127; Cultrone *et al.* 2001: fig. 3). Only one sample, PNT.G.11a.2, of subfabric Pnt1a, hints at the use of lower temperatures. The presence of a small chlorite (002)/kaolinite (001) peak indicates that either temperatures did not exceed 650°C, when the chlorite (002) peak generally disappears, or remained below 550°C, when kaolinite decomposes (Maggetti and Rossmanith 1981: 185; Maggetti 1982: 127; Trinidade *et al*. 2010: tab. 2).

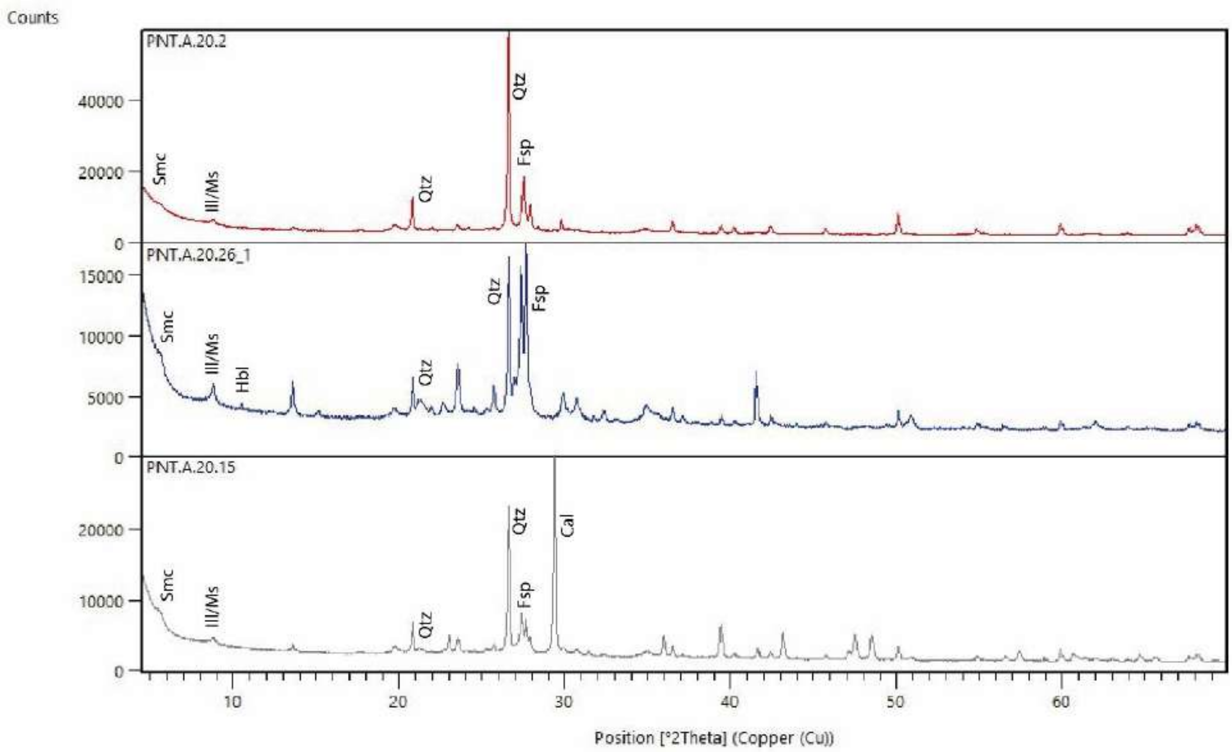


Figure 7.23. XRD spectra of representative samples from Pntecagnano. Top: sample PNT.A.20.2 main mineral phases. Middle: sample Pnt.A.20.26 with hornblende peak. Bottom: sample PNT.A.20.15 showing calcite. Ill: illite; Ms: muscovite; Smc: smectite; Qtz: quartz; Fsp: feldspars; Cal: calcite; Hbl: hornblende.

7.3.3. SEM-EDS

Analysis by SEM-EDS allowed the acquisition of high-resolution BSE and SE images and enabled point and area analysis of the samples. This clarified the chemical composition of specific inclusions, allowing a better understanding of their mineralogy.

SEM-EDS analysis helped clarify the chemical composition of the clay matrix and the nature of the grog/clay pellets. The clay matrix is quite homogeneous across the samples and shows an illitic-smectitic composition with variations occurring mostly in the Ca and Fe values. The clay matrices of fabrics Pnt1–3 show a slightly higher Fe content (Figure 7.24A) while the carbonatic fabric, Pnt4, is enriched in Ca (Figure 7.24B), as expected based on observation in thin section. In the case of the sedimentary fabric, Pnt5 (sample PNT.A.21.01), SEM-EDS analysis helped to define the ARF detected in thin section.

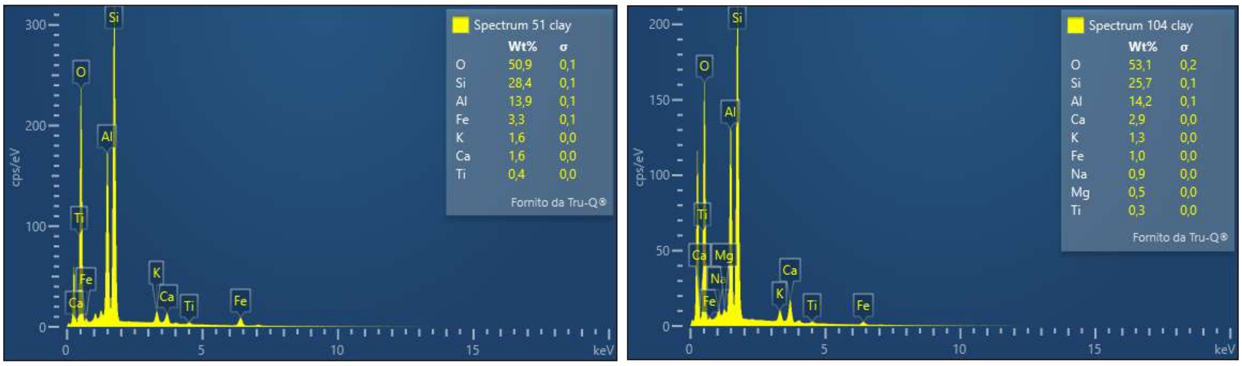


Figure 7.24. SEM-EDS spectra of the clay matrix in two samples: A. fabric Pnt1, sample PNT.G.13b.1; B. fabric Pnt4, sample PNT.A.20.15.

As shown in the elemental map in Figure 7.25, the ARFs show slightly lower Ca and Al content and an enrichment of iron, especially along the margins, suggesting their alteration due to exposure. This points to the identification at least of the larger fragments as mudstones with a similar composition to the clay matrix (probably of the same origin) rather than proper clay pellets generated during clay processing.

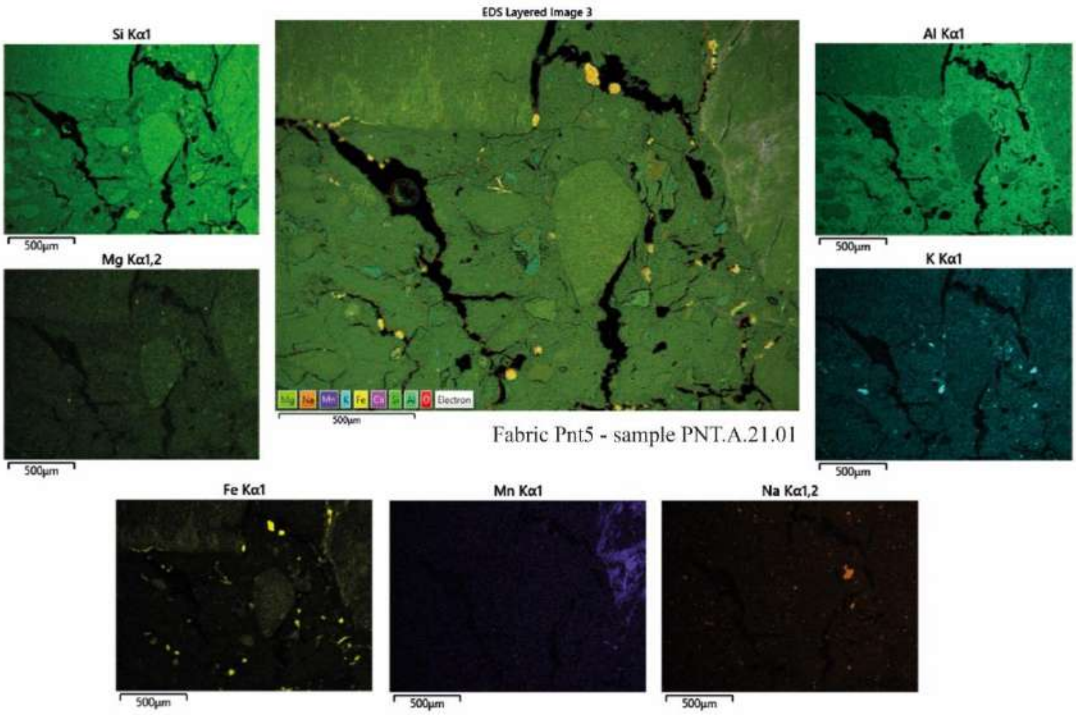


Figure 7.25. PNT.A.21.01. Elemental map produced by SEM-EDS, showing large ARF on the top left and top right corners of the main image.

This sample also revealed the presence of metallic minerals, identified as Fe-Ti oxides, not previously detected by optical microscopy. Small fragments of clinopyroxene, identified as augite, several small granules, possibly pyrite, were also detected (Figure 7.26A). In the volcanic fabric, Pnt2, large crystals of augite (Figure 7.26B) were quite common together with hornblende (Figure 7.26C) and occasionally sphene (Figure 7.26D). The high content of metallic and volcanic materials is explained by the proximity of Pontecagnano (compared to the other sites analysed) to the two main volcanic complexes of Campania, the Somma-Vesuvio and Phlegrean Fields. Sphene and augite are typical especially of the Phlegrean Fields, confirming the use of local clay sources for Copper Age potting in the area.

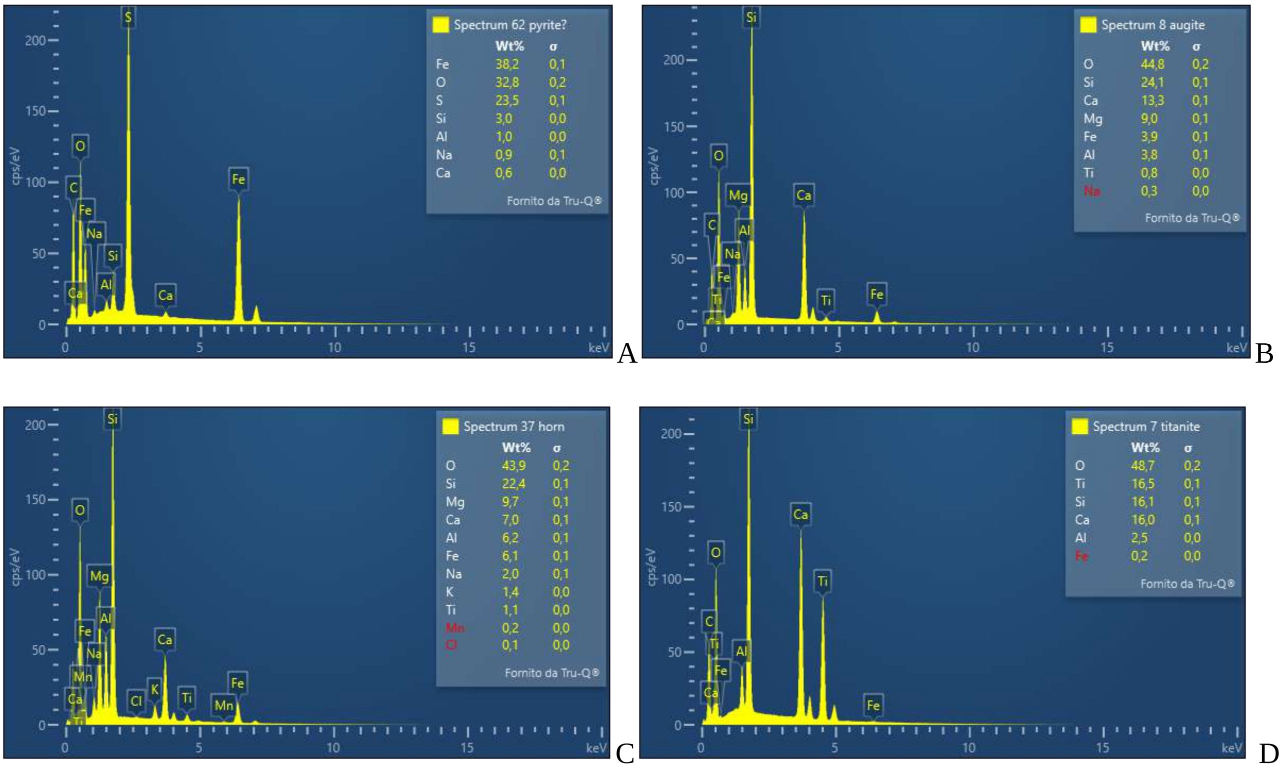


Figure 7.26. Selected SEM-EDS spectra of the samples analysed for Pontecagnano: (A) pyrite grain from sample PNT.A.21.01, sedimentary fabric Pnt5; (B) augite (C) hornblende; and (D) sphene/titanite spectrum from sample PNT.A.20.13, volcanic fabric Pnt2.

7.4. Sala Consilina

A total of 19 samples were collected from Sala Consilina’s Capo la Piazza locality, representative of the two phases attested: Phase I, cremation burials (Middle Copper Age Taurasi culture, 14 samples), and Phase II, trench graves (Middle-Late Copper Age Laterza culture, five samples). They were selected based on macroscopic observation, taking samples representative of each macroscopic ware and macroscopic fabrics. Attention was paid to the context of the sherds, ensuring each ware found in each context was represented. The trench graves (Phase II) yielded only a few ceramic grave goods, allowing only limited sampling, but all macroscopic wares and fabrics observed in this phase were selected. Shape and specific characteristics were also considered, to test for correspondences between material composition and typology. The analyses are summarised in Table 7.5 and detailed in the following subsections.

Method of analysis	No. of samples analysed
Petrography in thin section	19
XRD	7
XRF	15
SEM-EDS	0

Table 7.5. Methods and number of samples analysed for Sala Consilina.

7.4.1. Petrography in thin section

Thin section petrography was carried out on all 19 samples from Sala Consilina. Five main petrographic fabrics were identified, based on compositional and textural criteria. The occurrence of each petrographic fabric is shown in Figure 7.27 and summarised in Table 7.6; detailed petrographic descriptions are provided in Appendix 11.

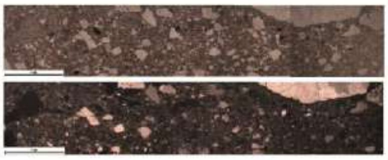
Fabric	Sub-group	Thin section photograph (ppl and xpl)	Main features
Sal1	*Sal1*		**Quartz metamorphic** *35% Inclusions – 60% matrix – 5% voids* Homogeneous matrix, moderate optical activity. Dominant subangular monocrystalline and polycrystalline quartz, frequent feldspars and quartz-feldspathic rock fragments, rare microcline. Close spaced and moderately sorted. **11 samples**
Sal2	*Sal2*		**Grog/ARF** *10% Inclusions – 85% matrix – 5% voids* Mostly heterogeneous matrix, moderately optically active. Silt size quartz and mica, frequent ARF/grog, common felspars and few SRF, pisoliths and opaques. Double spaced, moderately sorted. **5 samples**
Sal3	*Sal3*		**Sedimentary** *10% Inclusions – 80% matrix – 10% voids* Heterogeneous matrix, moderately optically active. Dominant siltstones/shale, frequent quartz, common ARF/grog and rare chert and clinopyroxenes. Double spaced, moderately bimodal. **1 sample**
Sal4	*Sal4*		**Fine** *5% Inclusions – 90% matrix – 5% voids* Heterogeneous matrix, almost sintered. Dominant fine quartz, frequent k-feldspars, common plagioclase and mica, few opaques, rare chert and trachyte. Open spaced, moderately sorted. **1 sample**
Sal5	*Sal5*		**Carbonatic** *90% Inclusions – 5% matrix – 5% voids* Highly calcareous, low optical activity. Dominant carbonate inclusions, common quartz, few feldspars, rare non calcareous ARF/grog, mica and chert. Closely packed, moderately sorted. **1 sample**

Table 7.6. Sala Consilina. Overview of the fabrics and subgroups attested.

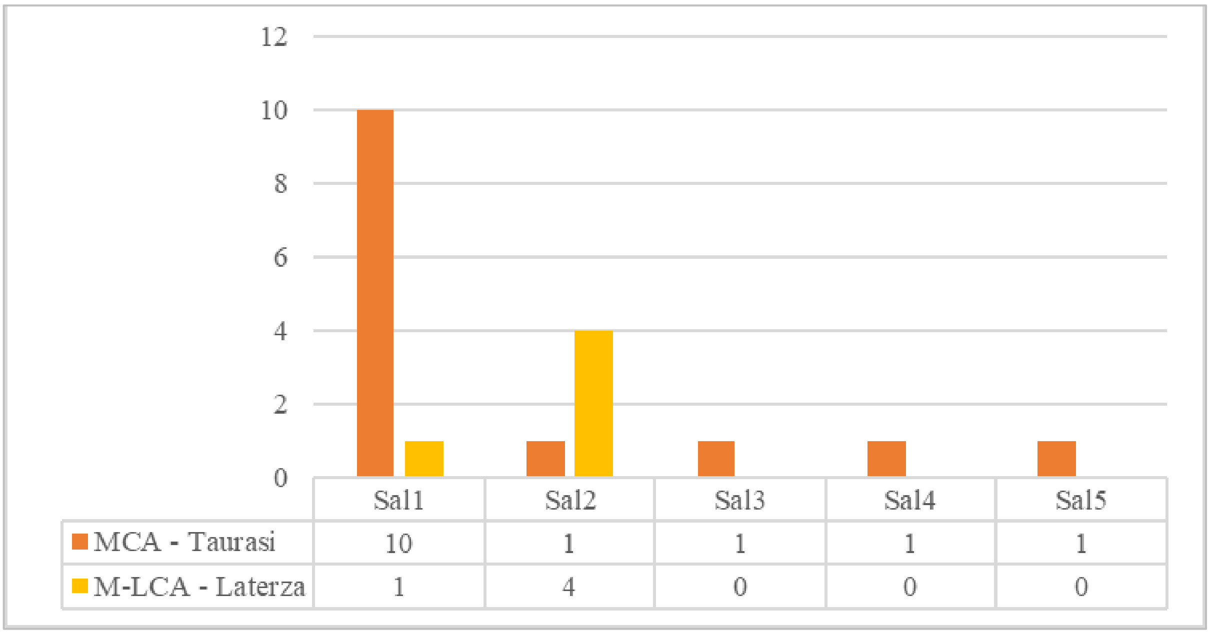


Figure 7.27. Sala Consilina. Number of samples per fabric analysed by optical microscopy in thin section, divided by period/cultural tradition.

Fabric Sal1 – Quartz metamorphic (11 samples)

This coarse-grained fabric is characterised by closely spaced, sub-angular to sub-rounded inclusions of mostly coarse, sand-sized (with a few pebble-sized) grains. Monocrystalline and polycrystalline quartz dominate, while coarse quartz-feldspathic rock fragments are common (Figure 7.28). K-feldspars are frequently attested and plagioclase is common; microcline, opaques, volcanic lithics (trachyte), chert, clinopyroxenes and metamorphic rock fragments are occasionally attested. Sedimentary rock fragments and ARF are present, mostly in SAL.C.I.01, SAL.C.I.05 and SAL.C.II.04. The non-plastic inclusions are poorly aligned to margins with a moderately sorted bimodal grain size distribution, with quartz and rock fragments as coarser grains. The non-calcareous matrix is mostly homogeneous with a moderate optical activity and strial to striated b-fabric, silt-sized mica and quartz grains and in some cases also iron-rich particles and clay pellets. Pores are mainly elongated meso and micro vughs and planar voids, mostly parallel to margins. Voids with blackened edges, probably due to the presence of burnt organics, were detected in only a few samples. The angularity of the inclusions and the presence of quartz-feldspathic rocks, mostly quartz arenites but also few igneous and metamorphic examples (granitoid and gneiss), suggests the use of crushed rocks as temper.

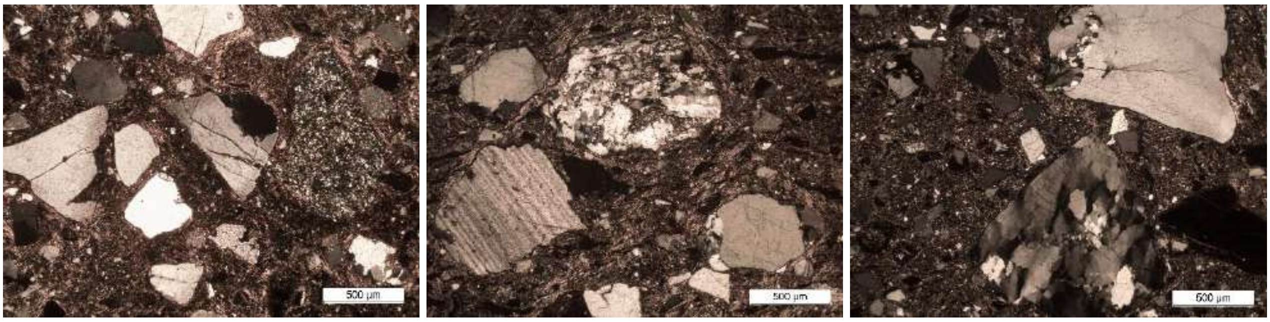


Figure 7.28. Fabric Sal1. Example of rock fragments and angular quartz grains (XPL). From left to right samples SAL.C.I.02, SAL.C.I.09, SAL.C.II.04.

Fabric Sal2 – Grog/ARF (five samples)

This slightly bimodal fabric is characterised by coarse to medium sand-sized, sub-rounded to sub-angular ARF, grog and rock fragments and by silt-sized quartz and mica inclusions (Figure 7.29). The inclusions show a good alignment to the margins. Other common minerals include feldspars, a few pisoliths, sedimentary rock fragments, opaques and occasional chert, trachyte, metamorphic rock fragments and clinopyroxenes. The non-calcareous matrix is generally heterogeneous with a moderate optical activity and a strial/striated b-fabric. Voids are mostly elongated meso and macro vughs, planar voids and a few vesicles (SAL.C.II.2-3). Vughs were in some cases probably generated by burnt organics, as indicated by slightly blackened edges. In two cases, a partly black core is also attested SAL.C.I.07, SAL.C.II.03.

The small size, poor sorting and rounded shape of the inclusions suggest that this fabric was not tempered, while the lack of very coarse inclusions may indicate the partial refinement of the base clay. The few coarser grains present are generally fragments of sedimentary rock, such as mudstones and siltstones, and they are generally rounded. A few pisoliths are also attested. The commonly occurring ARF can be interpreted mostly as clay pellets/lumps due to their similarity with the clay matrix, the lack of any relic surfaces and their optical activity (*cf.* argillaceous/clay lumps in Ho and Quinn 2021: 5). Given that their composition is similar to the matrix, they might be interpreted as unevenly wet clay bodies formed during the paste preparation (Quinn 2013: 58).

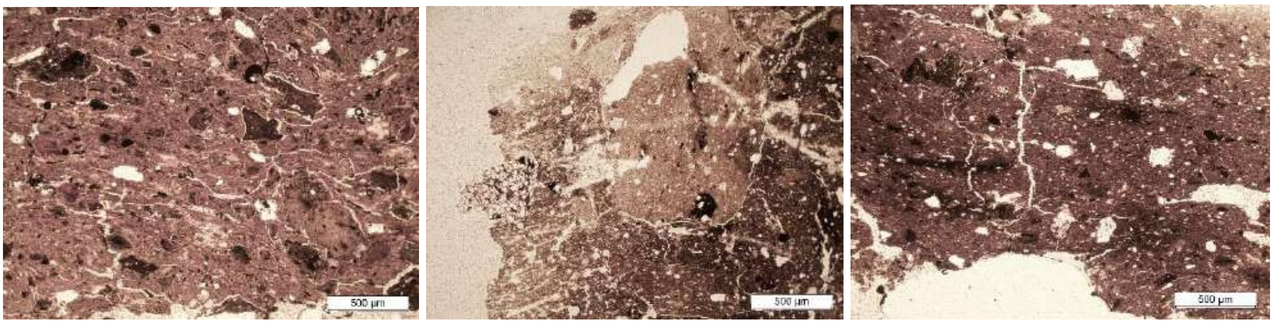


Figure 7.29. Fabric Sal2, microphotographs of the samples with grog/ARF, sedimentary rock fragments and burnt organics (PPL). From left to right samples SAL.C.II.05, SAL.C.II.03, SAL.C.II.01.

Fabric Sal3 – Sedimentary (one sample)

This sedimentary fabric is dominated by sub-rounded, elongated coarse and very coarse, sand-sized shale/mudstone fragments (Figure 7.30), which may, in some cases, also be interpreted as clay pellets. Quartz inclusions are frequent, brown ARF with a different density from the matrix are common, and chert and clinopyroxenes are rare. The matrix is heterogeneous and moderately optically active with a strial b-fabric. Voids are mostly parallel to margins and consist of meso and macro planar voids, channels and vughs, in some cases possibly generated by burnt organics, as indicated by blackened edges.

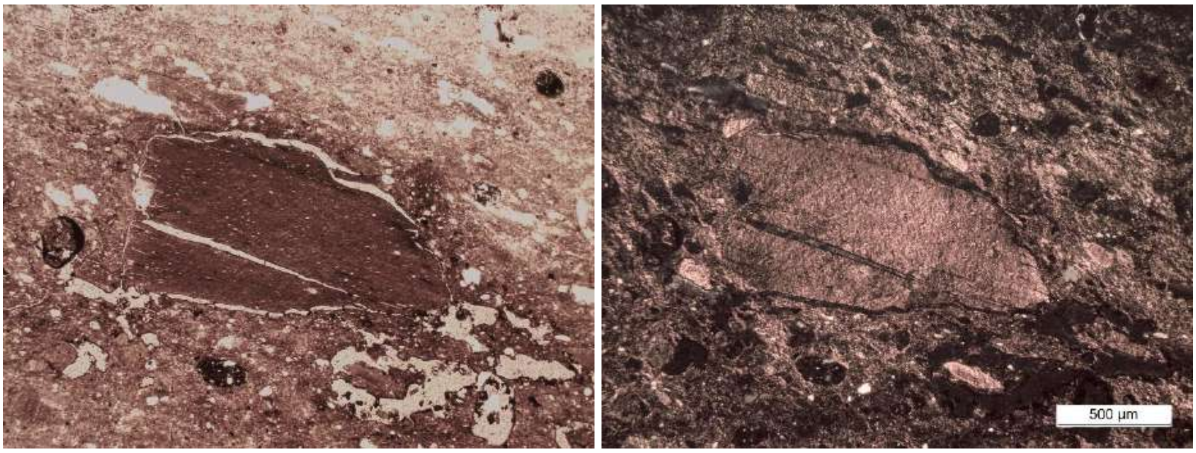


Figure 7.30. Fabric Sal3, microphotograph in PPL and XPL of a slate/shale grain (sample SAL.C.I.06).

This fabric shows a rather heterogeneous matrix, rich in organic materials. An uneven clay mixing (either of two different clays or of the same heterogeneous clay) is suggested by streaks and by the uneven distribution of the inclusions. The large mudstone fragments suggest either their addition as temper or the use of a coarse base clay, possibly a variegated clay, that was unevenly mixed.

Fabric Sal4 – Fine (one sample)

This fine fabric, associated with only one sample, is characterised by few widely spaced, moderately sorted inclusions dominated by fine, sand-sized monocrystalline quartz, with frequent k-feldspars (Figure 7.31). Plagioclase and silt-sized mica are common, with a few opaques, chert (often spherical radiolarite), and rare trachyte, sedimentary rocks and clinopyroxenes. Possible calcareous ghosts are also present. The clay matrix is non-calcareous and heterogeneous, and almost sintered but with patches. It is rich in textural features, but it is unclear whether these are due to firing or irregular clay mixing. Voids are mostly vughs and vesicles, which are randomly oriented, in a few cases with blackened edges.

This fine fabric shows very few coarse inclusions suggesting a refinement of the base clay by removing the coarser grains. The low optical activity of the clay matrix implies an exposure to high firing temperatures (or exposure to a firing event?).

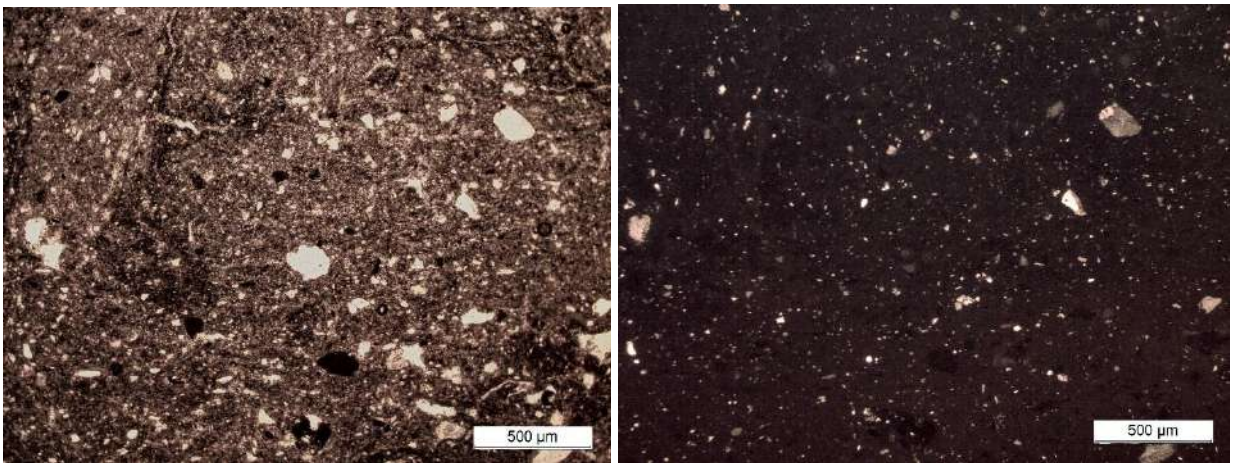


Figure 7.31. Fabric Sal4, microphotograph in PPL and XPL (sample SAL.C.I.13).

Fabric Sal5 – Carbonatic (one sample)

This carbonatic fabric is dominated by rounded carbonate inclusions, probably attributable to a fine carbonatic sand, with little clay matrix (Figure 7.32). Angular dolomite grains are also common. Other inclusions are fine quartz, a few instances of plagioclase, k-feldspars, non-calcareous ARF or grog which strongly differ from the matrix, and rare mica and chert. The matrix shows a low optical activity, but this is barely detectable due to the carbonate composition. A few voids include meso and macro vesicles and channels, mostly randomly oriented and in some cases with blackened edges.

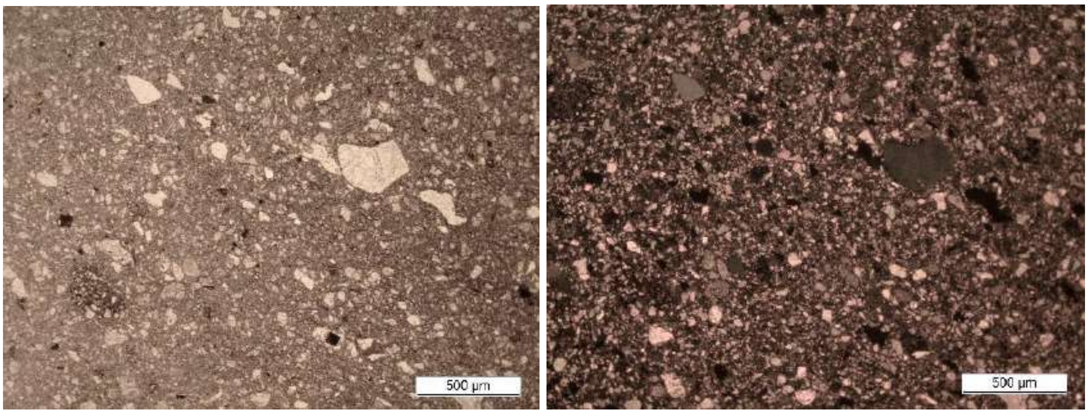


Figure 7.32. Fabric Sal5, microphotograph in PPL and XPL (sample SAL.C.I.14).

The calcareous composition of this fabric suggests a different raw material from all the other fabrics attested at the site. A sandy calcareous clay, rich in calcareous fragments was probably used, with rare non-calcareous ARF. The sample analysed is the only example of a calcareous fabric, which implies a different source of raw material (calcareous clay compared to the non-calcareous of the other fabrics) and the application of different skills during the firing of the vessels, given the potential problems when firing vessels rich in calcite (Shoval *et al*. 1993; Velde and Druc 1999: 143–4; Gliozzo 2020). These aspects of different provenance, technologies and skills will be considered further in Section 7.6 and in Chapter 8.

7.4.2. XRD

A total of seven samples, representative of each petrographic fabric, was selected for XRD analysis. The main mineral phases identified (Appendix 12) showed a good correspondence with the five petrographic fabrics identified.

The three samples representing the quartz metamorphic fabric, Sal1 (Figure 7.33, top), are quite homogeneous with the presence of quartz, k- and plagioclase feldspars. The clay minerals detected are always illite/muscovite with a possible smectite component indicated by a small 14–15Å peak. In only one sample (SAL.C.I.12, Figure 7.34) was a (002) chlorite peak detected, at 7Å. The identification as chlorite rather than kaolinite (since the respective peaks may overlap) is suggested by the presence of a small 3.52Å peak of chlorite, rather than the 3.57Å typical of kaolinite (Moore and Reynolds 1997: 234).

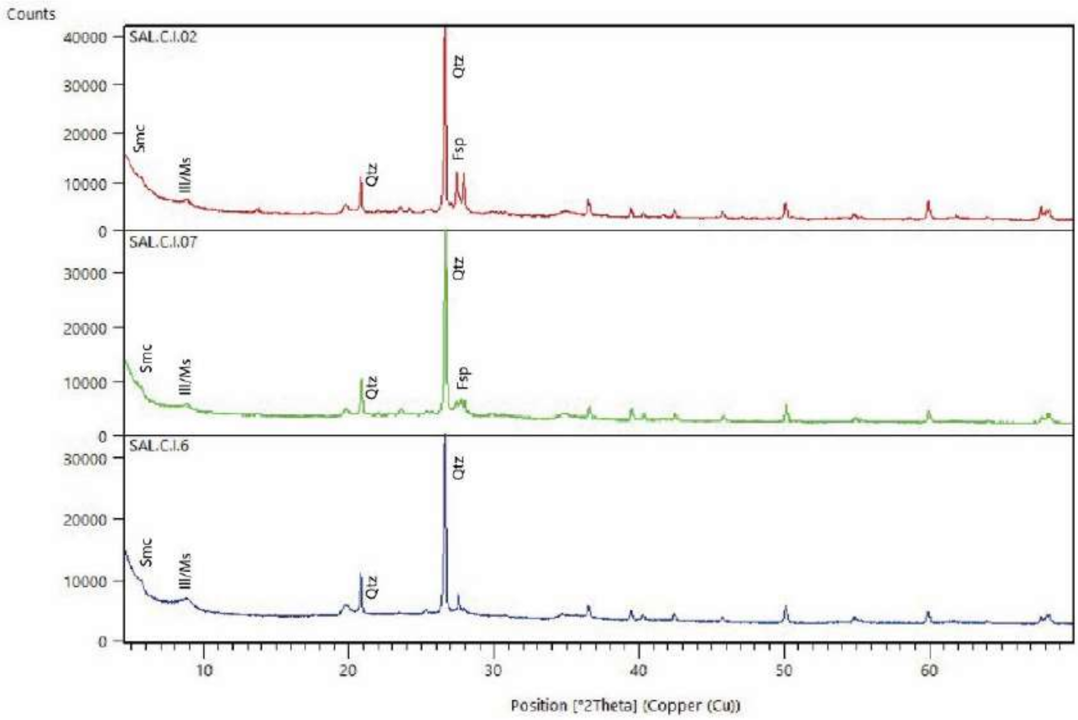


Figure 7.33. Sala Consilina. XRD spectra of samples from fabrics Sal1 (SAL.C.I.02), Sal2 (SAL.C.I.07) and Sal3 (SAL.C.I.06). Ill: illite; Ms: muscovite; Smc: smectite; Qtz: quartz; Fsp: feldspars; Cal: calcite.

The sample analysed for the grog/ARF fabric, Sal2 (Figure 7.33, centre), is very similar to Sal1 due to the presence of quartz, illite/muscovite and a smectitic component. The main difference, of a lower feldspar peak, suggests a smaller amount of feldspars present, as suggested also by optical microscopy. A complete absence of feldspars is attested in the sedimentary fabric, Sal3 (Figure 7.33, bottom), as also detected in thin section. Fabric Sal4, characterised by a fine and partially vitrified matrix, completely lacks illite/muscovite peaks with only quartz, k- and plagioclase feldspars attested, together with wollastonite (Figure 7.34, centre).

The presence of wollastonite, a high temperature mineral, suggests a reaction between carbonates and silicates occurring between 800 and 1100°C. Possible traces of altered carbonates were also found by optical microscopy. A firing reaching these temperatures is also consistent with the absence of illite/muscovite, which decomposes above 900°C (Maggetti *et al.* 2011; Gliozzo 2020) and with the partial vitrification of the clay matrix, which generally loses its optical activity over 800–850°C (Quinn 2013: 191). The presence of a low smectite peak (15.7Å) would be inconsistent with this evidence of a high firing temperature but its presence could also be interpreted as a post-depositional product due to hydroxylation of the amorphous phase, and the possible coating and reaction with dissolved ions circulating in fluids in humid environments (Eramo and Mangone 2019: 7; Maritan 2020: 198–9). The only carbonatic fabric (SAL.5) also shows an illitic-smectitic clay with quartz and feldspars but is characterised by high levels of calcite.

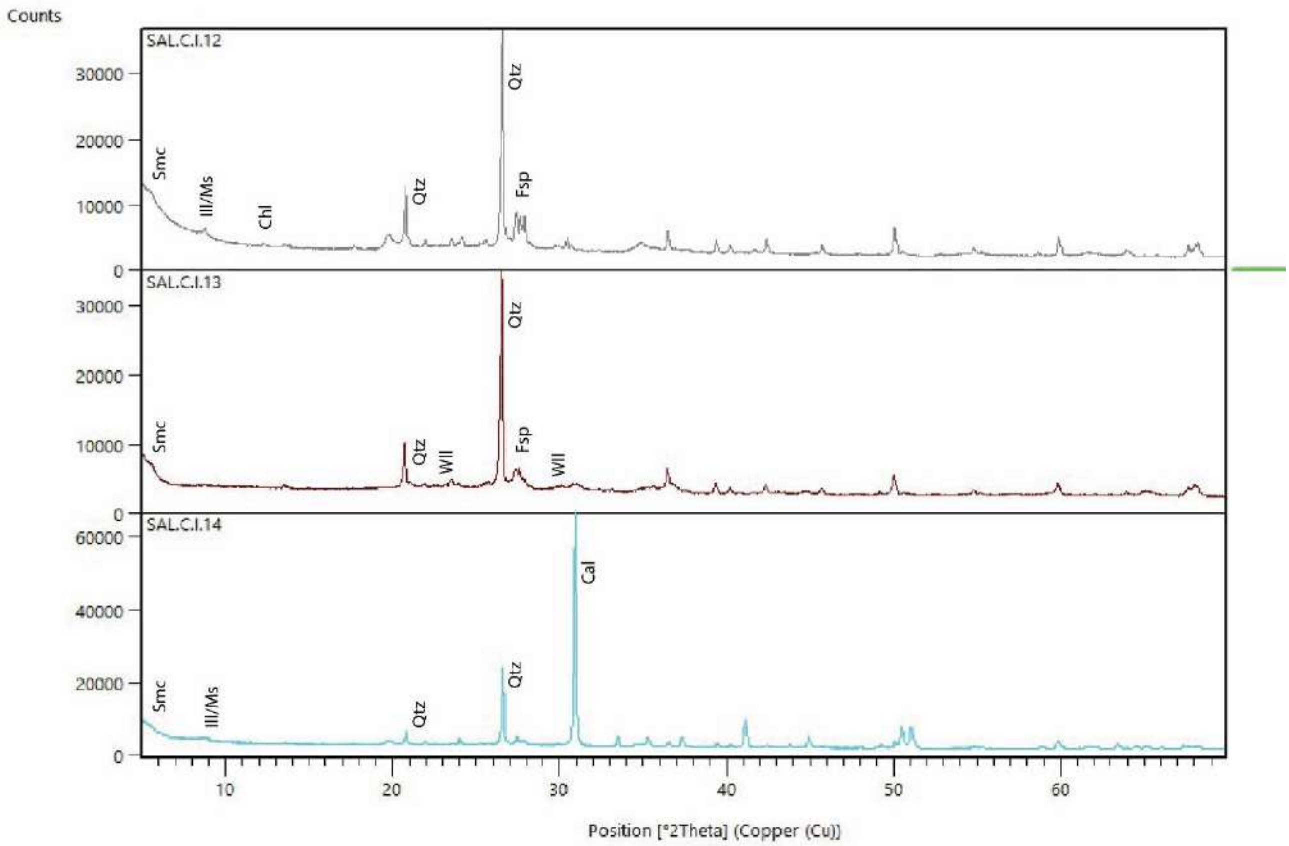


Figure 7.34. Sala Consilina. XRD spectra of samples from fabrics Sal1 (SAL.C.I.12) with presence of chlorite/kaolinite, Sal4 (SAL.C.I.13) and Sal5 (SAL.C.I.14). Ill: illite; Ms: muscovite; Qtz: quartz; Fsp: feldspars; Cal: calcite; Wll: wollastonite.

The estimated firing temperature reached by these samples indicates temperatures generally not exceeding 800–850°C due to the optical activity of the matrix, the lack of high temperature phases and the presence of illite/muscovite peaks. Two exceptions can be noted. The analysis of fabric Sal4 (one sample), suggests temperatures above 850°C due to the presence of wollastonite and the lack of the illite/muscovite peak, as explained above. Similarly, the single sample (SAL.C.I.12) of fabric Sal1 suggests temperatures below 650°C due to the presence of a (002) chlorite peak. The firing temperatures will be further discussed in Chapter 8 in relation to the wider literature for the Copper Age.

7.5. Atena Lucana

The large ceramic assemblage from the Final Copper Age settlement of Atena Lucana, situated in the Fossa Aimone locality, has been subject to only preliminarily analysis and is currently unpublished. Given the importance of the site, it was included for comparison with the 8 km far site of Sala Consilina. However, the sample selection is representative only of specific ceramic types and classes. More extensive analysis of the whole ceramic assemblage is needed in the future to allow a comprehensive consideration of the overall compositional and technological features for the site. The analyses undertaken as part of the current research are summarised in Table 7.7 and detailed in the following subsections.

Method of analysis	No. of samples analysed
Petrography in thin section	13
XRD	9
XRF	10
SEM	0

Table 7.7. Detail and number of samples analysed for Atena Lucana.

7.5.1. Petrography in thin section

Thin section petrography was carried out on all 13 samples from Atena Lucana. Six main petrographic fabrics were distinguished, based on compositional and textural criteria. The occurrence of each fabric is shown in Figure 7.35, and an overview can be found in Table 7.8; detailed petrographic descriptions are provided in Appendix 11.

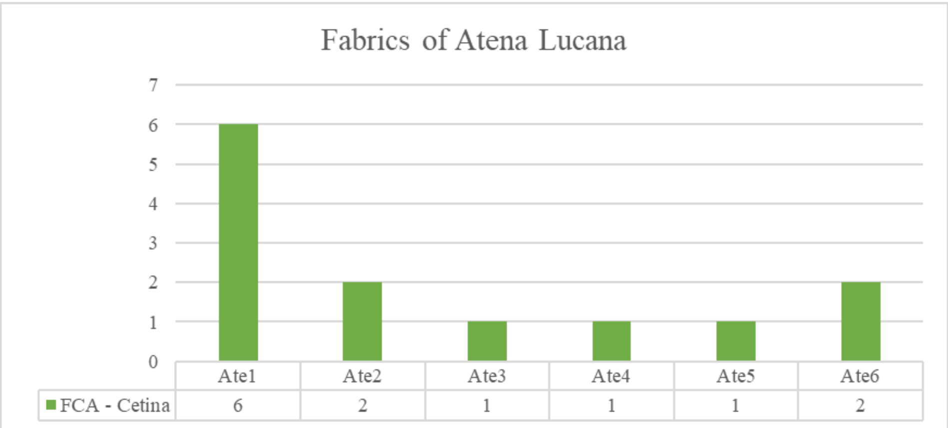


Figure 7.35. Number of samples per fabric analysed by optical microscopy in thin section for Atena Lucana, Final Copper Age.

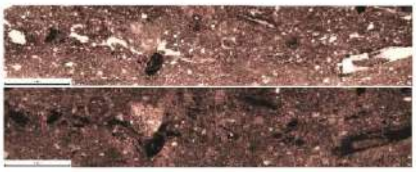
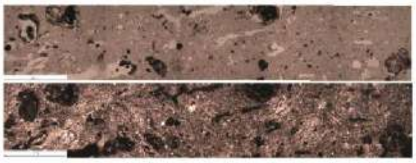
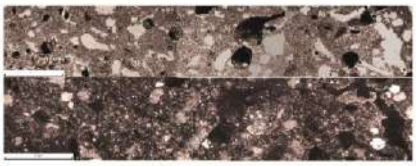
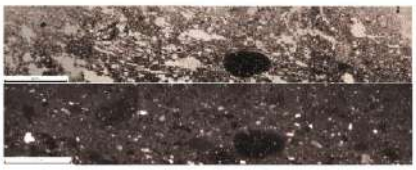
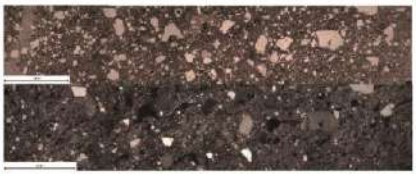
Fabric	Sub-group	Thin section photograph (ppl and xpl)	Main features
Ate1	***Ate1a***		**ARF and organics** *10% Inclusions – 85% matrix – 5% voids* Homogeneous matrix, optically active. Dominant fine quartz and common feldspars, few grog/arf, chert, plagioclase, clinopyroxenes and trachyte. Open spaced and poorly sorted. **2 samples**
	Ate1b		**ARF, organics and carbonatic** *10% Inclusions – 80% matrix – 10% voids* Homogeneous matrix, optically active. Dominant fine quartz and common calcareous inclusions, very rare SRF and silicified bioclast. Open spaced and moderately sorted. **2 samples**
	Ate1c		**ARF and organics** *10% Inclusions – 85% matrix – 5% voids* Homogeneous matrix, optically active. Dominant fine quartz, common k-feldspars, iron rich bodies and ARF, few pisoliths. Open spaced and moderately sorted. **2 samples**
Ate2	***Ate2***		**Chert and iron rich** *10% Inclusions – 87% matrix – 3% voids* Homogeneous matrix, optically active. Dominant iron rich particles, frequent subangular quartz and common to few angular chert, few ARF/grog and k-feldspars. Double to open spaced, moderately sorted. **2 samples**
Ate3	***Ate3***		**Carbonatic and sedimentary** *30% Inclusions – 60% matrix – 10% voids* Heterogeneous, moderately to high optically active. Dominant carbonate and calcite grains, frequent arf/grog, common quartz and iron rich particles, few SRF. Moderately bimodal, poorly sorted. **1 sample**
Ate4	***Ate4***		**Carbonatic and organics** *30% Inclusions – 60% matrix – 10% voids* Heterogeneous matrix, low optical activity, sintered. Dominant carbonate grains, frequent quartz, k-feldspars and quartz-feldspathic rock fragments, few trachyte and SRF, rare microcline. Single spaced and poorly sorted. **1 sample**
Ate5	***Ate5***		**Quartz and bioclasts** *20% Inclusions – 70% matrix – 10% voids* Homogeneous matrix, low optical activity, sintered. Dominant fine quartz, frequent k-feldspars, common rounded chert, few silicified bioclasts, opaques, SRF, ARF/grog, rare rock fragment with silicified bioclasts. Single to double spaced, moderately bimodal. **1 sample**
Ate6	***Ate6***		**Quartz metamorphic** *10-20% Inclusions – 87-77% matrix – 3% voids* Homogeneous matrix, moderate optical activity. Dominant coarse monocrystalline and polycrystalline quartz, common quartz-feldspathic rock fragments, few feldspars, mica and biotite. Close to single spaced, moderately sorted. **2 samples**

Table 7.8. Overview of the fabrics and subgroups attested at Atena Lucana.

Fabric Ate1 – ARF and organics (six samples)

This fine fabric is characterised by the presence of organic materials distinguishable by voids with blackened edges (Figure 7.36). The fabric shows inclusions of mostly fine to medium, sand-sized, sub-angular to sub-rounded quartz plus angular to sub-rounded feldspars. Different subfabrics were distinguished based on the abundance of ARF and the presence of carbonate inclusions. In all the variants, the base paste is similar: mostly homogeneous and moderately to highly optically active with a strial b-fabric. Voids are mostly consistent, generally elongated vughs with blackened edges. In some cases, traces of original organic materials can be still detected in the voids. The differences between subfabrics probably relate to slightly different tempering or, in the case of ARF, an internal variability of the raw material. ARF are generally dark brown with varying density and sharp boundaries, in some cases possibly, but not clearly, also identifiable as grog. Clay pellets with a similar matrix to the clay paste are also present.

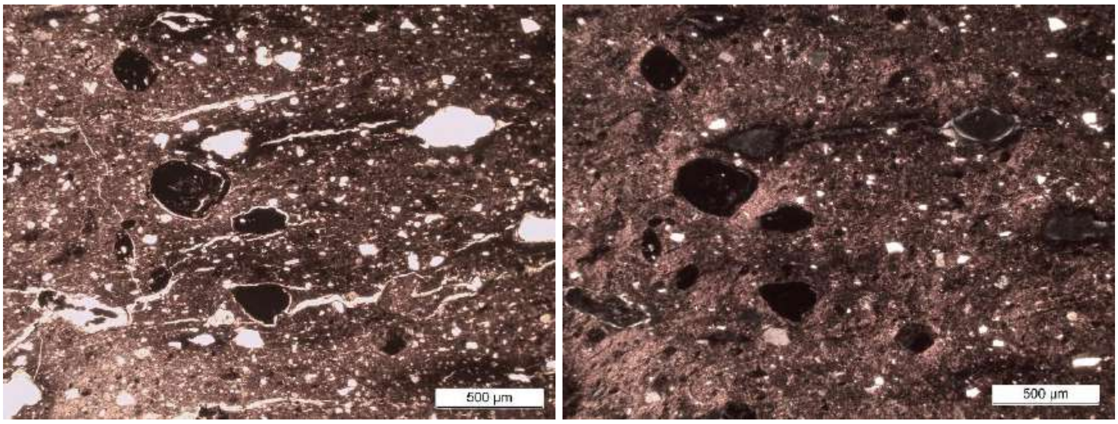


Figure 7.36. Fabric Ate1: elongated voids and vughs with blackened edges and dark brown ARF (sample ATE.FA.09).

Subfabric Ate1a is characterised by fewer and finer inclusions. Subfabric Ate1b is characterised by the common occurrence of coarse to medium sand-sized, rounded carbonate inclusions. In one sample (ATE.FA.11), a silicified bioclast is also present. Subfabric Ate1c lacks carbonate inclusions but is characterised by more common ARF/grog. Further minerals and features detected include a few pisoliths and ferrous bodies, and occasional chert, plagioclase, clinopyroxenes, trachyte and sedimentary rock fragments.

This fabric suggests the use of an organic-rich clay, poor in mineral inclusions that are mostly silt-sized to very fine sand-sized. Coarser inclusions are rare, suggesting a possible refinement of the base clay by removing coarser grains. The differences between the subfabrics might be due either to internal variability or to different processing of the raw material. Given their number, large dimensions and poor sorting, the calcareous inclusions do not appear to be a consistent feature but random or naturally occurring. The presence of ARF and clay pellets suggests an irregular mixing of the clay, probably with unevenly wet clay bodies (Ho and Quinn 2021). The voids with burnt edges and charred remains are significant, but not so frequent as to be clearly identified as an artificial addition and might be naturally present in the clay.

Fabric Ate2 – Chert and iron-rich (two samples)

This petrographic fabric is dominated by iron-rich bodies, but in some cases small or broken parts of pisoliths are also common. A further characteristic feature is the presence of angular, very coarse to coarse, sand-sized chert (Figure 7.37), most common in sample ATE.FA.01, which clearly points towards tempering with crushed chert. Fine monocrystalline and polycrystalline quartz is frequent, with a few ARF/grog, k-feldspars; plagioclase and sedimentary rock fragments are rare or absent. The non-calcareous matrix is mostly homogeneous, moderately to highly optically active, with strial/striated b-fabric. The few voids are mainly elongated meso and macro-vughs. In ATE.FA.01, planar voids are present, parallel to margins. In a few cases these were probably generated by burnt organics, as indicated by their slightly blackened edges.

This fabric is distinctive for the dominance of pisoliths and iron-rich bodies, features occurring naturally in clays. The difference between this fabric and the others points either to the use of a separate clay source or to the lack of refinement of this clay. The addition of chert as temper clearly suggests a pottery recipe.

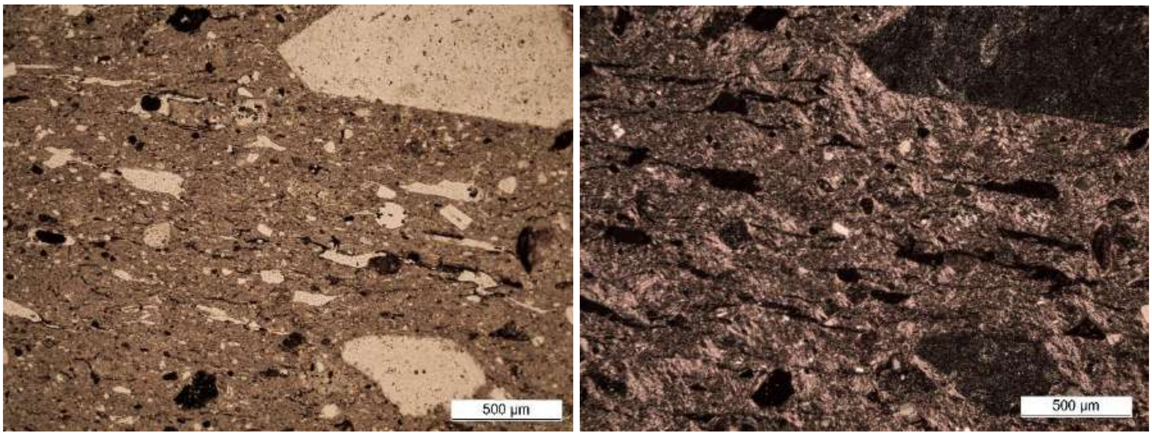


Figure 7.37. Fabric Ate2: angular chert grain in the top right corner (sample ATE.FA.01).

Fabric Ate3 – Carbonatic and sedimentary (one sample)

This coarse sedimentary fabric is dominated by sub-angular carbonate and calcite grains, showing a crystalline habit. Very coarse ARF/grog of various compositions frequently occur (Figure 7.38), ferrous bodies are common, and there are a few large sedimentary rock fragments, mostly with quartz grains in iron or clay cement (quartzarenite). Very fine, sand-sized quartz is also common, and k-feldspars are rare or absent. The fabric shows a moderately bimodal, poorly sorted grain size distribution. The non-calcareous clay matrix is heterogeneous, moderately to highly optically active with strial/striated b-fabric. Voids are mostly elongated meso and macro-vughs, mostly parallel to margins and often with blackened edges.

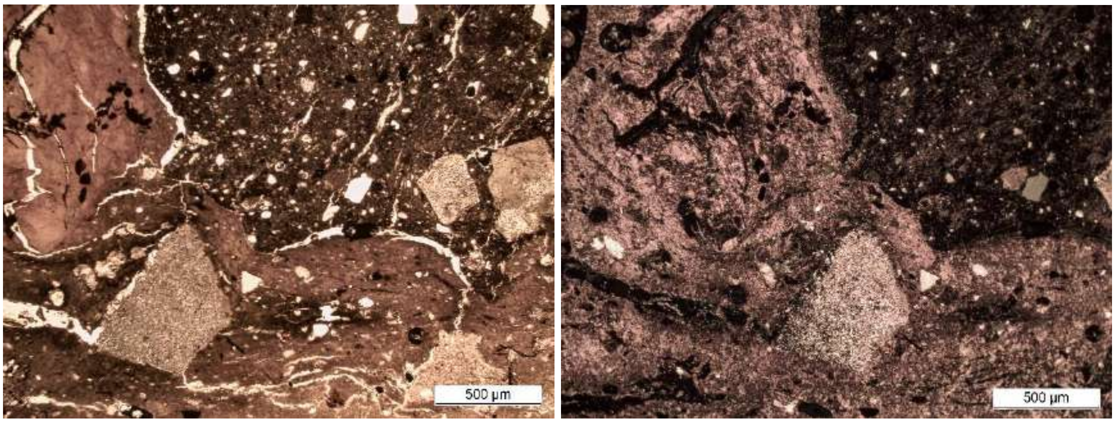


Figure 7.38. Fabric Ate3 (sedimentary and carbonatic): ARF and micritic inclusions in sample ATE.FA.04.

The angularity of the micritic inclusions and calcite grains suggests their addition to the clay matrix. The coarseness, angularity and variability of the ARF might also suggest their addition as temper. In only a few cases can they perhaps be identified as grog by the presence of relic surfaces. Coarse fragments of sedimentary rocks also occur, suggesting a low level of refinement of a coarse base clay.

Fabric Ate4 – Carbonatic and organics (one sample)

This fabric is dominated by pebble- to medium sand-sized, sub-rounded carbonate grains, in some cases showing a partial alteration resulting in the distribution of secondary calcite. The shape and abundance of voids, mainly randomly oriented macro-vughs, suggests the presence of organic material which, in this case, is not carbonised; there is no charred material and no blackened edges. Quartz is frequently present, k-feldspars and rock fragments with quartz and feldspars grains (granitoids?) are common, and there are a few instances of trachyte/iron altered chert, microcline, clinopyroxene, chert and radiolarite. The matrix might be calcareous, but the presence of secondary calcite hinders its identification. It is heterogenous with a few clay pellets and low optical activity.

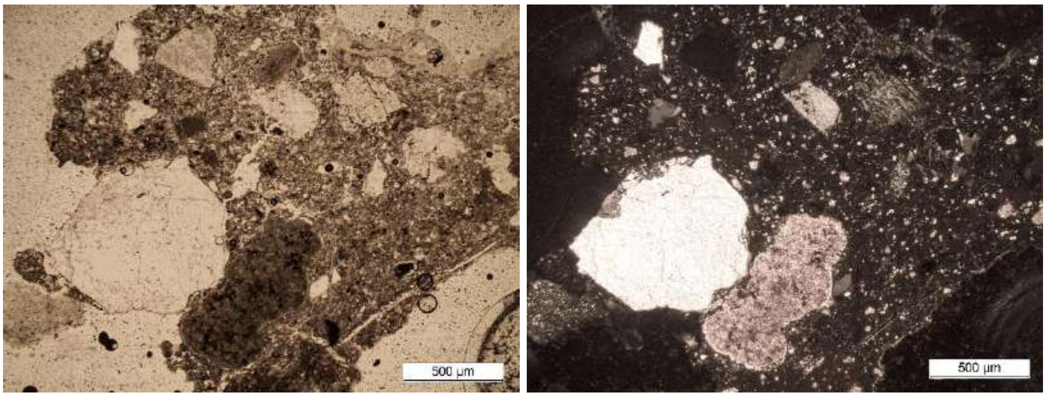


Figure 7.39. Fabric Ate4, microphotographs in PPL and XPL of sample ATE.FA.13.

This coarse fabric shows a high content of micritic calcite, either as inclusions or distributed in the matrix. The varied types and poor sorting of the inclusions suggests an unrefined base clay with the addition of abundant organic materials (such as chaff) also visible macroscopically and consistent with the interpretation of the sample as part of a possible daub or clay structure exposed to fire.

Fabric Ate5 – Quartz and bioclasts (one sample)

This finer fabric is characterised by a moderately bimodal grain size distribution with few larger ARF/grog and rock fragments, dominated by fine, sand-sized monocrystalline and polycrystalline quartz. A peculiarity of this fabric is the rounded chert, radiolarite (Figure 7.40), which occurs commonly both in the matrix and in rock fragments, showing silicified bioclasts, detected also in the matrix. Further features are a few opaques, sedimentary rock fragments, and the rare presence of clinopyroxene, plagioclase and trachyte. The shape of some voids and the traces of carbonate inclusions might suggest the dissolution of carbonates during firing. The matrix is non-calcareous and sintered with a slight optical activity towards the inner surface of the vessel.

This fine fabric is characterised by frequent silicified bioclasts. The few inclusions and poor sorting of occasional coarser sedimentary rock fragments suggest a base clay that was not particularly refined and probably lacked artificial additions of temper.

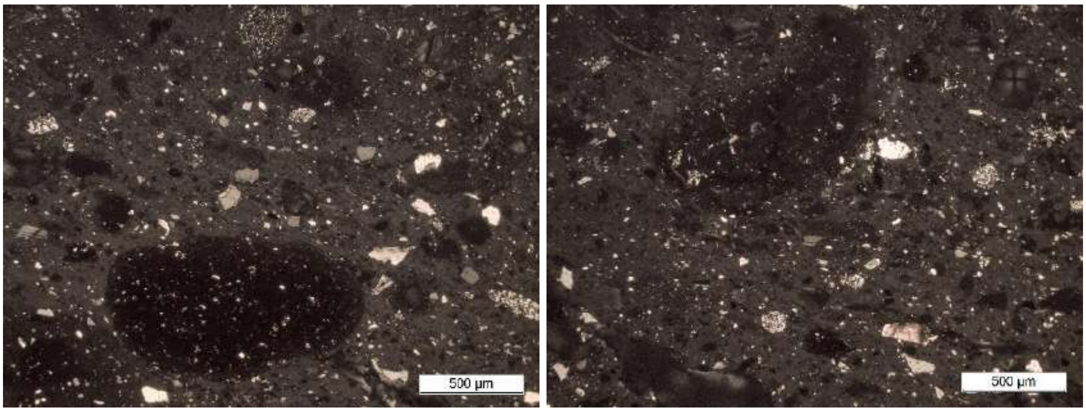


Figure 7.40. Fabric Ate5: XPL microphotographs of silicified bioclasts and radiolarites, sample ATE.FA.03.

Fabric Ate6 – Quartz metamorphic (two samples)

This coarse-grained fabric is characterised by closely spaced sub-angular to sub-rounded inclusions that are mostly coarse and sand-sized grains, with a few pebble-sized grains (Figure 7.41). Monocrystalline and polycrystalline quartz dominate with coarse quartz-feldspathic rock fragments common. There are a few k-feldspars, plagioclase and mica/biotite, while microcline, opaques, volcanic lithics (trachyte), chert, clinopyroxenes and sedimentary rock fragments are also rarely attested. Hornblende, layered metamorphic rock fragments and pisoliths are very rare. The non-plastic inclusions are poorly aligned to margins with a moderately sorted bimodal grain size distribution, and with quartz and rock fragments as coarser grains. The non-calcareous matrix is mostly homogeneous with a moderate optical activity and strial to striated b-fabric, silt-sized mica and quartz grains, and in some cases also clay pellets. Pores are mainly elongated meso and micro vughs parallel to margins. A few voids with blackened edges, probably due to burnt organics, were detected only in sample ATE.FA.07.

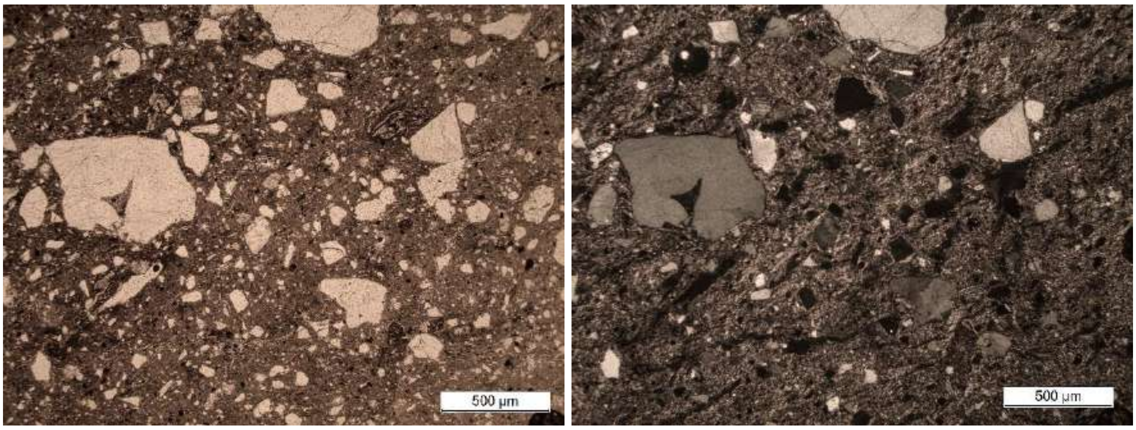


Figure 7.41. Fabric Ate6: angular quartz grains in sample ATE.FA.07.

This fabric is very similar to fabric Sal1 from Sala Consilina, which also contains angular inclusions and quartz-feldspathic rocks, mostly quartz arenites but also a few igneous and metamorphic examples (granitoid and gneiss), suggesting the use of crushed rocks as temper.

7.5.2. XRD

Nine samples representative of each petrographic fabric were selected for XRD analysis. The results identified the main mineral phases present (Appendix 12) which are largely similar in composition. Fabrics Ate1 and Ate2 show a very homogeneous composition of quartz, plagioclase and k-feldspars (Figure 7.42). The clay minerals detected are illite/muscovite and a smectitic component with a small peak at 15.7Å. Fabric Ate3 is characterised by a lack of feldspars, with the presence of only quartz, illite/muscovite, smectite and calcite (Figure 7.43). In contrast, the other carbonatic fabric, Ate4, characterised by a high calcite peak, shows a presence of both k- and plagioclase feldspars, with quartz, illite/muscovite and smectite (Figure 7.43). Fabric Ate5 has a composition similar to fabrics Ate1 and Ate2 with the possible presence of microcline (Figure 7.42). Clay mineral phases (illite/muscovite and smectite) are poorly attested, consistent with the vitrification of the matrix detected in thin section observations. Fabric Ate6 shows quite homogeneous results in both samples analysed, with quartz, k-feldspars (possibly also microcline in ATE.FA.07), plagioclase feldspars, illite/muscovite and smectite (Figure 7.43).

The samples analysed are mostly homogeneous in composition, consistent with the petrographic fabrics distinguished. The clay minerals attested are both illite/muscovite and smectite, attested in lower quantities in the sample with a vitrified matrix (ATE.FA.03). Further differences relate mostly to the presence/abundance of feldspars (absent in some cases), and the presence of calcite, identified only in the two carbonatic fabrics.

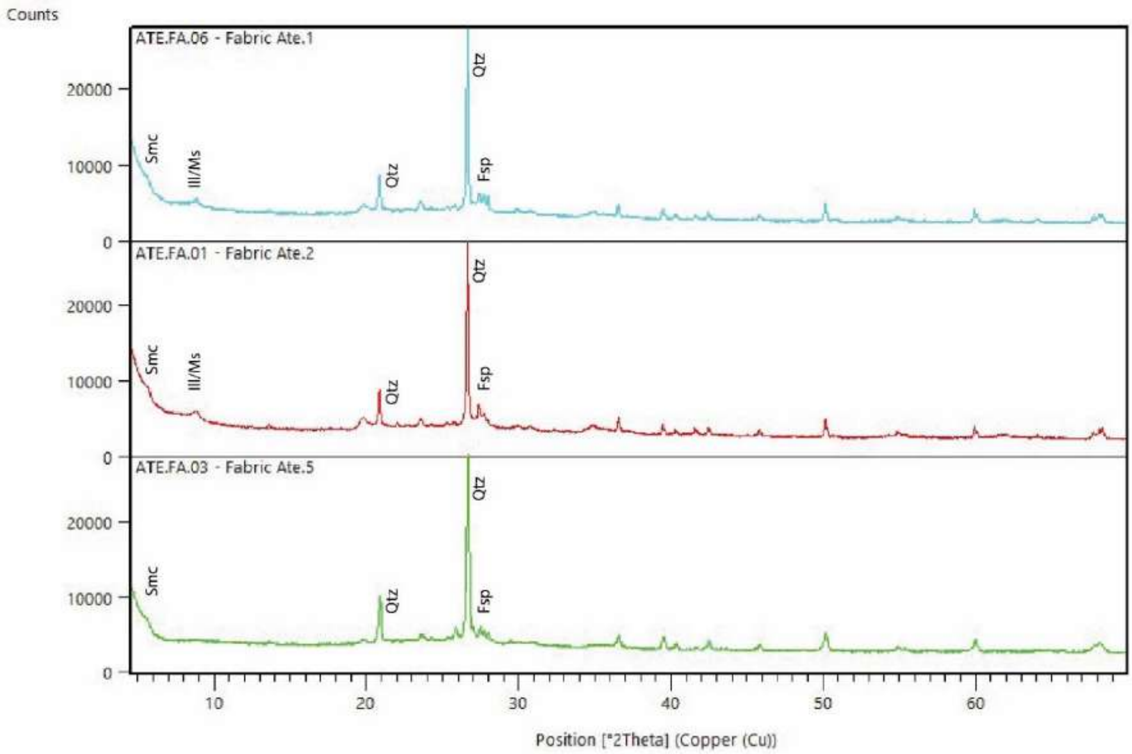


Figure 7.42. XRD spectra of fabrics Ate1, Ate2 and Ate5 showing similar compositions. Ill: illite; Ms: muscovite; Smc: smectite; Qtz: quartz; Fsp: feldspars.

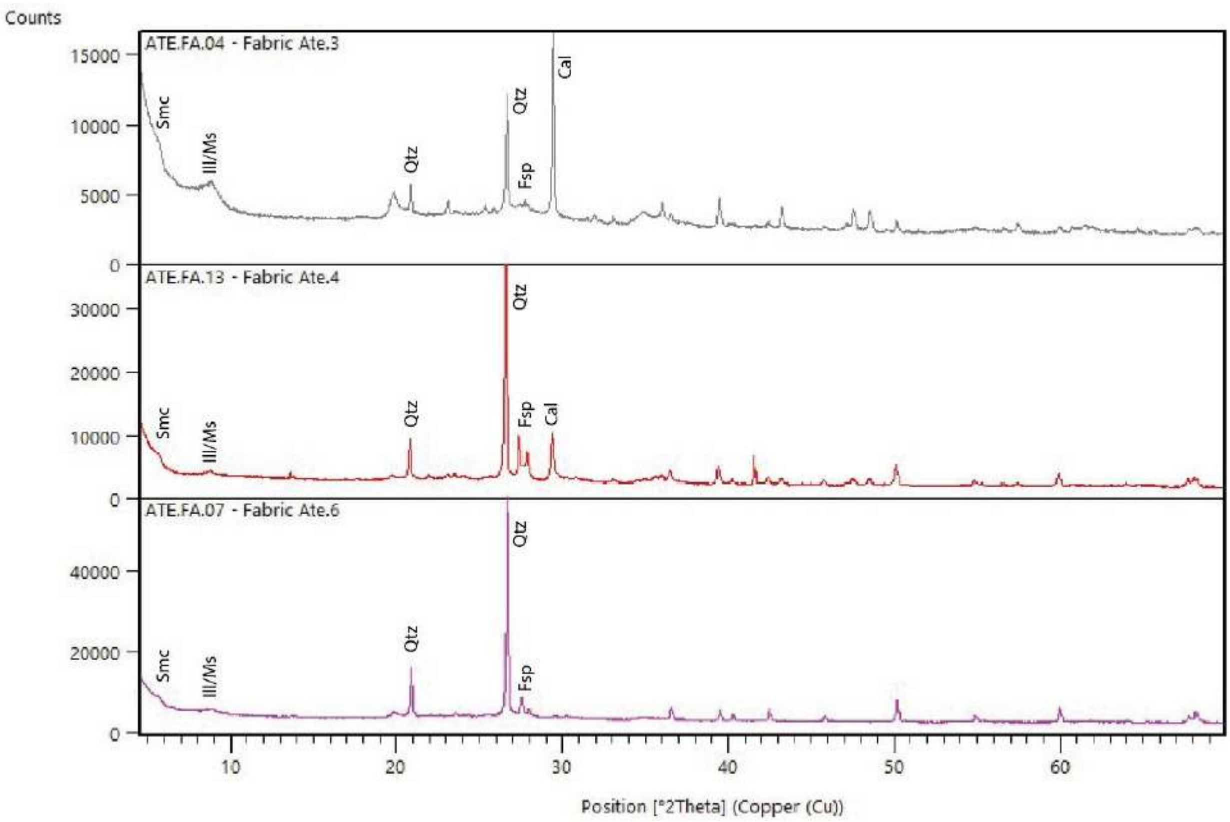


Figure 7.43. XRD spectra for fabrics Ate3, Ate4 and Ate6. Ill: illite; Ms: muscovite; Smc: smectite; Qtz: quartz; Fsp: feldspars; Cal: calcite.

Observations regarding the estimated firing temperature can be made based on specific mineral phases. The presence of illite and smectite indicates firing temperatures not exceeding 850°C, above which both mineral structures collapse (Maggetti *et al.* 2011; Gliozzo 2020). The calcareous fabrics, Ate3 and Ate4, also suggest temperatures below 850°C given the presence of the calcite peak and the absence of neoformations (Figure 7.43, Gliozzo 2020: 8; Maritan 2004: 304; Maggetti *et al*. 2011: fig. 7). In the case of the fine fabric, Ate5 (Figure 7.42), however, the sintered matrix and the low clay mineral peaks suggest temperatures around or higher than 850–900°C, when the clay generally loses its optical activity and illitic and smectitic crystalline structures collapse (Quinn 2013: 191; Maggetti *et al.* 2011; Gliozzo 2020).

7.6. Statistical analysis of the overall geochemical data

The validity of these statistical analyses is greater when comparing larger amounts of data. PCA and bivariate analysis of the chemical composition was therefore undertaken for all the samples from all four sites studied.

As outlined in Chapter 4.2, the four sites are located in Southern Campania (Figure 4.1, Chapter 4). The sites of Paestum and Pontecagnano are situated in the Sele River Plain, Paestum in the south and Pontecagnano in the north, nearer to the volcanic complexes (Figure 4.2, Chapter 4). The sites of Sala Consilina and Atena Lucana lie in the Vallo di Diano (which once hosted a Pleistocene lake), between the carbonatic Alburni Mountains and Monti della Maddalena (Figure 4.3, Chapter 4). The two areas are connected by the Tanagro River which crosses the Vallo di Diano and then merges with the Sele River, ultimately flowing into the sea near Paestum. Given the mostly sedimentary and carbonatic geology of the area, the four sites predictably show a rather similar mineral composition, as confirmed by petrographic and XRD analyses. XRF data, statistically analysed through PCA (Orton and Hughes 2013: 176–80, see Chapter 5.4.3) together with element ratio and bivariate analyses help to refine the ‘chemical fingerprint’ of each sample and examine variations in the data in order to detect geochemical groupings. In this way, sharper distinctions between raw materials, compositional groups and provenance can be inferred.

Log10 normalised data were statistically analysed by PCA (Figure 7.44) as described in Chapter 5 (5.4.3).

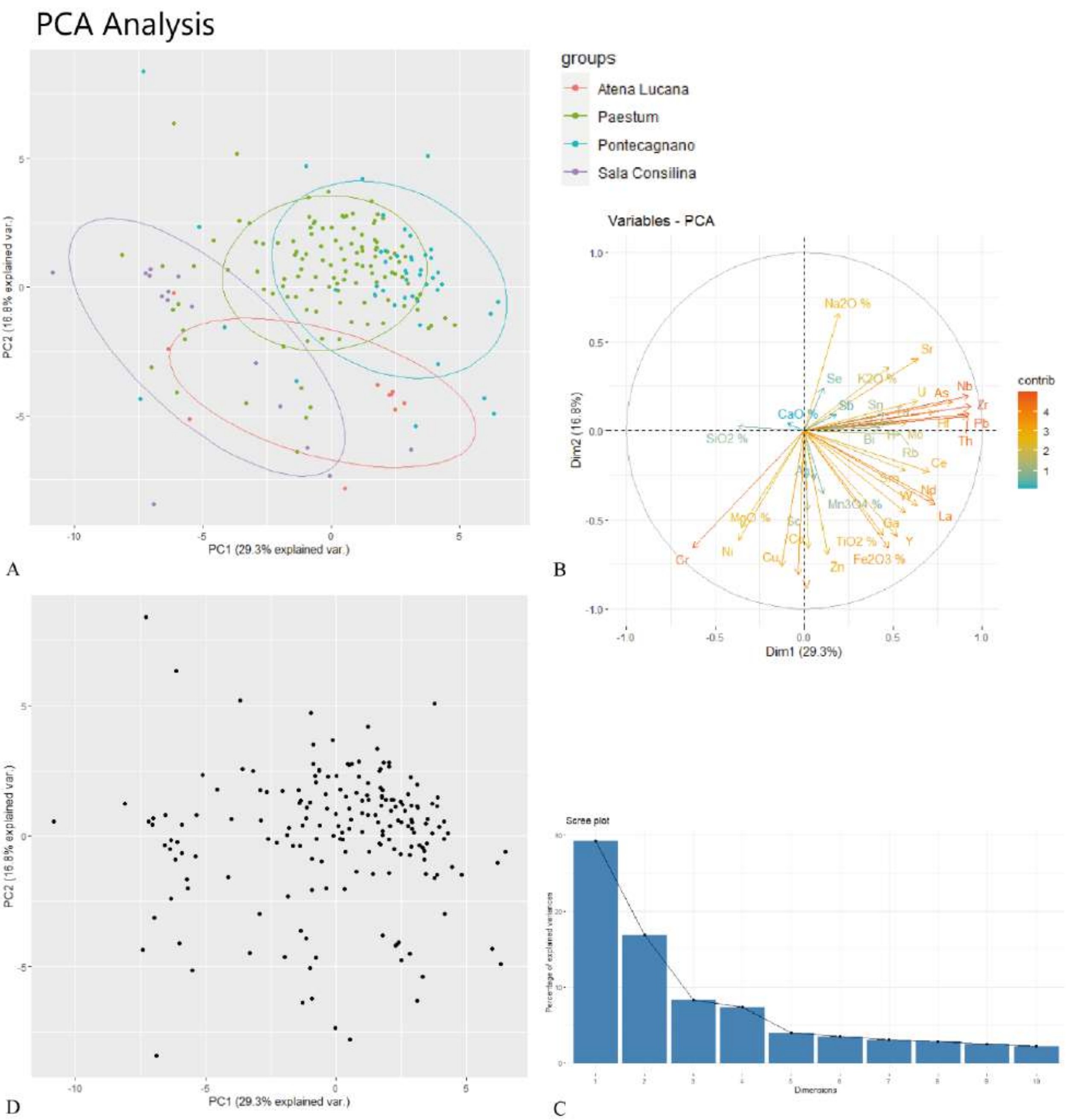


Figure 7.44. Statistical treatments by PCA of geochemical data of all samples analysed grouped according to site. A: PCA; B: loading plot with contribution; C: scree plot of the first ten components; D: unlabelled PCA.

The loading plot (Figure 7.44B) shows that differentiation between samples is driven mainly by trace elements such as Nb, Zr, Th, Pb, Cr, with a considerable contribution from Fe_2O_3. The first ten PCs together account for 79.81% of the total variance of the system, with PC1 and PC2 representing 29.2% and 16.84% respectively. The results of the PCA (Figure 7.44) show a clear association between some sites. The vast majority of Paestum and Pontecagnano samples are compositionally similar, albeit with some outliers.

The outliers from all the sites can usually be linked to clearly different fabrics, often represented by single samples, characterised by a calcareous composition (Pae7, Pnt4, Sal5, Ate3, Ate4), finer fabrics (Ate5, Sal4), sedimentary fabrics (Pnt5, Pnt6) or clay-rich fabrics with organics (Pae6). Sala Consilina shows a main cluster linked to its quartz metamorphic fabric, Sal1, that also includes one of the two samples of the same fabric from Atena Lucana, Ate6. The other sample of Ate6, characterised by far fewer quartz inclusions, groups with the main cluster for Atena Lucana, with samples from the ARF and iron-rich fabrics Ate1 and Ate2, probably due to the lower number of metamorphic inclusions detected. In addition to those samples showing a clearly different fabric and therefore composition, many, especially from Paestum and Pontecagnano, display a variance in geochemistry that is not detectable in their petrography. Chemical variations within the samples might suggest different raw material sources, especially clays, or differences in the variability of inclusions due to the silico-clastic environment. These might relate to differing geological inputs or other formation processes that impact the trace element chemical profile.

To investigate these less evident geochemical differences, the ratios of some elements, especially trace and rare earth elements (REEs; La, Ce, Nd, Sm), were investigated further. Element ratios (rather than absolute values) are useful to mitigate the impact of variation among the samples of volatile organic matter, known post-depositional impacts, and tempering with quartz, calcite/limestone, and other sedimentary rocks and minerals (see Hein and Kilikoglu 2020 for a recent treatment). The ratios of elements (La, Th, U, Cr, Co, Sc), including some REEs, are useful for identifying variations in the original clay source of the fabrics since these are less affected by differences in tempering (Degryse and Braekmans 2014; Finlay *et al*. 2012: 2389). Bivariate plots of selected element ratios were therefore produced.

The plots of La/Sc and Cr/Th (Figure 7.45) show several different concentrations, indicated in Figure 7.45A. Most of the samples from Paestum and Pontecagnano represent the main concentration, with low values for both La/Sc and Cr/Th ratios. Pontecagnano samples (light blue crosses in Figure 7.45A), show strong clustering suggesting a homogeneous composition except for a few outliers with a stronger volcanic composition.

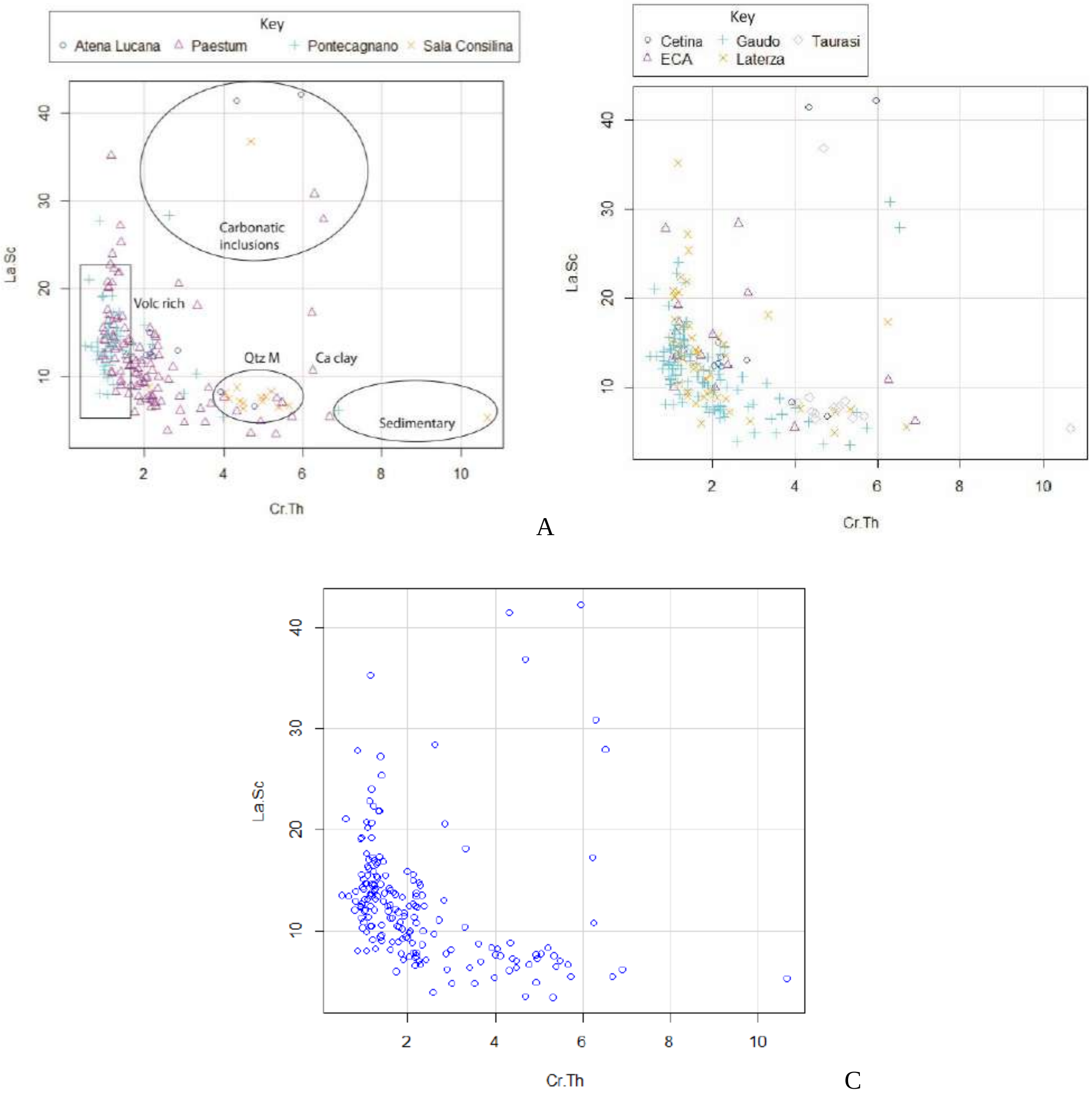


Figure 7.45. Bivariate plot of La/Sc and Cr/Th ratios. The samples are colour coded by site (A) and cultural tradition (B), and unlabelled (C), with possible compositional groups circled and explained (Qtz M = quartz metamorphic Sal1 and Ate6; Volc rich = rich in volcanics Pnt1 and Pnt2; Ca clay = calcareous clay, Pnt7; Sedimentary = Pnt5 and Sal3);.

Samples from Sala Consilina (yellow crosses in Figure 7.45A), tempered with quartz rich, metamorphic rock fragments, also show good clustering, which is quite distinct from the Paestum-Pontecagnano concentration, with a higher Cr/Th ratio. The samples from Paestum (pink triangles in Figure 7.45A) display a more scattered distribution compared to those from Pontecagnano, with a higher number of outliers and a possible cluster with higher La/Sc ratio. Samples with carbonatic inclusions (Ate3-4, Sal5, and Pae1b) are clearly compositionally different, also from the sample made of calcareous clay, fabric Pae7, probably due to the type of inclusions.

The bivariate plots in Figure 7.46 further highlight some minor compositional trends that mostly relate to the carbonatic, sedimentary or metamorphic origin of the inclusions. The variations in the Sr/Ni, Cr/Ni, Sr/Rb and Cr/Zr ratios between the four sites indicate three main compositional groupings based on the sites where they are most attested: Pontecagnano, Paestum and Sala Consilina, as detailed below.

The Pontecagnano cluster shows higher Zr and partly higher Sr content, with lower Cr and Ni. Almost all samples from Pontecagnano are gathered in this group except for a few outliers that fall in the other two clusters. The group includes only samples from Pontecagnano, and these are mostly fabric Pnt1 (rich in grog and organics) with a few samples of Pnt2 (rich in volcanics). Both fabrics are characterised by a higher presence of volcanic materials, especially larger euhedral pyroxenes, as suggested by the higher levels of Zr (Degryse and Breakmans 2014: 194).

The Sala Consilina cluster displays lower Zr and Sr values. This group also includes several samples from Paestum, Pontecagnano and Atena Lucana, specifically fabrics Pae5, Pae6, Pae7, Pnt5, Sal1, and some of Sal2, Sal4, Sal5, Ate3, Ate4, Ate5 and Ate6. These fabrics are mostly sedimentary and clay-rich, often with organics or ARF/grog. In two cases (Sal1 and Ate6) they are calcareous, and they are rich in metamorphic quartz.

The Paestum cluster shows values intermediate between the two previous groups, at times overlapping with Pontecagnano (Sr/Rb and Sr/Ni graphs in Figure 7.46). The group has a wider variability and includes most of the samples, including some from Pontecagnano and Atena Lucana. These fabrics are characterised by a variable silicoclastic composition, they are clay rich and ARF/grog are common.

In the Sr/Rb bivariate plot, the samples show quite homogeneous and scattered values. Exceptions are the samples from Sala Consilina with low Sr values as well as one sample of fabric Sal2 with very high Rb and Cr content, while the sedimentary and carbonatic fabrics from Pontecagnano and Sala Consilina (fabrics Pnt4, Pnt5, Sal3 and Sal5) have lower values for both Rb and Cr.

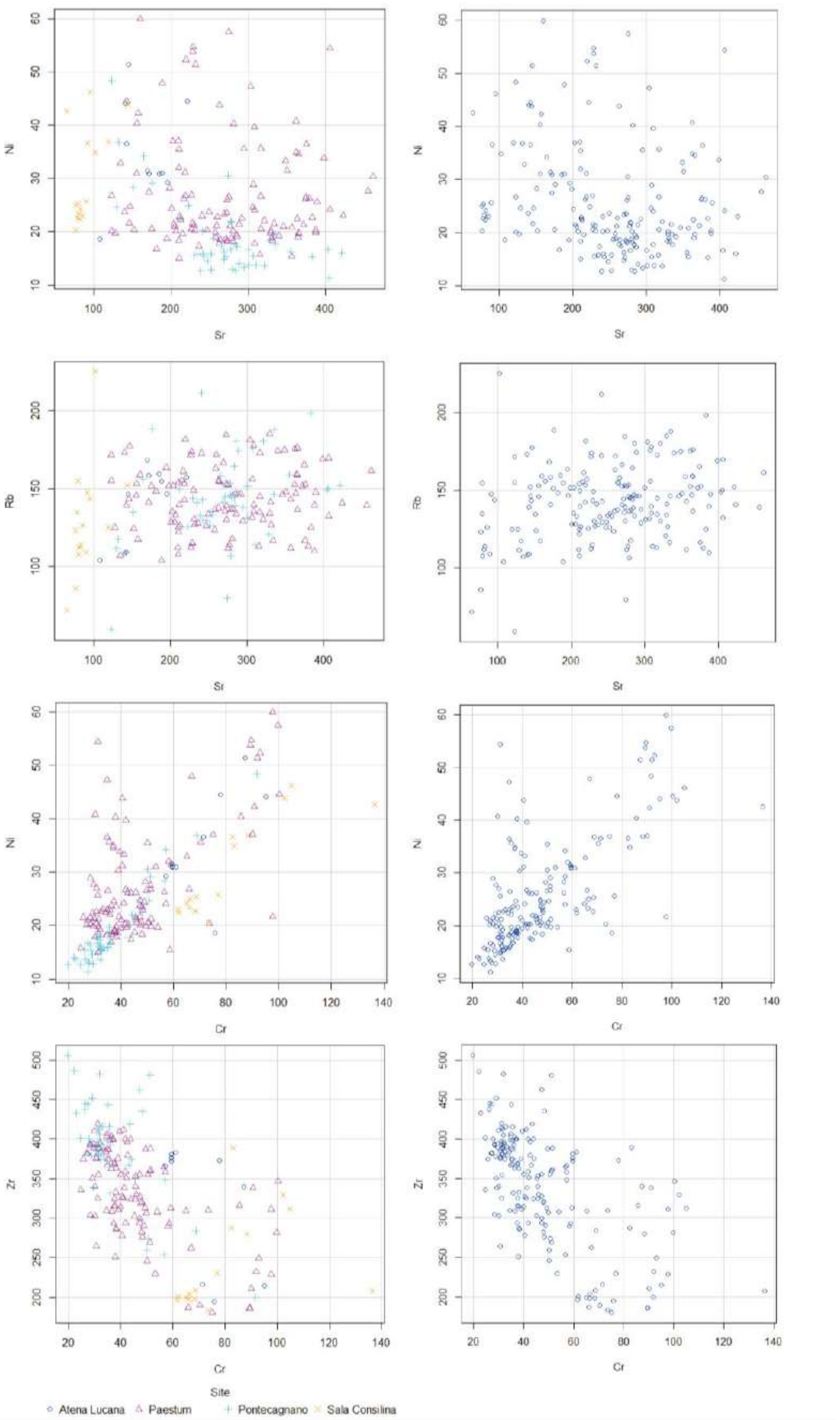


Figure 7.46. Scatter plots of diverse trace element concentrations measured in all the samples from the four sites. The sites from which the samples were taken are indicated by different symbols and colours.

This might be linked to the presence/absence of mica or micaceous clays, which are probably present at lower levels in these sedimentary and carbonatic fabrics. Furthermore, the sandy fabrics, which are rich in quartz-feldspathic inclusions, often with rock fragments, are more scattered than other fabrics, probably reflecting the variety of their inclusions, but possibly also variations in the base clay.

Based on this general overview, the chemical composition of the samples is analysed in the following sections divided by site, to detect eventual patterns at an intra-site level.

7.6.1. Paestum - XRF

Measurements of major elements (on fused beads) and minor and trace elements (on pressed pellets) were undertaken for 117 samples from Paestum (23 from the Agorà context, 25 from Cerere, and 69 from Gaudo). The raw chemical data (Appendix 13) were subjected to univariate and bivariate analysis (Papageorgiou 2020). Starting with the major elements, the CaO content ranges between 1.17 and 2.69wt% in most of the samples, exceeding this in only three. In the carbonatic fabric, Pae7 (sample PAE.A.II.01), it shows a content of 5.25wt%, which is still classifiable as a non-calcareous fabric (Maniatis and Tite 1981), but clearly lies above the average for Paestum. Two other samples of fabric Pae1b, a variant characterised by carbonatic inclusions and secondary calcite, show high CaO contents of 10.21wt% (PAE.G.III.8) and 8.26wt% (PAE.G.XI.8). In these cases, petrographic observation points to the calcareous content being derived from the inclusions rather than from the utilisation of calcareous clays. Observation by optical microscopy of these fabrics in thin section showed the presence of several calcareous inclusions and micritic calcite in the clay matrix, but these occurred only near the grains rather than throughout the sample. The samples show an Al_2O_3 content ranging between 13.35 and 22.24wt% and a SiO_2 content of between 44.57 and 66.3wt%.

Differences in silica and aluminium content are closely related to the clay richness of the fabrics (Ross and Bustin 2009). In both the univariate diagrams for Al_2O_3 and SiO_2 (Figure 7.47) and the bivariate plot combining the two oxides (Figure 7.48A), the coarser, quartz-feldspathic fabrics (Pae1, Pae3 and Pae4) clearly show higher SiO_2 values and lower Al_2O_3. In contrast, fabrics with lower SiO_2 and higher Al_2O_3 values (Pae2, the sedimentary Pae5 and especially Pae6) are characterised by a higher percentage of clay matrix. In the case of Pae7, a lower Al_2O_3 value might be explained by the higher CaO content (Figure 7.48B).

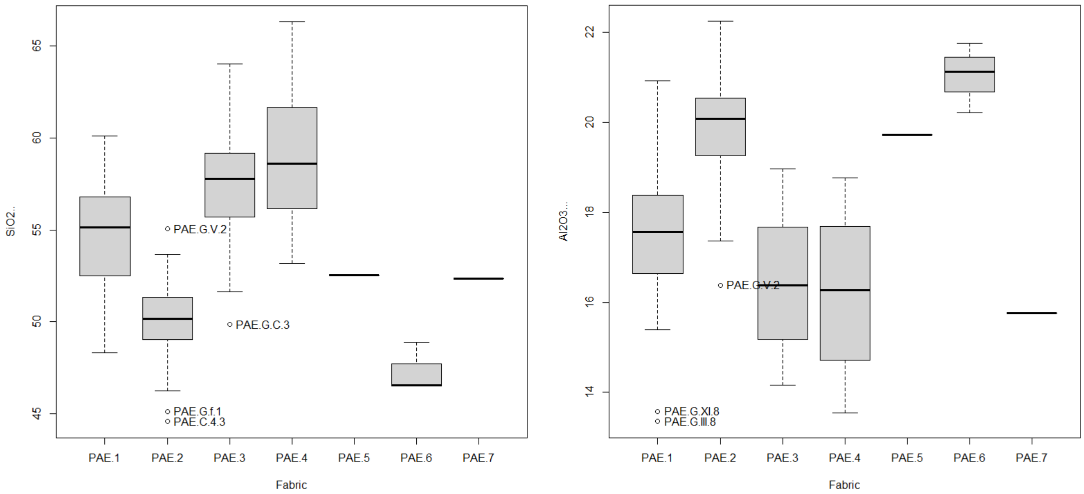


Figure 7.47. Paestum. Univariate plots showing the variations in SiO_2 and Al_2O_3 content (wt%) grouped according to petrographic fabric.

The levels of MgO, and TiO_2 do not vary greatly (0.4–1.6 and 0.5–0.9wt% respectively), and nor do those of K_2O and Na_2O (1.6–3.8 and 0.3–1.8wt% respectively). Fabrics characterised by a low feldspathic component (Pae5–7) show lower K_2O and Na_2O levels but higher MgO and TiO_2 content. The opposite pattern can be detected in quartz-feldspathic fabrics (Pae1–4). The highest MgO content registered is for the carbonatic fabric, Pae7. The concentration of iron is average (ranging between 3.8 and 7.2wt%, but mostly below 6wt%). The highest Fe_2O_3 content (7.2wt%) is attested in sample PAE.C.2.1, with sedimentary fabric, Pae5, rich in iron-bearing sedimentary rock fragments. Fabric Pae6 is also characterised by Fe_2O_3 values higher than 6wt%.

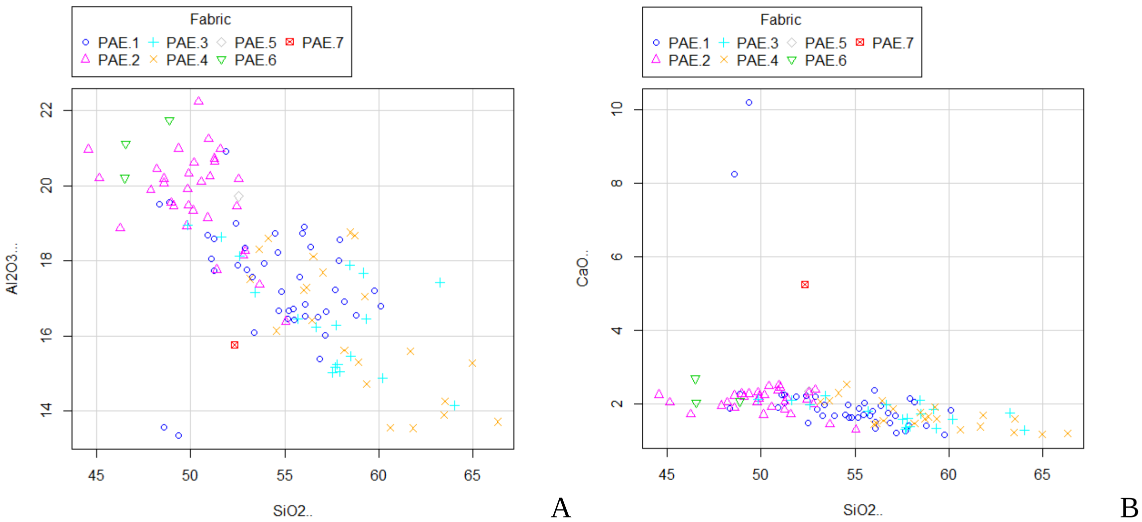
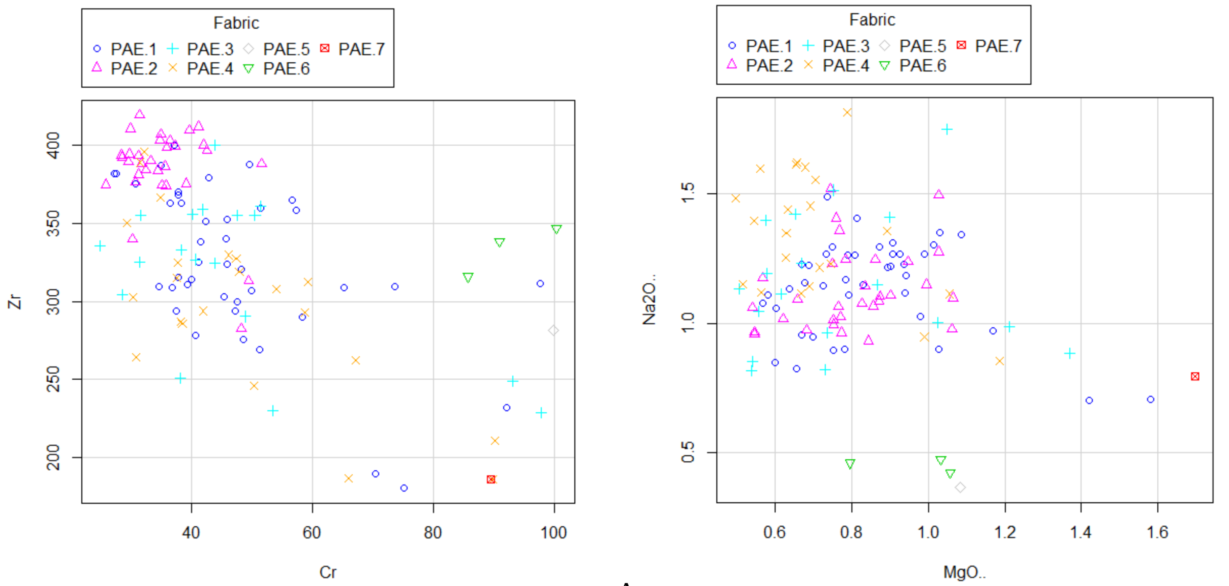


Figure 7.48. Paestum. Binary major oxides (wt%) compositional plots of samples grouped according to petrographic fabric: A. SiO_2 and Al_2O_3; B. SiO_2 and CaO.

Two main groups emerge from the univariate analysis of major, minor and trace elements. The first includes the coarser, quartz-feldspathic fabrics, with a higher volcanic component, characterised by a higher internal variability but also a consistent composition with only a few outliers. The second group is represented by fabrics with a stronger sedimentary composition (Pae5, the organic-rich Pae6, and the carbonatic Pae7), which show different values from the other samples, both for oxides and minor elements. This is exemplified by the Zr-Cr and MgO-Na_2O bivariate plots (Figure 7.49). In both cases most of the samples cluster together at high Zr/low Cr values, and high Na_2O/MgO values. In contrast, fabrics Pae5 and Pae6 show a relatively high concentration of Zr and Cr and a low concentration of Na_2O and MgO, while Pae7 shows high Cr and MgO with low Zr and Na_2O. Some outliers, especially from fabric Pae1, and in minor amounts from Pae3 and Pae4, show a similar pattern.



A B

Figure 7.49. Paestum. Binary major oxides (wt%) and trace elements (ppm) compositional plots of samples grouped according to petrographic fabric: A. Zr-Cr (ppm); B. Na_2O and MgO (wt%).

Log10 normalised data were statistically analysed by PCA as described in Chapter 5 (Section 5.4.3) to reduce the complexity of the dataset and identify possible groups in relation to the different fabrics (Figure 7.50). The loading plot (Figure 7.50B) provides information about the chemical elements that contribute most to the differentiation of samples. These are largely trace elements with Nb, Pb, Cr, Zr, Nd and La showing the highest contribution.

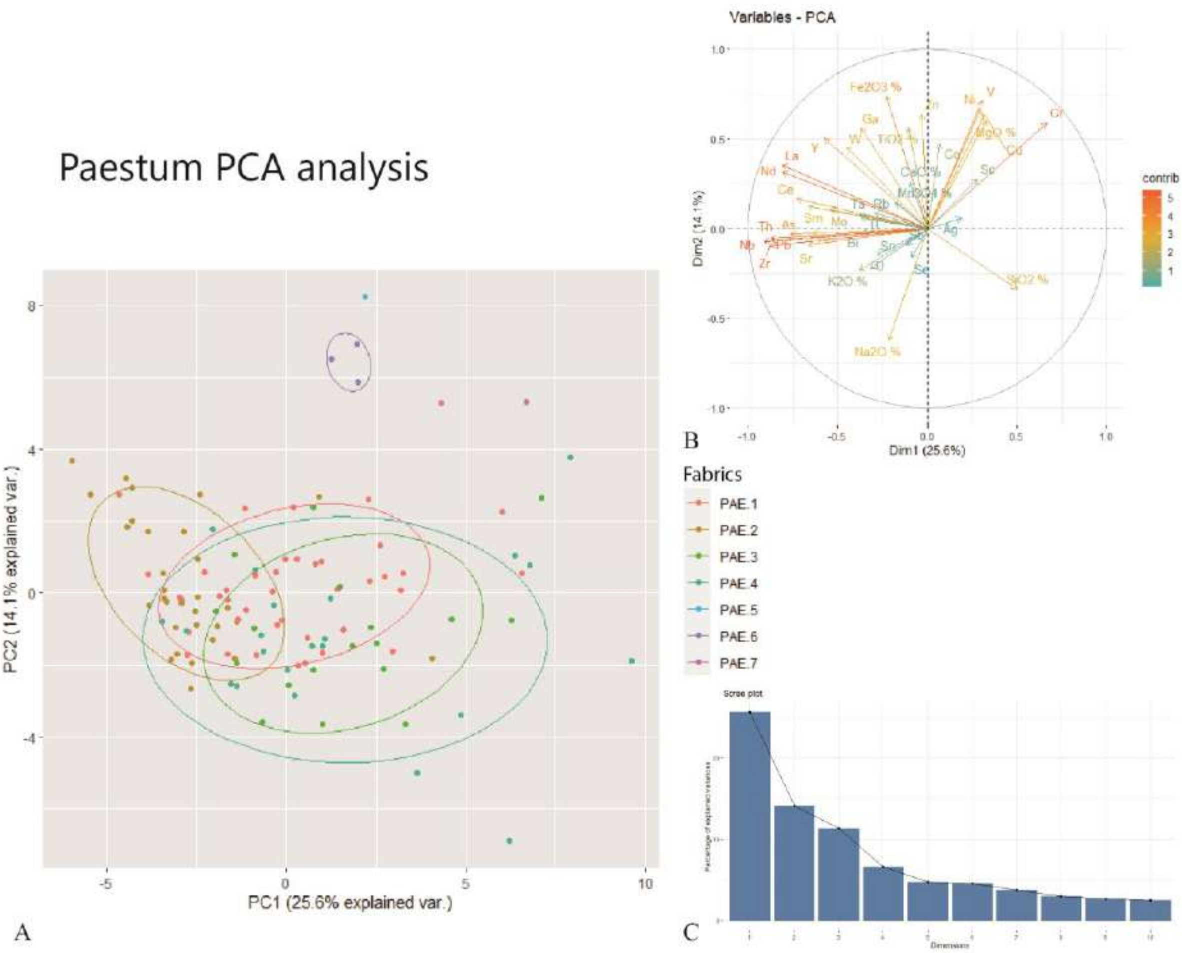


Figure 7.50. Paestum. Statistical treatments by PCA of geochemical data of the 117 samples analysed for the site grouped according to petrographic fabric. A: PCA with confidence ellipses; B: loading plot with contribution; C: scree plot of the first ten components.

The first ten PCs together account for 78.8% of the total variance of the system, with PC1 and PC2 representing 25.6% and 14.1% respectively. As already noted in the univariate and bivariate analyses, the samples from the quartz feldspathic fabrics (with and without grog), Pae1, Pae3, and Pae4, cluster quite well, sharing the same composition except for a few outliers. For Pae2, the samples appear more concentrated with fewer outliers. Fabrics Pae5, Pae6 and Pae7 clearly differ from the main projection field, with Pae5 and Pae6 clustering together. Outliers from fabrics Pae1, Pae3 and Pae4 are mostly due to the Cr, Zr and MgO content.

In these cases, the variability might be due to the heterogeneities of the type and number of inclusions in these sandy fabrics or might indicate the use of a different clay.

To summarise, the detrital and sandy fabrics (with or without grog, Pae1–4) display a similar composition, with a slightly different clustering for the bimodal fabric, Pae2, possibly due to the different refinement/tempering of the ceramic paste. It must be noted that Pae2 has a smaller coarse fraction than fabrics Pae1, Pae3 and Pae4, mostly represented by well-sorted angular quartz and feldspars, suggesting the crushing of a parent rock and its addition as temper but also a lower dilution effect of the temper. In contrast, fabrics Pae5–7 clearly show a different composition, mostly due to their inclusions except for Pae6 which is poor in mineral grains, and a different clay material can be inferred, as appears clear in the case of the calcareous Pae7.

7.6.2. Pontecagnano - XRF

Measurements of major elements (on fused beads) and minor and trace elements (on pressed pellets) were made for 46 samples from Pontecagnano: 13 from the ANAS context and 33 from the Gaudo culture cemetery. The raw chemical data (Appendix 13) were subjected to preliminary univariate and bivariate analysis of major and trace elements (Papageorgiou 2020). The CaO content ranges between 1.04 and 2.76wt% in most samples. Only in the carbonatic fabric, Pnt4 (sample PNT.A.20.15), does it exceed this with a content of 14.93wt%, confirming the use of a calcareous clay (over 6wt%, Maniatis and Tite 1981). This value is consistent with the petrographic observation of large carbonatic fragments and also of shells in the fabric. The samples show an Al_2O_3 content of 13.95–23.50wt% and a SiO_2 content of 37.57–61.34wt%. As with Paestum, the differences in silica and aluminium content appear to be related to the coarseness and quartz content of the fabrics. In both the univariate diagrams for Al_2O_3 and SiO_3, and in the bivariate plot combining the two oxides (Figure 7.51A), the coarser quartz-feldspathic fabric, Pnt3, clearly shows higher SiO_2 and lower Al_2O_3 values, with a similar pattern to the sedimentary fabric, Pnt5. Fabrics Pnt1 and Pnt2 distribute in a gradient that reflects the inner variability of the vessel types and the coarseness of the inclusions. The carbonatic fabric, Pnt4, shows lower Al_2O_3 and SiO_2 content due to the substantial calcareous presence in both the clay and the inclusions.

MgO and TiO_2 levels do not vary significantly (0.4–1.0 and 0.5–0.9wt% respectively); K_2O and Na_2O levels are also relatively consistent (1.3–4.1 and 0.4–1.7wt%, respectively). The highest K_2O and Na_2O values are registered for the volcanic fabric, Pnt2 (Figure 7.51B–C), which is rich in feldspars and pyroxenes. The fabrics characterised by a lower feldspathic component (Pnt1, Pnt4, and Pnt5) show lower levels of K_2O and Na_2O. The average concentration of iron is relatively low (3.8–7.2wt%, but mostly below 6wt%); a lower Fe_2O_3 content (1.5wt%) is attested in sample PNT.A.20.15 of the carbonatic fabric Pnt4 (Figure 7.51B, D). Fe_2O_3 and TiO_2 have a significant presence in all the fabrics except for the sandy Pnt3 and the carbonatic Pnt4, being at very low levels in the latter (Figure 7.51D). This trend is consistent with the high content of ferrous bodies, especially in Pnt1.

The distribution of minor and trace elements also broadly reflects the petrographic fabrics detected. The Cr-Zr plot (Figure 7.51F) confirms the difference between Pnt1 and Pnt2, characterised by higher Cr and lower Zr content with respect to the other fabrics, which might be linked to their more volcanic composition. A further distinction for Pnt1 and Pnt2 is evident in the Sr-Rb plot (Figure 7.51E) which shows different Sr concentrations for the fabrics with only a few outliers: higher in Pnt2, moderate in Pnt1 and Pnt4, and lower in Pnt3 and Pnt5. The Rb content is, in contrast, quite stable, ranging between 100 and 200ppm, with only Pnt4 and Pnt5 lower than 100ppm.

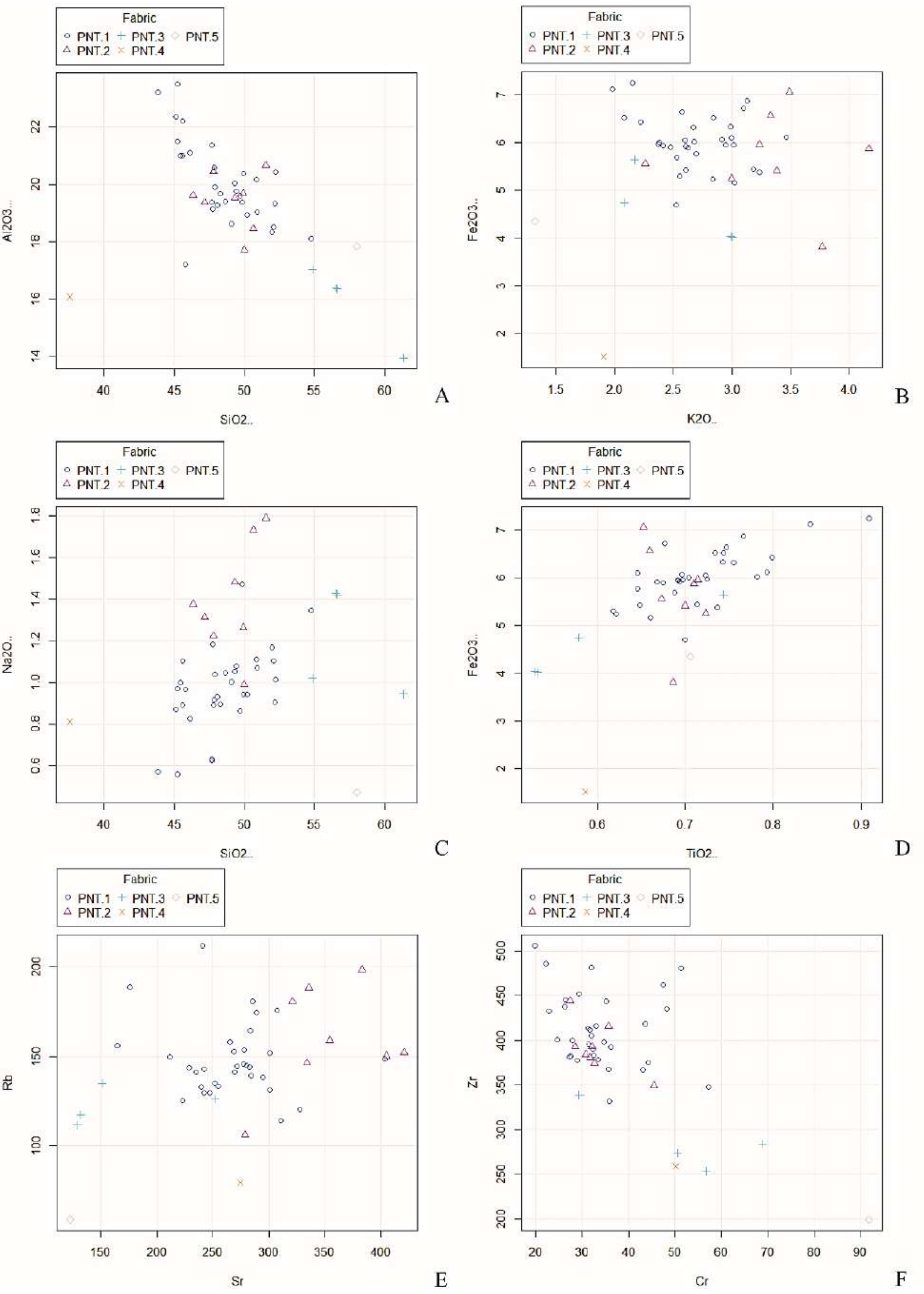


Figure 7.51. Pontecagnano. Binary compositional plots for major oxides (wt%) and trace elements (ppm) of samples grouped according to petrographic fabric.

Log10 normalised data were statistically analysed by PCA as described in Chapter 5 (Section 5.4.3) to reduce the complexity of the dataset and identify possible groups in relation to the different fabrics (Figure 7.52). The loading plot (Figure 7.52B) shows that differentiation between samples is driven mostly by trace elements, with Nb, Pb, Zr, Ni, Th and As showing the highest contribution. The first ten PCs together explain 88.0% of the total variance of the system, with PC1 and PC2 representing 31.0% and 22.0% respectively.

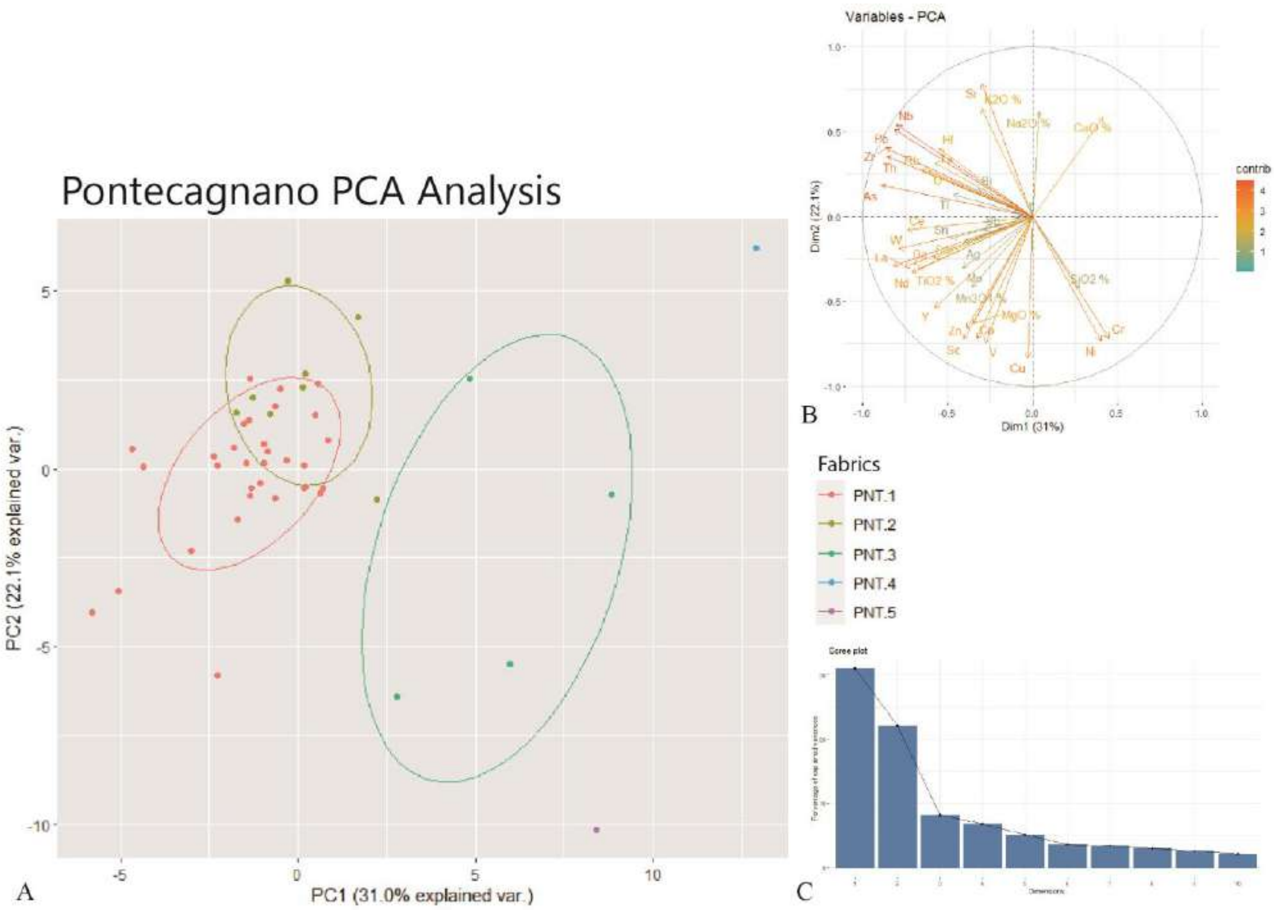


Figure 7.52. Pontecagnano. Statistical treatments by PCA of geochemical data for the 46 samples analysed for the site grouped according to petrographic fabric. A: PCA with confidence ellipses; B: loading plot with contribution; C: scree plot of the first ten components.

As already noted for the univariate and bivariate analyses, the petrographic fabrics cluster quite well with some overlapping between Pnt1 and Pnt2, a scattered distribution for Pnt3, and clearly different compositions for Pnt4 and Pnt5. The higher compositional variability of Pnt3 might be explained by its sandy composition and the greater internal variability in type and size of inclusions. Several compositional outliers are evident in Pnt1. These samples do not show major petrographic differences. The different composition may relate either to the variability of the detrital inclusions or to the use of different clays with the same tempering. The site of Pontecagnano lies in an alluvial plain where weathered products from the mountain chains are transported by the rivers, causing a degree of variability in both clay and temper sources. The alluvial plain is rich in clay resources, so the potters of Pontecagnano might have adopted similar technological traditions, using similar types of non-calcareous clay and quartz-felspathic or volcanic temper, but from slightly different sources, although possible compositional variability in the same clay bed must also be considered (Hein *et al*. 2004).

Clearly different compositions can be inferred between (on the one hand) the two fabrics Pnt1 and Pnt2, and (on the other hand) the rest of the fabrics, Pnt3–5, resulting from the use of different raw materials: sedimentary for Pnt4, carbonatic for Pnt5, and sandy for Pnt3.

7.6.3. Sala Consilina - XRF

Measurements of major elements and minor and trace elements were made for 15 samples from Sala Consilina (14 from the cremation burials, and three from the trench graves). The raw chemical data (Appendix 13) were subjected to preliminarily univariate and bivariate analysis of major and trace elements (Papageorgiou 2020). The CaO content ranges between 1.11 and 1.95wt% in most of the samples. Only in the carbonatic fabric, Sal5 (sample SAL.C.I.14), does it exceed this range at 13.43wt%, suggesting a calcareous fabric (over 6wt%, Maniatis and Tite 1981). This value is consistent with the petrographic observation which highlighted a very highly carbonatic fabric where the clay matrix is hardly visible. These data are also confirmed by the low Al_2O_3 content of the fabric (10.47wt%) compared to that in the other samples (14.48–22.37wt%). The SiO_2 content ranges between 29.00 and 63.59wt%.

The differences in silica and aluminium also appear to be related to the type and abundance of the inclusions. Both in the univariate diagrams for Al_2O_3 and SiO_3 and in the bivariate plot combining the two oxides (Figure 7.53), the quartz-rich fabric, Sal1, clearly shows higher SiO_2 values and slightly lower Al_2O_3, with a similar pattern for the fine, quartz-rich fabric, Sal4. The ARF/grog and sedimentary fabrics show high silica values but also higher levels of Al_2O_3. A major difference is evident only in the carbonatic fabric, Sal5, characterised by low values for both oxides.

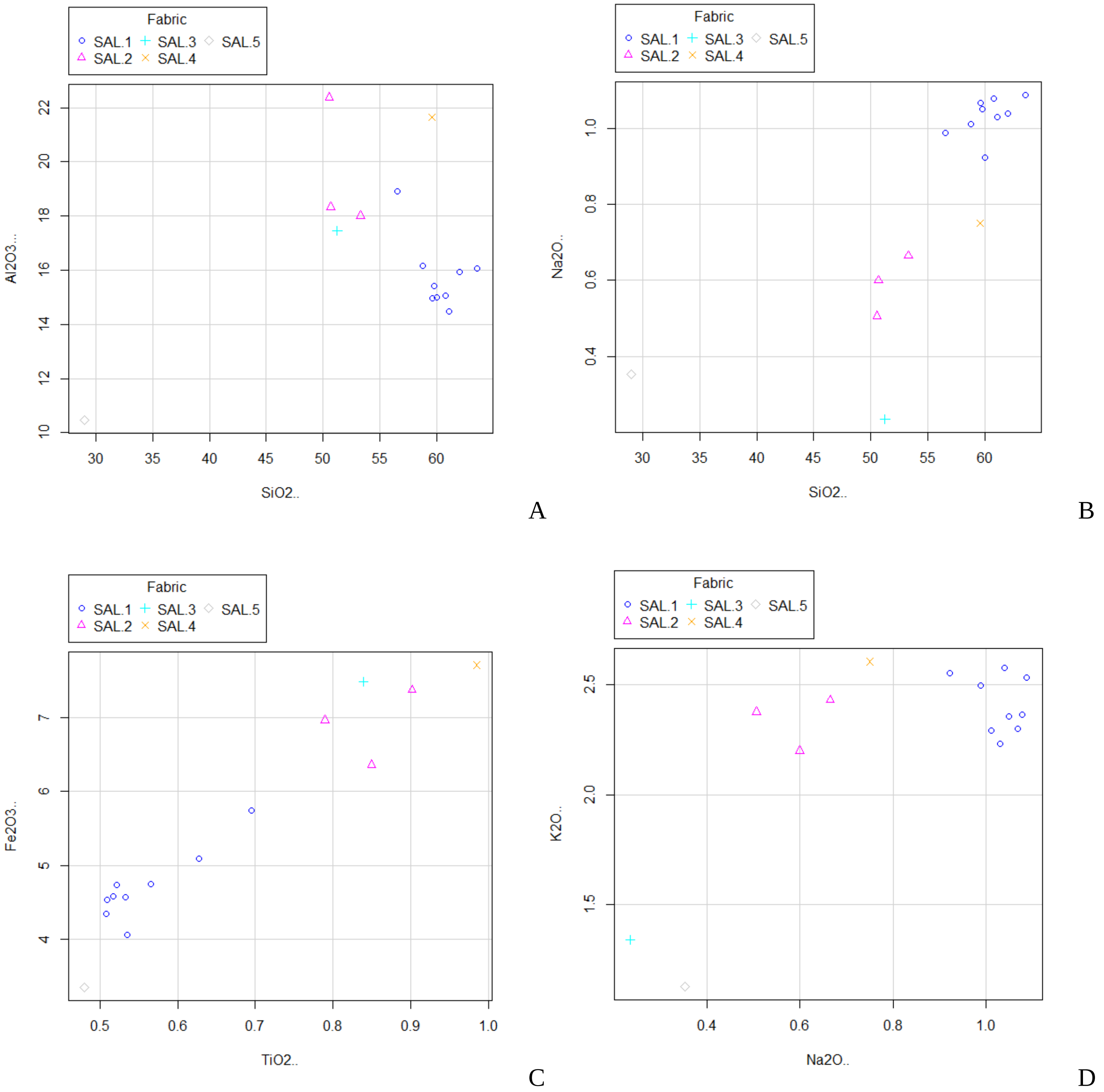


Figure 7.53. Sala Consilina. Selected binary major oxides (wt%) and trace elements (ppm) compositional plots of samples grouped according to their petrographic fabric. A: SiO_2 and Al_2O_3; B: SiO_2 and Na_2O; C: TiO_2 and Fe_2O_3; D: Na_2O and K_2O.

Levels of MgO are low, mostly below 2wt%, except in the case of the carbonatic fabric, Sal5 (10.16wt%). TiO_2 shows minor variation, but this is clearly linked to the different fabrics, with higher values in the ARF/grog fabric, Sal2, the fine Sal4, and in the sedimentary Sal3, and lower values in the quartz-rich Sal1 and the carbonatic Sal5 (0.4–0.9wt%). K_2O and Na_2O also show minor variations (1.1–2.6 and 0.2–1.0wt%, respectively). The highest K_2O and Na_2O values are registered in the quartz feldspathic fabric, Sal1, with relatively high values also for fabrics Sal2 and Sal4 (sedimentary). The average concentration of iron is relatively low (3.3–7.7wt%) with the highest values recorded for the ARF/grog, fine and sedimentary fabrics (Sal2–4), as also detected in thin section. Sal1 shows a higher variability with some positive and negative outliers, while Sal5 has the lowest level of iron oxide.

The univariate analysis of major, minor and trace elements suggests some compositional trends. The chemical composition regarding the major elements appears consistent with the fabric determination, with clear differences between all five fabrics, suggesting a strong correspondence with the type of inclusions. The Na_2O and K_2O clustering corresponds well to the varying presence of feldspars (Figure 7.53B), whilst the Fe_2O_3 content is higher in the sedimentary and ARF/grog fabrics, as expected due to the abundance of opaques and iron-rich particles.

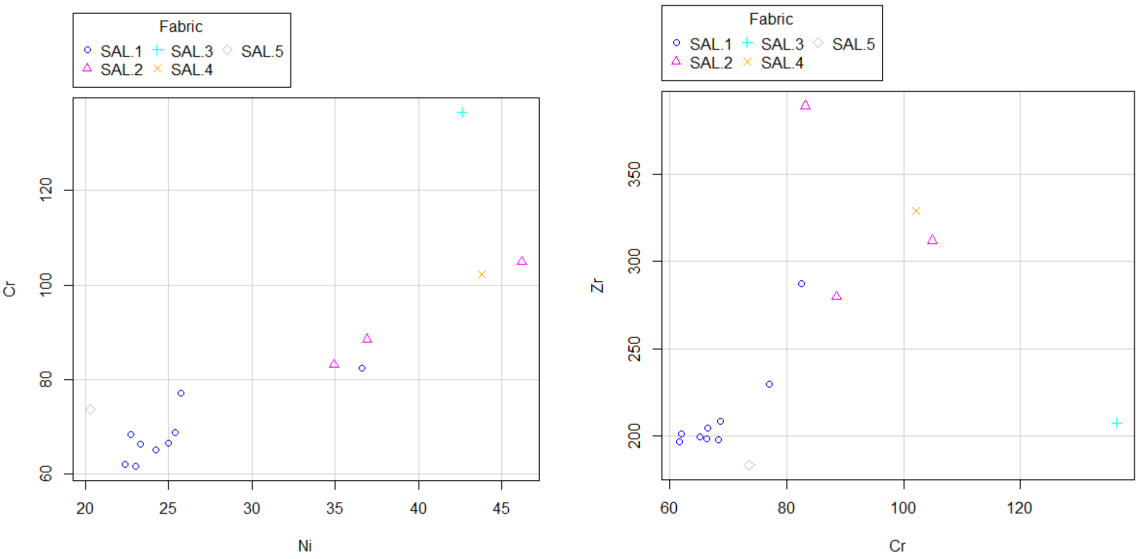


Figure 7.54. Sala Consilina. Selected binary trace elements (ppm) compositional plots of samples grouped according to petrographic fabric.

When minor and trace elements are also considered (Figure 7.54), the fabric groups can be still detected but show a higher variability depending on the elements considered. Sal1 still shows good clustering except when Ni and Zr are considered, when an outlier clearly clusters with Sal2. The latter shows a more variable composition, as do the other three fabrics, each represented by only one sample.

Log10 normalised data were statistically analysed by PCA as described in Chapter 5 (Section 5.4.3) to reduce the complexity of the dataset and identify possible groups in relation to the different fabrics (Figure

7.55). The loading plot shows that differentiation between samples is driven by major elements such as Na_2O, Fe_2O_3, TiO_2, K_2O and Ni, with Nb and Cr among the minor elements. The first ten PCs together explain 98.0% of the total variance of the system, with PC1 and PC2 representing 48.9 and 17.4% respectively. As already noted in the univariate and bivariate analyses, the petrographic fabrics cluster quite well with Sal1 samples clearly grouping together except for one outlier (SAL.C.I.05). For Sal2, the distribution is quite scattered, perhaps due to the lack of distinctive mineral inclusions. This fabric is, in any case, clearly compositionally different from Sal1. Fabrics Sal3, Sal4 and Sal5 show a distinctly different composition to the other fabrics, consistent with their different inclusions: sedimentary in Sal3, almost absent in Sal4 and carbonatic in Sal5. The fine Sal4 fabric groups near to Sal2, which is also poor in mineral inclusions, suggest a possible similarity in the base clay. Their slightly scattered distribution can be explained by the restricted number of samples, which prevents a full investigation of the possible internal variability of the same clay source (Hein *et al*. 2004).

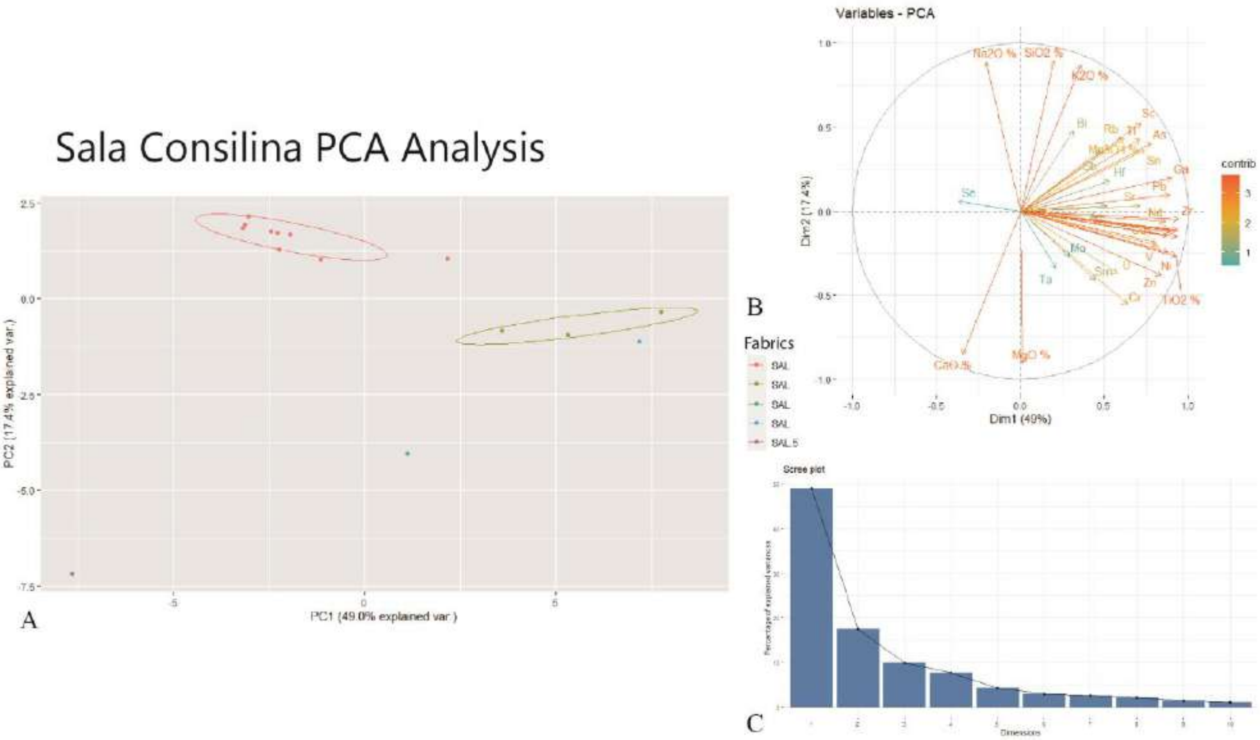


Figure 7.55. Sala Consilina. Statistical treatments by PCA of geochemical data of the 15 samples analysed grouped according to petrographic fabric. A: PCA; B: loading plot with contribution; C: scree plot of the first ten components.

The chemical analysis clearly highlights the varying components of the fabrics from Sala Consilina; different tempering practices strongly influence their geochemical composition. The similarity in trace elements between different fabrics might be due to the use of the same base clay, while other differences, not explained by variations in tempering, might reflect the use of different clay sources. This point is discussed further in Section 7.6 below, with the evidence from the four sites compared.

7.6.4. Atena Lucana - XRF

Measurements of major elements (on fused beads) and minor and trace elements (on pressed pellets) were made for ten samples from Atena Lucana. The raw chemical data (Appendix 13) were subjected to preliminarily univariate and bivariate analysis (Papageorgiou 2020). The CaO content ranges between 1.76 and 2.70wt% in most of the samples. Only in the two carbonatic fabrics, Ate3 and Ate4, does it exceed this range with a content of 8.37 and 9.27wt% respectively. These values are consistent with the petrographic observation which highlighted the dominance of carbonatic inclusions. The Al_2O_3 content ranges between 14.9 and 20.1wt%, while SiO_2 values lie between 42.22 and 63.74wt%. The highest Al_2O_3 contents are registered for fabrics Ate1–3 and Ate5, characterised by a few mineral inclusions and common presence of ARF. The differences in silica and aluminium content appear to be related to the type and abundance of the inclusions. Both in the univariate diagrams for Al_2O_3 and SiO_3 and in the bivariate plot combining the two oxides, the quartz-rich fabrics Ate6 and Ate5 clearly show lower Al_2O_3 values and higher SiO_3 values compared to the other samples. The lowest silica value is attested in the sedimentary, quartz-poor fabric, Ate3. The ARF-rich fabrics (Ate1 and Ate2) show the highest Al_2O_3 values. A major difference is evident only in fabric Ate4, characterised by low values in both oxides, probably due to its high calcareous content.

The amount of MgO is mostly below 2wt%, ranging between 0.63 and 1.83wt%. TiO_2 also shows low values (0.61–0.88wt%) with higher values in the ARF-rich fabrics (Ate1 and Ate2) and in the carbonatic fabric, Ate5. Levels of K_2O and Na_2O also show minor variations, mostly clustering between 1.92–2.43 and 0.53–0.75wt%, respectively. The highest K_2O and Na_2O value above the range is registered in one sample of the quartz feldspathic fabric, Ate6, which is clearly rich in feldspars, while the lowest value is for the sedimentary fabric Ate3, which lacked any feldspar peaks in the XRD analysis. The concentration of iron is generally between about 6.5 and 7wt%, with lower amounts in the silica-rich fabric, Ate6, and in the carbonatic fabric, Ate4. Only the fine fabric, Ate5, registered a higher iron oxide content of around 8wt%.

The univariate analysis of major, minor and trace elements suggests several compositional trends (Figure 7.56).

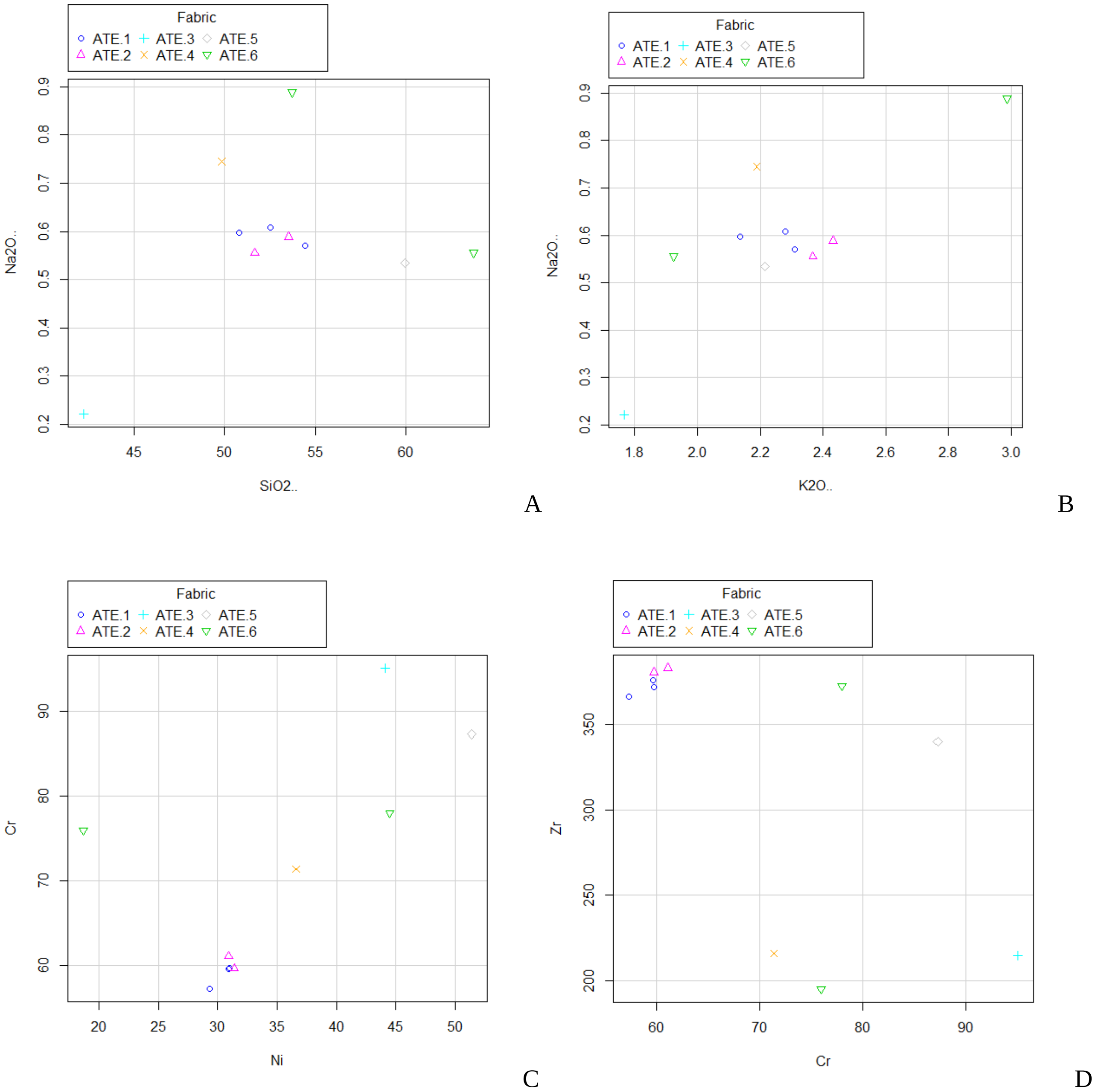


Figure 7.56. Atena Lucana. Selected binary major elements (wt%, A-B) and trace elements (ppm, C-D) compositional plots of samples grouped according to petrographic fabric.

For major elements, the chemical composition appears consistent with the fabric determination, with differences corresponding well to differences in the inclusions observed by optical microscopy in thin section. Fabrics Ate1 and Ate2 cluster well together, suggesting a degree of compositional homogeneity. One finer sample attributed to Ate6 shows quite a strong correspondence with Ate1 and Ate2, possibly due to the minor amount of quartz, but feldspars remain common as testified also by the higher values of NaO_2, probably due to plagioclase inclusions (Figure 7.56A). The other fabrics, Ate3–6, are by contrast quite variable in their composition. This is not surprising since these fabrics are mostly represented by single samples and show a degree of variability in mineral inclusions and possibly also clay sources.

When minor and trace elements are also considered, the fabric groups can still be detected but show higher variability depending on the elements. Fabrics Ate1 and Ate2 still show good clustering while the other fabrics appear quite scattered.

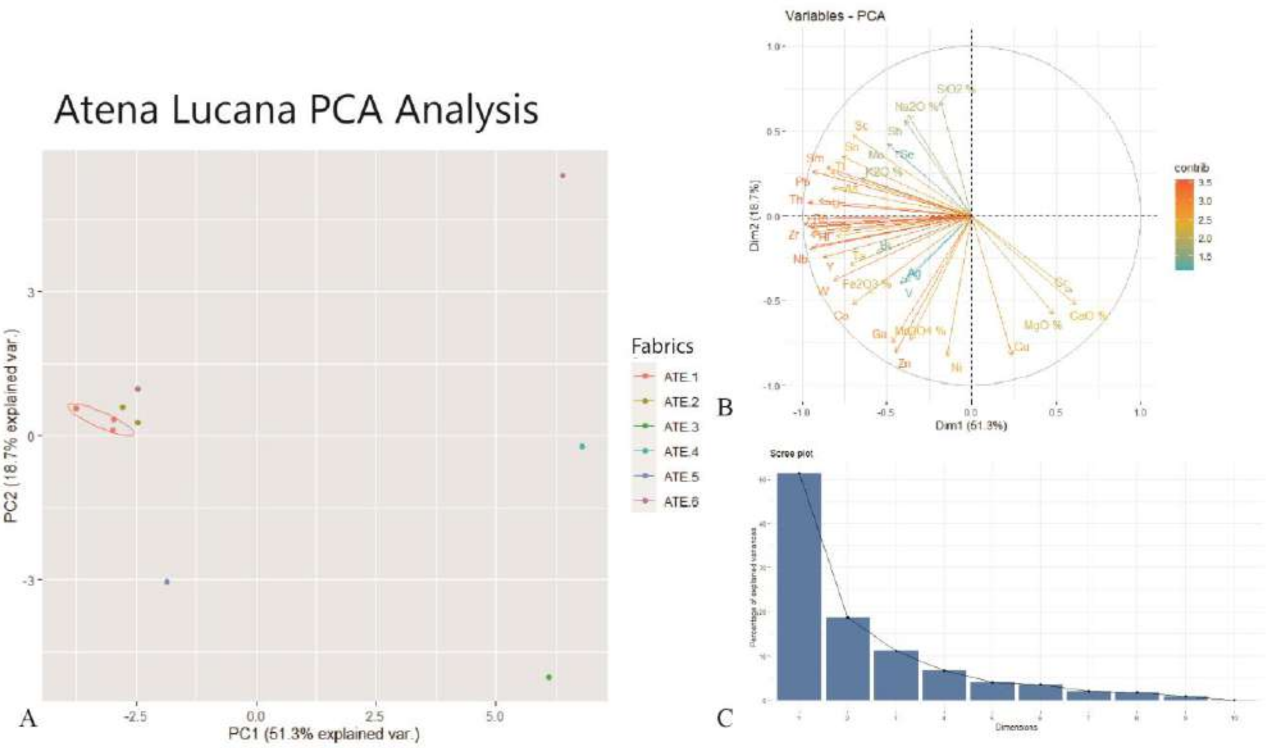


Figure 7.57. Atena Lucana. Statistical treatments by PCA of geochemical data of the 15 samples analysed, grouped according to petrographic fabric. A: PCA; B: loading plot with contribution; C: scree plot of the first ten components.

Log10 normalised data were statistically analysed by PCA as described in Chapter 5 (5.4.3) to reduce the complexity of the dataset and identify possible groups in relation to the different fabrics (Figure 7.57). The loading plot (Figure 7.57B) shows that differentiation between samples is driven by major elements such as Na_2O, Fe_2O_3, TiO_2, K_2O with Ni, Nb and Cr among the minor drivers. The first nine PCs together explain 100.0% of the total variance of the system, with PC1 and PC2 representing 51.2 and 18.7% respectively. As already noted for the univariate and bivariate analyses, fabrics Ate1 and Ate2 cluster quite well while the other samples show clearly different compositions. Sample ATE.FA.08 (fabric Ate6) shows good chemical correspondence with fabrics Ate1 and Ate2 despite its slightly higher quartz-feldspathic content. This might suggest the use of the same base clay for fabrics Ate1 and Ate2 with the addition of crushed quartz felspathic rocks in the case of ATE.FA.07 (the other sample from Ate6) but in lower amounts. It must be noted, however, that the restricted number of samples from this site diminishes the reliability of the statistical analysis. Based on these evaluations, several inferences regarding raw material provenance and processing at the four sites are discussed in the following section.

7.7. Preliminary discussion of archaeometric results

The combination of several archaeometric approaches (thin section petrography, XRD, XRF and SEM-EDS) allowed an extensive characterisation of the mineralogical and chemical composition of the samples and of the technological choices made by potters in the preparation of ceramic paste.

The overall composition of the fabrics points to a local provenance for the raw materials used for pottery making at the four sites. The petrographic composition of the inclusions is fully compatible with the geological features of the area, where predominantly siliciclastic-arenaceous and carbonate formations outcrop along with less extensive pyroclastic fall deposits related to the activity of Somma-Vesuvius, and especially of the Phlegraean Fields (Chapter 4.2, Figure 4.1). For the sites of Paestum and Pontecagnano, it must be noted that the area of the Sele River Plain is characterised by geological complexity as highlighted in Chapter 4.2 (Figure 4.2). In this context, the range of possible raw materials used for pottery making is wide: clays can be detected in geological formations of alluvial and marine origin: alluvial sediments (gravel and sands), and lagoon and lacustrine/marsh (silt and clays) deposits fill the plain; while Aeolian and coastal sands characterise the plain’s seaward portion. Travertine deposits have also formed in the area of Paestum and Pontecagnano since the upper Pleistocene.

A study of the possible clay sources of the area has been recently undertaken but is not yet fully published. This related mostly to later ceramic productions (affected by subsequent volcanic eruptions, especially from the Somma-Vesuvio complex, e.g., Avellino Pumices and later eruptions; De Bonis 2018; De Bonis and Gassner 2018). These clay sources show a rather heterogeneous chemical composition due to the different sedimentary formations of the area (De Bonis 2018: 6). In Figure 7.58, the composition of the sites analysed in the present study is compared to the composition of coarse Greek and Roman pottery and to clay sources from the area of Paestum and Pontecagnano (after De Bonis 2018).

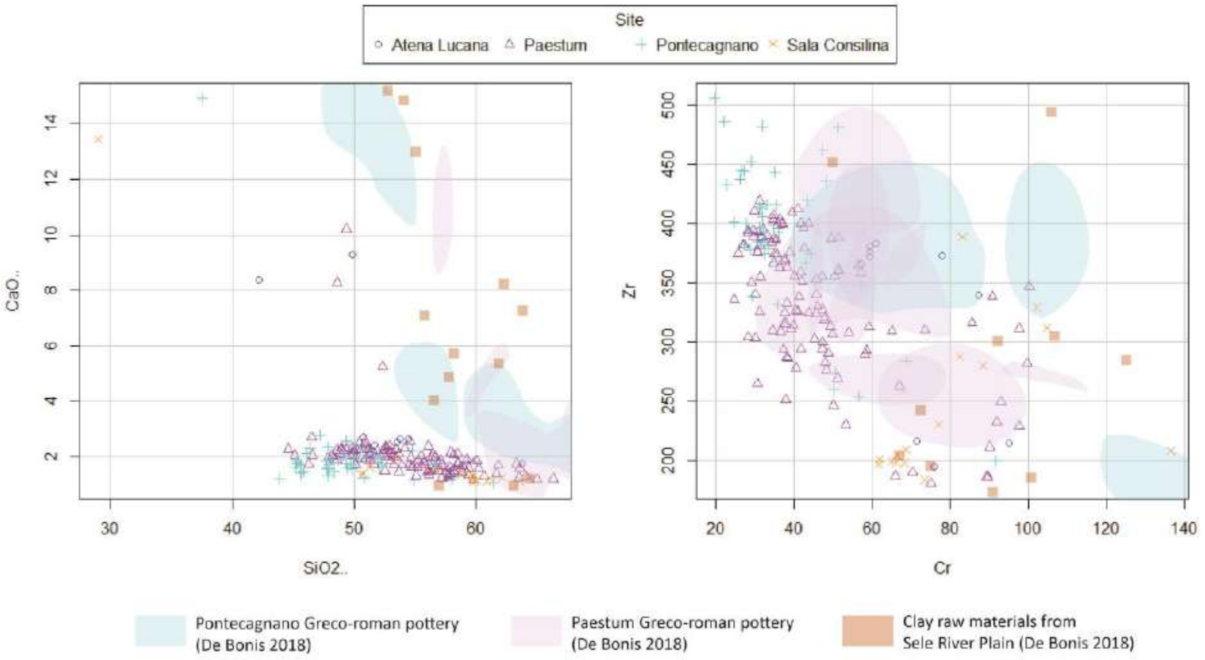


Figure 7.58. Compositional groups of all samples analysed from the present study compared with later coarse Greco-Roman pottery from Paestum and Pontecagnano and clay raw materials from the Sele River Plain (after De Bonis 2018).

The clay raw materials analysed by De Bonis are both alluvial and basinal, from the plain and nearby hills. As highlighted by the graphs, only a few clay raw materials correspond to the low CaO values of the samples analysed. These are mostly from the area of Paestum, specifically a marine clay from Capaccio (CAP2, De Bonis 2018) and an alluvial clay from Fonte, about 5 kilometres far from Paestum (FONTE2, De Bonis 2018). All other clay samples display higher CaO values and can therefore be excluded with regard to Copper Age products.

The attribution of samples with higher CaO to calcareous clays is uncertain due to the presence in these fabrics of carbonatic inclusions, which could also cause the higher CaO content. Only in the case of fabric Pae7, with a CaO content of about 5%, does the yellowish colour of the clay and the presence of micritic calcite in the matrix suggest the use of a different clay, slightly higher in CaO and lower in Fe_2O_3.

Clay samples with similar values come from Capaccio (CAP3, marine clay; De Bonis 2018) and the Heraion area near the site of Paestum on the estuary of the River Sele (HER1, alluvial clay).

It must be noted that non-calcareous clays, which were the most commonly used clays at the Copper Age sites analysed in the present research, are found either in older basinal formations (Upper Jurassic-Lower Miocene) or as alluvial clays, depending on the stratigraphy. Basinal clays formed during Miocene-Pleistocene are mostly calcareous. Furthermore, alluvial clays are often rich in a quartz-feldspathic component, closely corresponding to most of the Copper Age fabrics analysed in Paestum and Pontecagnano.

Regarding trace elements, several outliers to the Paestum and Pontecagnano cluster, and to the main cluster from Sala Consilina, are particularly rich in Cr. The larger cluster from Paestum does not clearly correspond to particular clay raw materials, although it must be taken into consideration that the artificial addition of temper (sand and quartz-feldspathic inclusions) can strongly affect the chemical composition (Hein and Kilikoglou 2020). The high Zr-low Cr value of one clay sample from the area of Pontecagnano is of interest as this roughly corresponds to the main cluster for Pontecagnano Copper Age samples. This clay source (PCGA1, De Bonis 2018) is derived from the weathering of a pyroclastic deposit in the area of Pontecagnano, supporting the hypothesis based on the petrographic analysis of the use of such a raw material source. The coarse Greco-Roman samples analysed by De Bonis (2018), displayed in Figure 7.58, also show a similar scattered composition for trace elements. A different origin might be inferred for the sedimentary fabrics Pae5, Pnt5, Sal3, which are also quite common in the neighbouring areas, consisting mostly of sedimentary environments (see Chapter 4.2).

Throughout Copper Age it must be noted that the use of calcareous clays is extremely rare at the sites analysed, as are calcareous inclusions, attested mainly in single samples for each site. This suggests that calcareous clays and inclusions were mostly avoided, despite their abundance in the area (De Bonis 2018) and the ubiquity of calcareous rocks originating both from the travertine formations of the Sele Plain (Vitale and Ciarcia 2018) and the carbonate Apennine Platform (Vitale and Ciarcia 2018). This preference might also be due to the higher technical knowledge and skills needed to monitor the firing process for ceramic made of calcareous clays (Amicone *et al*. 2020: 99).

Further observations can be made based on the mineral inclusions. Both the Sele River Plain and Vallo di Diano are alluvial plains characterised by sedimentary formations. The silico-clastic grains that characterise most of the Copper Age samples are common in the area due to various flysch formations and wedge-top basins (Vitale and Ciarcia 2018). Volcanic materials are more attested and less weathered at Copper Age Pontecagnano due to its proximity to the volcanic complexes of Somma-Vesuvio and Phlegrean Fields, a trend also detected in later ceramic productions (De Bonis 2018). Two samples from Copper Age Paestum, from the Gaudo and Cerere cemeteries, are characterised by large euhedral pyroxenes, similar to those detected in Pontecagnano fabrics Pnt1 and Pnt2, but of smaller dimension and in more moderate quantities. Though their provenance from the Pontecagnano area cannot be firmly established, the hypothesis of a connection between the two sites in terms of raw material provenance is a thought-provoking possibility.

No volcanic products typical of the Somma-Vesuvio eruption (such as olivine and garnet) could be detected in any of the Copper Age samples analysed. This is consistent with the chronology of the sites, which all date prior to the Vesuvian eruptions such as the Avellino Pumices (3945±10 cal BP, Passariello *et al*. 2020) which can be clearly detected in the mineral composition of Bronze Age pottery from Southern Italy, e.g., from Apulia (Modesto *et al*. 2021).

Chemical comparisons between the Copper Age sites of Sala Consilina and Atena Lucana and local sources are difficult given the lack of similar analysis on raw materials. Nevertheless, based on the petrographic and mineralogical analyses, some inferences can be made. Both sites display a lower impact of volcanic products compared to Paestum and Pontecagnano, which lie closer to the volcanic complexes. A peculiarity of both sites is the presence of fabrics characterised by polycrystalline quartz grains of metamorphic origins (Sal1 and Ate6). Metamorphic outcrops are not attested in the Campania region, the nearest being in northern Calabria, but residual and detrital gneiss, granitoids and schists are attested in the sedimentary environments, especially in flysch formations outcropping near the Vallo di Diano (Flysch di Gorgoglione and Lagonegregro succession; Vitale and Ciarcia 2018). The local provenance of these ceramics is also supported by evidence of the use of a similar raw material in the later Middle Bronze Age in the cave of Pertosa, on the edge of the Vallo di Diano basin (Carloni *et al*. 2017; Cannavò *et al*. 2019).

A further peculiarity of the samples from the Vallo di Diano is the common presence of chert (Ate2) and silicified bioclasts/radiolarites (Ate5). These formations can be attributed to the Rhaetian–Jurassic radiolarites and reddish, greenish and violet silicified argillites typical of the 'Scisti Silicei' formation, outcropping in the area of Sala Consilina, 8km from Atena Lucana (Vitale and Circia 2018: 14).

Based on the results of the analysis presented in the previous sections, the samples from the four Copper Age sites can, ultimately, be assigned to ten main fabric groups, which take into account both composition and possible tempering choices, as summarised in Table 7.9. Such categorisation of broader fabric groups, designed to facilitate wider comparisons, between sites and regions and between recent Italian archaeometric research projects, is generally based on the geological/lithological characteristics of the principal inclusions (whether as temper added by potters or naturally occurring in clay deposits; Cannavò *et al*. 2019; Modesto *et al*. 2021). The same criteria have been used in the present research, in order to compare the four sites analysed and to detect common compositional and tempering choices.

Fabric Group	**Main component**	**Fabrics**
Qtz S	Quartz-feldspathic detrital grains Poor to well sorted, coarse to fine sand	Pae4, Pnt3 (Pae3, grog also present)
Qtz M	Quartz metamorphic – polycrystalline quartz	Sal1, Ate6
Grog	Grog + quartz feldspathic detrital grains	Pae1, Pae2, Pae3, Pnt1
Fine	No coarse fraction	Sal4, Ate5
Volc	Volcanic inclusions, feldspars and pyroxenes	Pnt2
Org	No coarse fraction, rich in organic inclusions and ARF	Pae6, Ate1 (Pnt1 also rich in organics)
ARF	Rich in ARF/clay pellets	Pae5, Sal2
Ca	Micritic and at times spathic calcite	Pae7, Pnt4, Sal5, Ate3, Ate4
Sedim	Sedimentary grains (sandstone, siltstone or mudstones)	Pae5, Pnt5, Sal3
Chert	Chert + iron-rich features	Ate2

Table 7.9. Fabric groups recognised for the four sites, with specification of the main component determining the group and associated petrographic fabrics.

As shown in Figure 7.59A, Grog is clearly the most common fabric group (62%), suggesting the existence of a distinct tempering tradition, especially common to Gaudo culture contexts. It must be acknowledged, however, that the relatively large sample taken from Gaudo culture contexts partly accounts for the high representation of this fabric group. Nevertheless, this tradition of tempering is also attested in the Early Copper Age contexts and is well represented in Middle-Late Copper Age Laterza contexts (Figure 7.59C). The sandy quartz fabric group (Qtz S) is also quite widespread (15%) compared to the other fabric groups (all below 6%) and is mostly attested in Laterza contexts at Paestum (Figure 7.59C).

These fabric groups represent choices and processes in the preparation of the ceramic paste. Their relation to the time periods of the sites, and to the macroscopic characteristics of the pottery. are further explored in Chapter 8, where macroscopic and archaeometric data are combined.

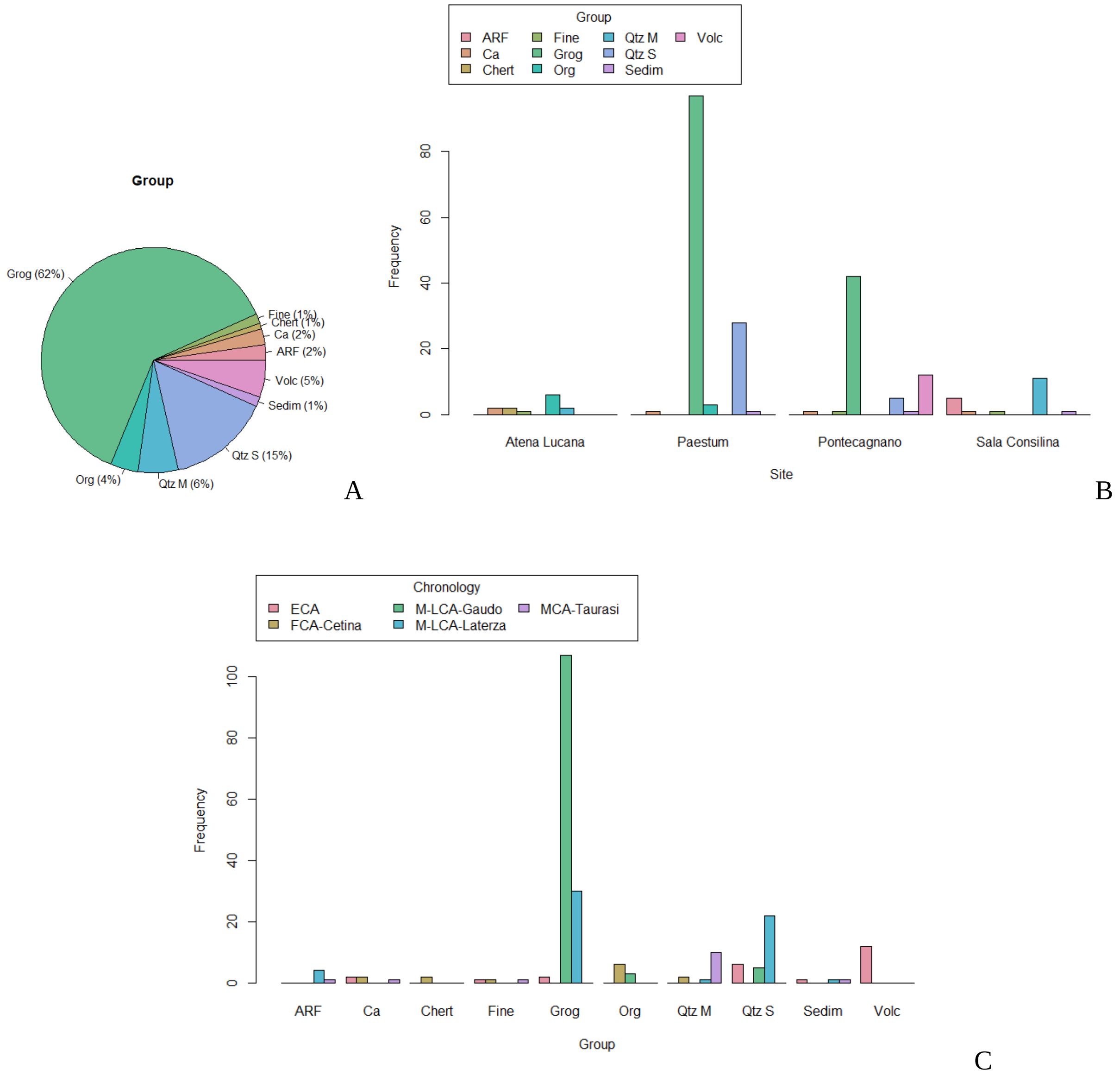


Figure 7.59. Percentage of occurrence of each fabric group (A) and their distribution among the sites analysed (B), and by chronological phase/cultural tradition (C).

Chapter 8 – Collation of the macroscopic and archaeometric results

8.1. Aim of this chapter

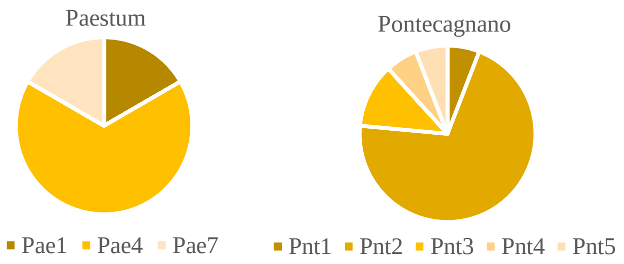
This chapter combines the macroscopic and archaeometric results presented in Chapters 6 and 7 respectively and compares them to the broader Campanian and Southern Italian context as outlined in Chapters 2 and 4. The analyses presented in the previous chapters revealed a degree of consistency between sites previously attributed to the same period/cultural tradition. The integrated data is therefore presented here in chronological order and by archaeological culture, highlighting similarities and differences, continuities and changes in ceramic production across time and space. The entire production process, including the resulting diversity of wares, characteristic of each chronological phase is considered, from raw material selection, to preparation of a range of ceramic pastes, to forming of a variety of vessels, to firing and its outputs.

8.2. Early Copper Age (3900–3650 BC)

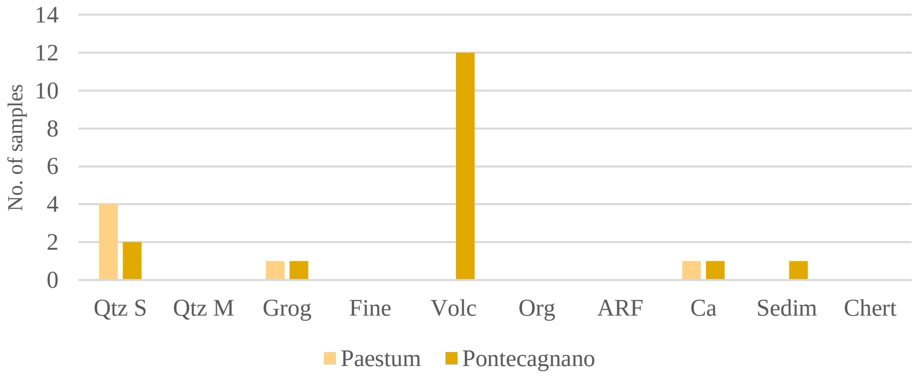
The ceramic production of the Early Copper Age was investigated at Paestum (Agorà, Phase I) and Pontecagnano (ANAS excavation). The main observations are summarised in Table 8.1 and discussed in detail below.

<table>
<tr><th colspan="2">Early Copper Age – 3900-3650 BC</th></tr>
<tr><td>A. Chronology</td><td>3900-3650 BC</td></tr>
<tr><td>B. Sites - contexts</td><td>Paestum – Agorà phase I, unclear context
Pontecagnano – Anas excavation, house, daily life context</td></tr>
<tr><td>C. Raw materials procurement and processing</td><td>

Petrographic fabrics attested



Fabric groups



Mineral composition (XRD)

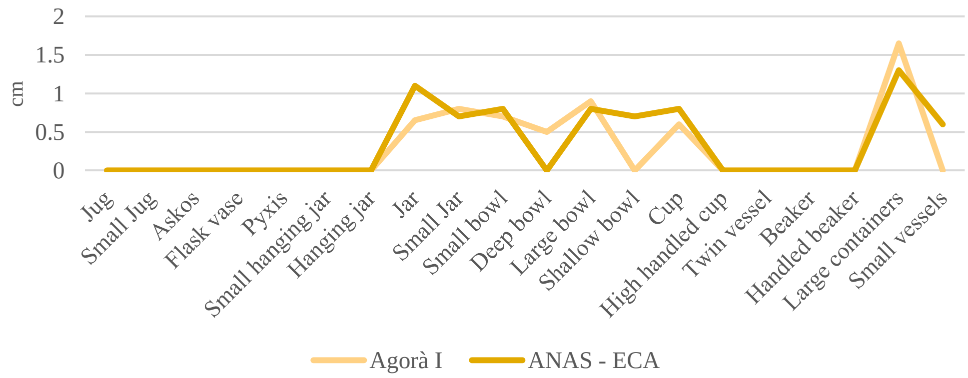
Quartz, K-feldspars, illite/muscovite, smectite: all samples
Hematite: two samples from Paestum
Calcite: only in the two carbonatic fabrics (Pae7 and Pnt4)
Hornblende: 1 sample from Pontecagnano

</td></tr>
<tr><td>D. Fashioning</td><td>

Shaping techniques attested

Coiling
Handle attached by simple spreading or by piercing the surface
Horizontal tunnel handle applied internally

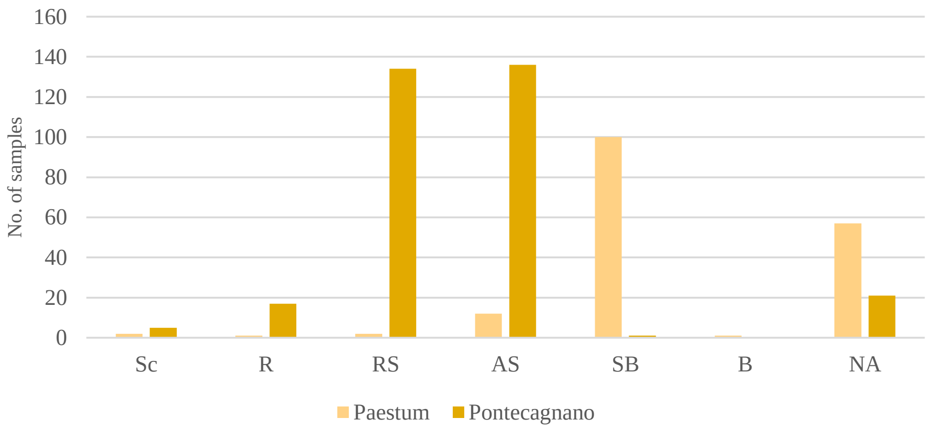
Wall thickness



</td></tr>
</table>

<table>
<tr>
<td>D. Fashioning</td>
<td>

Surface treatment



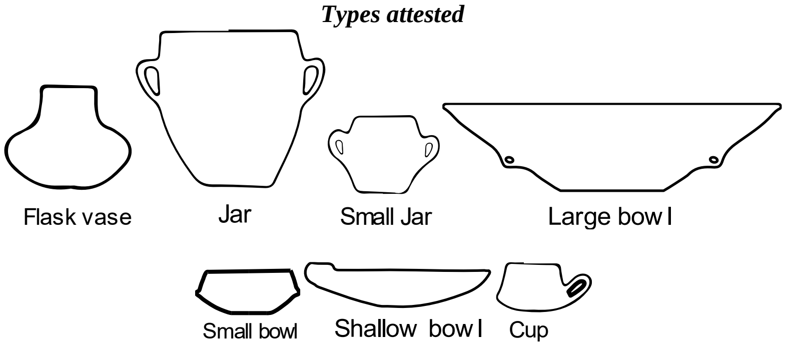
Decoration

Decorated (10%) – Undecorated (90%)

Impressed (28%), plastic (26%), scaled (26%), incised (15%), plastic and impressed (4%), impressed and incised (2%)

</td>
</tr>
<tr>
<td>E. Forms</td>
<td>

Types attested



Morphology

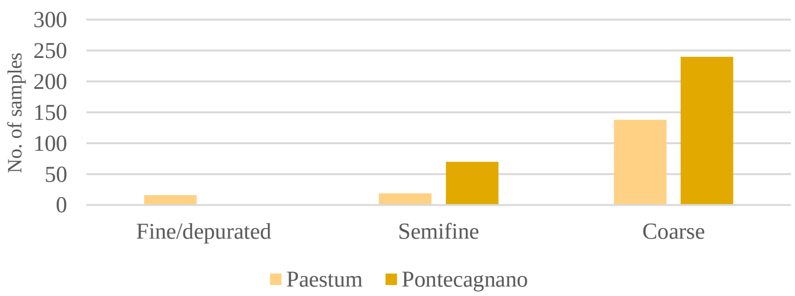
- Simple geometrical shapes, truncated cone or ovoidal
- Loop handle in jars or vertically pierced handle near the rim
- Horizontal tunnel handle in large bowls
- Loop or spool shaped handles in cups, often near the rim

</td>
</tr>
<tr>
<td>F. Firing</td>
<td>

Conditions: Mostly oxidising or irregular, reducing conditions mainly attested in large bowls with a truncated cone shape

Temperature: 700-850 °C
Where hematite is detected by XRD surely above 700°C

</td>
</tr>
<tr>
<td>G. Wares</td>
<td>



</td>
</tr>
</table>

Table 8.1. Main characteristics of Early Copper Age ceramic production..

8.2.1. Raw material selection

Early Copper Age potters in the Sele River Plain used local raw materials, displaying a good understanding of the various resources available in the alluvial plain and surrounding hills (Table 8.1C). The complex geology of the area created a landscape rich in potential clay and temper sources (Chapter 4.2), therefore the exact supply basins exploited are hard to identify, but some observations can be made based on the information available for known local clay sources (De Bonis 2018; De Bonis and Gassner 2018).

As clarified by petrographic, mineralogical and geochemical analyses (Chapter 7), Early Copper Age potters in Paestum and Pontecagnano had a clear preference for non-calcareous, iron-rich, illitic-smectitic clays though with different compositions linked to the different geology of the Northern and Southern section of the Sele Plain. In the site of Paestum (southern section), alluvial clays, rich in quartz-feldspathic grains, or tempered marine clays were mostly used, available within 5km from the site (see Chapter 7.7). In the case of Pontecagnano, probably due to their direct presence at the site (Amato 2011; De Bonis *et al.* 2013: 486), clays derived from pyroclastic alterations were preferred. Natural or artificially added inclusions at both sites were mostly quartz-feldspathic sands (Qtz S) with different degrees of sorting and weathering which could have been easily sourced near the rivers and coast as alluvial and coastal sands (Gromola and Campolongo Units), as well as from sandy alluvial sediments (Cinque *et al.* 2009).

Use of a calcareous clay is rare at both sites and displays very different characteristics. At Paestum, a fine calcareous clay is used only for fine ware vessels (Ca fabric group, fabric Pae7), continuing the Late Neolithic *figulina* tradition analysed by Muntoni et al. (2015) at the same site. The clay supply basin can be identified either as basinal (as suggested by Muntoni et al. 2015 for *figulina* based on petrographic analyses) or as alluvial since both type of clays are attested within a maximum of 7km from the site (see Chapter 7.7). The calcareous fabric from Pontecagnano is characterised by a coarse calcareous matrix as well as micritic and shell inclusions (Ca fabric group, fabric Pnt4). This composition can likely derive from the carbonatic formations of the area, such as the travertine plateau on which the site was built or the Apennine platform outcropping about 5km north-east of the site.

Sedimentary rock fragments, common in the alluvial environment (especially mudstones showing the same composition of the clay matrix), are particularly concentrated in one fabric (Sedim fabric group, Pnt4 fabric), from Pontecagnano. The base clay and the inclusions might derive from a different raw material source, probably outcropping on the hills behind the settlement, where sedimentary formations rich in over-consolidated clays such as the Argille Variegate Group, the Arenarie di Castiglione dei Genovesi group and Lagonegrese Unit are attested (Russo *et al*. 2010).

8.2.2. Preparation of the ceramic paste

The analyses suggest different types of clay processing at each site studied (Table 8.1C). Two main paste recipes (intended as the combination of clayey raw materials, eventually mixed or refined, and temper) can be differentiated: a non-calcareous clay (of different origin at the two sites, see section above) tempered with a quartz-felspathic sand (Qzt S), and a volcanic-rich clay (Volc) with volcanic material either naturally present or added. The first of these is attested at both sites, whereas the second is exclusive to Pontecagnano (Table 8.1C).

Four other minor recipes are attested (Table 8.1C): a calcareous clay with grog (Ca-Pae7), a coarse non-calcareous clay with grog (Grog-Pae1 and Pnt1), a clay with coarse, crushed mudstones as temper (Sedim-Pnt5), and a calcareous clay with micritic inclusions and shell fragments (Ca-Pnt4). In the latter, large sedimentary and low-grade metamorphic rock grains suggest that the coarse clay or added temper was not particularly refined before use. Intentional selections or refinement of the raw material could be detected only in the quartz-rich, sandy fabrics (Pae3-4 and Pnt3) characterised by well-sorted, sand-sized quartz-feldspathic grains that rarely occur this way in natural sediments. .

Paestum's recipe with the calcareous, calcite-rich clay (Ca-Pae7) is a continuation of the previous Late Neolithic *figulina* tradition attested at the site (Muntoni *et al*. 2015: 132, samples PAE01-PAE07), but the Early Copper Age examples analysed in this research are coarser and also contain grog. In Southern Italy, the use of grog is attested in a few Neolithic contexts from Apulia, e.g., Pulo di Molfetta (Laviano and Muntoni 2006) but is limited to a handful of analysed finds in Neolithic and Copper Age productions while it becomes dominant from Bronze Age on (mostly analysed in Apulia and Aeolian islands; Laviano and Muntoni 2006; Levi et al. 2019). The limited availability of ceramic and archaeometric data for Early Copper Age sites in Campania and Southern Italy prevents more precise parallels. The two main recipes (quartz-feldspathic and volcanic) suggest that special attention was paid to the use of specific, non-plastic inclusions. This tempering choice might depend on these materials' properties to improve the mechanical strength and thermal shock resistance of the vessels (the latter only in the case of volcanics and grog; Vekinis and Kilikoglou 1998).

8.2.3. Fashioning and vessel types

Moving to the next stage of ceramic production, the fashioning of the vessels, it is helpful to consider the relationship between paste recipes and vessel types or categories. While a clearer correspondence could be assessed for the site of Paestum, for the site of Pontecagnano, this could not happen due to the high number of indeterminable sherds. As explained in Chapter 7, clearly diagnostic ceramics could not be sampled from, given their small dimensions. Nevertheless, the recording of macroscopic fabrics (i.e. fabrics recognised at a first macroscopic observation of ceramic fresh cut sections, see Chapter 5.2) and their broad correspondence with petrographic fabrics (analysed by optical microscopy in thin section) allows the identification of several trends in the use of particular paste recipes with respect to vessel categories and types.

At both Paestum and Pontecagnano, jars, large bowls and large containers were mostly manufactured using coarse paste recipes such as the quartz sandy or volcanic fabrics, while the grog and sandy recipes were used for finer vessel types such as small and shallow bowls, small jars and cups. The other fabric groups are quite rare and represented by only a few examples from two ends of the spectrum in vessel size. The fine calcareous fabric from Paestum (Pae7) was reserved for small bowls and small vessels, while the coarser calcareous fabric from Pontecagnano (Pnt4) is attested for a large jar, with thick walls and coarse calcareous grains. The sedimentary fabric (Pnt5) could not be matched with any specific vessel type, but the thickness of the walls and roughly regularised surfaces suggests it was also used for large containers.

The most common shaping technique detected was coiling (Table 8.1D). Handles were applied either by simply spreading onto the outer surface, by inserting the protruding end of a pre-shaped piece into a perforation in the vessel wall or, in the case of vertical and horizontal tunnel handles (only attested at Pontecagnano), the vessel wall was modelled, externally pierced and clay affixed to the inside wall to create a small, internal tunnel.

In this period, the morphology of the vessels was particularly simple, following Late Neolithic trends (Table 8.1E). The shapes are simple geometric forms, generally ovoid or a truncated cone. The handles are generally vertical loop handles, or vertically-pierced flattened lugs, while both horizontal and vertical tunnel handles are common on large bowls or jars. As displayed in Table 8.1E, the types attested, given their small number and simple characteristics could be interpreted as broadly multifunctional. In fact, Early Copper Age sites do not display any specialised feature (e.g., for pouring or drawing) and therefore no particularly specialised type could be detected (e.g., jugs, high handled cups etc.).

Attention to surface treatment mainly comprised smoothing, sometimes accurate. A light burnishing (smoothing/burnishing) do however sometimes occur, especially at Paestum, and is reserved for a specific vessel type: the large, truncated cone-shaped bowl, which is always associated with the sandy, quartz-felspathic fabric (Qtz S). This correspondence suggests the presence of a specific, well-defined manufacturing tradition and process for these bowls extending from paste recipe, to vessel type and surface treatment. Decorations are quite rare, with only 10% of vessels displaying simple motifs, mostly made by impression, such as rows of notches or digital impressions near the rim, plastic cordons with digital impressions, or scaled decoration, which is mostly attested on jars and large containers.

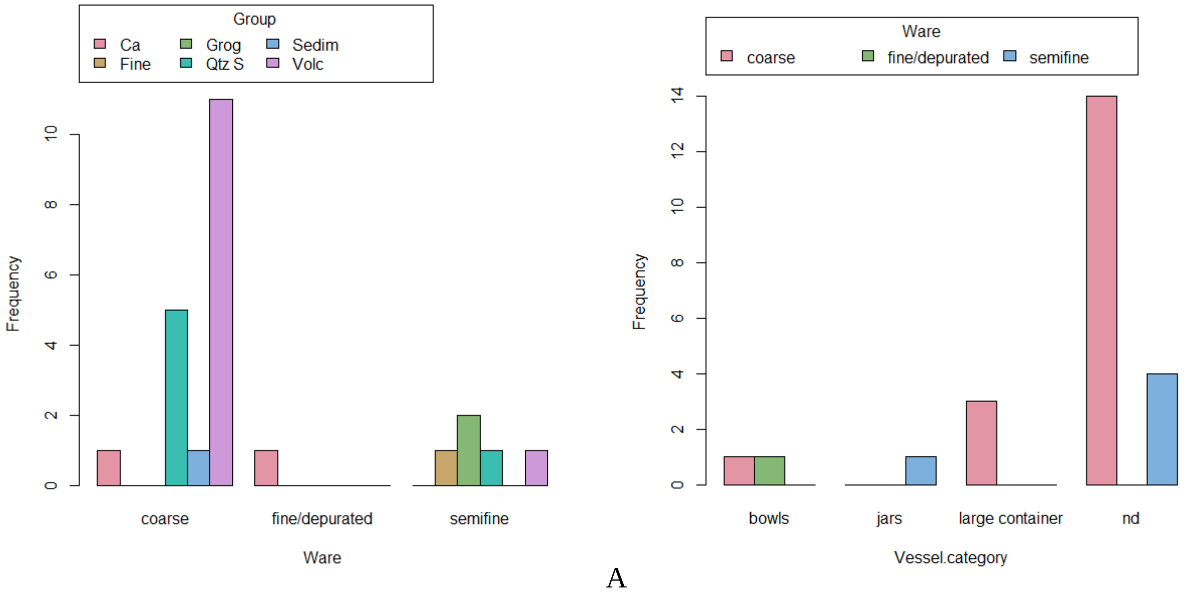
8.2.4. Firing

Early Copper Age potters display the ability to manage firing conditions but little consistency in their control. Different trends are evident at the two sites (Table 8.1F). At Paestum, most vessels (57%) were fired in reducing conditions, shown by the common, blackish surfaces, especially for the large, truncated cone bowls. By contrast, the fine/depurated calcareous ware was fired in a completely oxidising atmosphere. In contrast, at Pontecagnano, the firing conditions were mostly irregular (58%) with a fairly frequent incidence of vessels fired under oxidising conditions (34%). These contrasts suggest slightly different manufacturing processes and traditions between the two sites, which will be further explored in Section 8.2.6.

No clear indication of the Equivalent Firing Temperature could be reached by XRD analysis due to the composition of the samples (Table 8.1F). The lack of high temperature minerals, the presence of clay minerals (mostly illite/muscovite and smectite) and the lack of sintering of the clay matrix suggest firing at temperatures below 800–850°C, but possibly much lower. The presence of haematite in two samples from Paestum, however, indicates that the temperature in some cases exceeded 700°C.

8.2.5. Wares

The distinction in wares (combining typological and technological attributes such as fabric, surface treatment, decoration, colour etc.; see Chapter 5.2.2) for this phase was based on Neolithic traditions (depurated/fine, semi-fine and coarse wares), and seems to correspond to other characteristics such as wall thickness, fabric and vessel types. Coarse ware is the most common at both sites, with a good representation of the semi-fine ware at Pontecagnano (Table 8.1G). Fine/depurated ware is attested only at Paestum, probably suggesting that this slowly disappearing Final Neolithic tradition had already been lost at Pontecagnano.



A B

Figure 8.1. Early Copper Age. Distribution of wares with respect to fabric groups (A) and to vessel categories (B) as presented in Chapter 5.2.1.

As displayed in Table 8.1A, the coarse ware corresponds to coarse petrographic fabrics (fabric groups: Volc, Qtz S, Ca and Sedim) and is mostly reserved for large containers and a single bowl (Table 8.1B). The fine calcareous fabric corresponds to the fine/depurated ware and is associated with small bowls (Table 8.1B). The semi-fine ware is mostly grog-tempered and macroscopic observation showed it to be associated with small bowls, small jars and cups (Table 8.1B). Differences in the respective thickness ranges of the three wares can also be detected, with similar values for the semi-fine and fine/depurated wares (0.3–1.1cm and 0.4–1.1cm respectively), and higher values for the coarse ware (0.4–2.1cm).

8.2.6. General observations regarding Early Copper Age ceramic production

Overall, Early Copper Age ceramic production has no strongly distinctive stylistic and technological characteristics, being distinguished by a degree of homogeneity and simplicity of vessel forms, surface treatments and decorations, and produced using a few ceramic recipes. This period can be characterised as stylistically transitory between Late Neolithic and Middle Copper Age, given the presence of stylistic and technological features both reminiscent of the previous and anticipating subsequent traditions.

The two sampled sites of Paestum and Pontecagnano clearly illustrate these trends. The Early Copper Age ceramic record from Paestum in particular shows continuity with Late Neolithic products in the use of calcareous raw clays typical of the Serra d'Alto-Diana phase (Middle-Late Neolithic) attested at the Temple of Cerere, but is coarser and with the novel addition for the site of grog as temper (Aurino *et al*. 2017; Muntoni *et al*. 2015). The use of grog temper is, however, attested in Neolithic and Late Neolithic contexts ranging from Northern to Southern Italy, though in minor quantities compared to subsequent periods. It is attested only rarely in Apulia Neolithic pottery (Laviano and Muntoni 2006, 2008; Muntoni *et al*. 2018), in some Final Neolithic Lagozza samples from the Alpine region (Saracino 2011) and Late Neolithic samples from the Aeolian islands (Levi *et al*. 2019).

The most representative vessel type of this period is the large, truncated, conical bowl attested both at Paestum and Pontecagnano. These bowls are characterised by the exclusive presence of the quartz-felspathic sandy fabric, the use of coiling, smoothed/burnished surfaces, and evidence of a reducing firing condition (although this is less consistent at Pontecagnano). This type of vessel finds parallels in other Early Copper Age sites from Campania, generally associated with Macchia a Mare/Spatarella style that is broadly dated between 4000 and 3800 BC (Pessina and Tiné 2008: 41) and characterised by a scratched/incised decoration, mostly found on the inside rim, with decorative motifs being either hanging triangles or zig-zag lines. In other contexts, such as in the cave of S. Angelo a Fasanella and Ausino Cave in southern Campania (Aurino 2013), this type of vessel displays recurrent features such as accurately smoothed or lightly burnished surfaces and a dark colour from reducing firing conditions.

On a larger scale, a contemporary, parallel shift to plain, glossy vessels is evident across much of Southern Europe (Robb 2007: 171). This broader style (and especially the large, truncated cone bowls with shiny blackish surfaces and occasional scratched/incised decorations) appears in several Late Neolithic–Early Copper Age contexts throughout Italy, probably due to influences of the Chassey-Lagozza style spreading from about 4500 BC across and from Southern France and North-Central Italy (Borrello and van Willingen 2014). In Southern Italy, this vessel type first appears in the coarse ware repertoire of the Late Neolithic Diana cultural tradition, alongside refined *figulina* wares. It then becomes more common in the later Diana-Bellavista and Diana D phases (Pessina and Tiné 2008). It can be detected in the Ripoli cultural tradition at the sites of S. Maria in Selva in Marche (4500–4000 BC) (Silvestrini and Pignocchi 1998, 2000), and Paterno in Basilicata

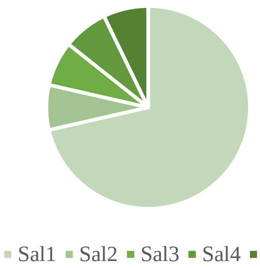
(4000–3800 BC) (Cremonesi 1984; Pessina 1991), and is generally associated with the Southern Italian Early Copper Age style of Macchia a Mare-Zinzulusa-Spatarella, which is widespread, especially in Apulia. In the area of Rome, evidence of these phases was recently dated to between 4550 and 3640 cal 2σ BC at several sites including Tor Pagnotta, Quadrato di Torre Spaccata and Casale di Valleranello (La Marca 2021). As the 5th millennium proceeded, dark burnished wares came to dominate almost exclusively in the Italian Peninsula (Cremonesi and Tozzi 1987; Robb 2007: 320).

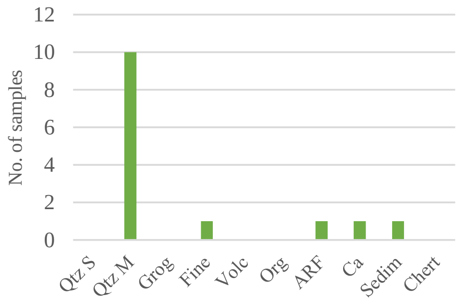
The other vessel types and decorations seen at Paestum and Pontecagnano also occur in several Central and Southern Italian Late Neolithic/Early Copper Age contexts. Impressed decoration placed under the rim of ovoid jars and deep bowls is widely attested both at Pontecagnano and in north-east Campania in the Irpinia mountainous area (Talamo 2008a: 127–8). Scaled decoration is also very typical for the Copper Age throughout Italy from this early phase.

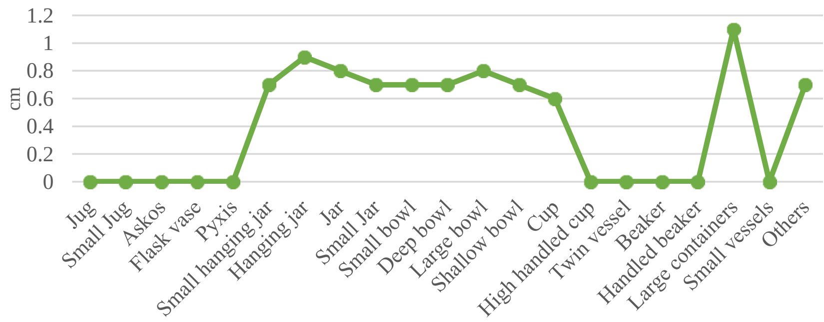
No archaeometric or technological data are currently available which date securely to the first half of the 4th millennium BC for Campania or Southern Italy, but data are available for the Aeolian islands for Late Neolithic and Early Copper Age ceramic production, which are regarded as the geographical core of the Diana cultural tradition. These show continuity in their extensive use of volcanic tempered fabrics, widely attested in the islands, with only occasional imports and changes in the ceramic recipes (Levi *et al*. 2019). This trend in the ceramic production at the dawn of the 4th millennium BC has been interpreted in relation to a territorial and demographic 'crisis' possibly linked to volcanic activity on the island, and to a decreased demand for its sharp obsidian, which circulated broadly in the Italian Peninsula during the Neolithic (Levi *et al*. 2020). A comparable pattern of territorial and demographic change is associated with this period throughout Italy, reflected in the substantial decrease in the number of settlements and changes in both economic and settlement forms as further addressed in Chapter 9. Further archaeometric and contextual analyses, and selected radiocarbon dates, would help to better characterise the ceramic production of this period and situate it better within its broader cultural context.

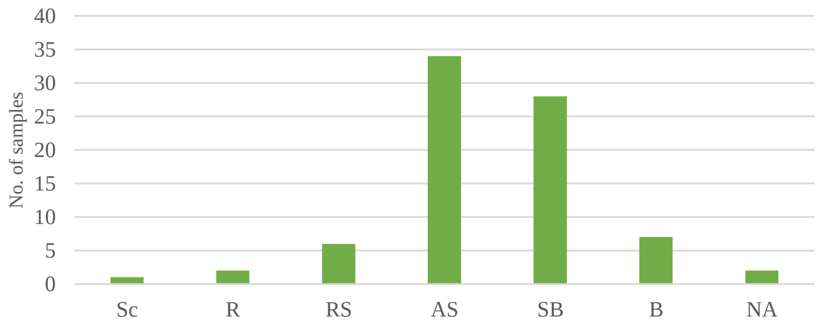
8.3. Middle Copper Age: Taurasi (3650-3100 BC)

During the Middle Copper Age, new cultural traditions are attested in Campania, with cremations from the eponymous site of Taurasi and from Casalbore radiocarbon dated to between 3650 and 3100 BC. This phase was investigated in the current research for the context of Sala Consilina, Phase I, where cremation burials in vessels or pits were found inside and near to drystone structures. The main observations are summarised in Table 8.2 and discussed below.

<table>
<tr><th colspan="2">Middle Copper Age – Taurasi, 3650-3100 BC</th></tr>
<tr><td>A. Chronology</td><td>3650 to 3108 cal. BC
Radiocarbon dating of the site of Taurasi (see Chapter 1)</td></tr>
<tr><td>B. Sites - contexts</td><td>Sala Consilina – cremation cemetery, phase I, funerary</td></tr>
<tr><td>C. Raw materials procurement and processing</td><td>Petrographic fabrics attested


Fabric Groups


Mineral composition (XRD)
Sal1 (Qtz M): Quartz, plagioclase, k-feldspars, illite/muscovite, smectite, in one sample also chlorite
Sal2 (ARF): Quartz, plagioclase, k-feldspars, illite/muscovite, smectite
Sal3 (Sedim): Quartz, illite/muscovite, smectite, no feldspars
Sal4 (Fine): Quartz, plagioclase, k-feldspars, low smectite and wollastonite
Sal5 (Ca): Quartz, plagioclase, k-feldspars, illite/muscovite, smectite, calcite</td></tr>
<tr><td>D. Fashioning</td><td>Shaping techniques attested
Coiling, also spiral coiling
Moulding attested for large bowls
Slab building
Vertical tunnel handle fixed by spreading on the outer surface
Wall thickness


Surface treatment

</td></tr>
</table>

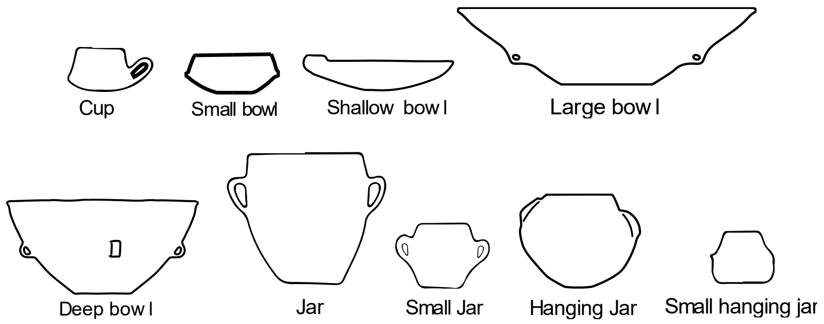
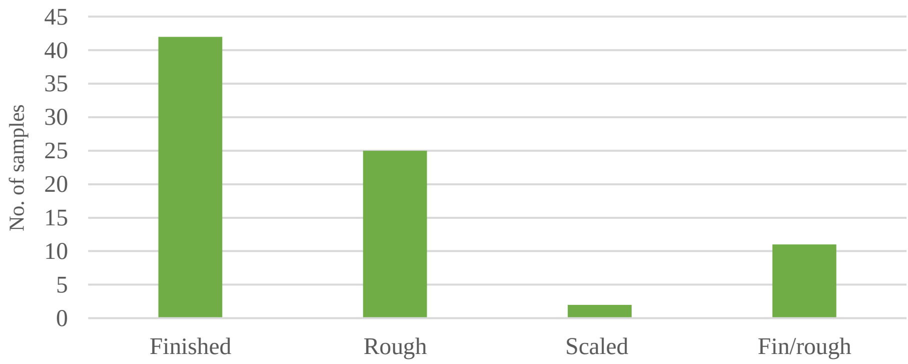
D. Fashioning	***Decoration*** Decorated (19%) – Undecorated (81%) Grooved (33%), scaled (27%), incised (13%), plastic (13%), impressed (7%), impressed and incised (7%)
E. Forms	***Types attested***  ***Morphology*** • Simple geometrical shapes, truncated cone or ovoidal • Two or three vertical tunnel handles for the hanging jars and small hanging jars • Single horizontal tunnel handle in large bowls • Small vertical angular loop handles in the small jar *Other ceramic objects:* Three conical lids or pedestals
F. Firing	***Conditions:*** Mostly irregular, in some cases oxidising and rarely reducing Temperature: • 800-850 °C in most of the samples • Below 650 °C in one Sal1 sample, due to the presence of chlorite/kaolinite • 850-1100 °C in Sal4 for the presence of wollastonite and vitrification
G. Wares	

Table 8.2. Main characteristics of Taurasi style ceramic production, Middle Copper Age.

8.3.1. Raw materials selection

During this phase at the site of Sala Consilina the raw materials used are consistent with the local geology of the Vallo di Diano (Table 8.2C). The site is located on an alluvial plain rich in materials suitable for ceramic production (Chapter 4.2). The clays used for pottery making are mostly non-calcareous and composed of a mixture of illite and smectite, in only one case with traces of chlorite/kaolinite (Sal1). Calcareous or marly clays were used for a single CaO rich fabric (Ca-Sal5). Both calcareous and non-calcareous clays are common in the area due to the quaternary lacustrine and alluvial deposits such as the Certosa di Padula and Buonabitacolo formations (Sgrosso *et al*. 2010) located at the bottom of the basin. Specific analyses of the clay raw materials in the area are not currently available, preventing a more specific identification of the clay sources.

Non plastic inclusions can also be linked to the local geology. The monocrystalline and polycrystalline grains of metamorphic origin typical of the most common fabric Sal1 (Qtz M group) are peculiar since clearly metamorphic formations are not attested in the area. Nevertheless, residual metamorphic rocks can be found in the local flysch formations of the Lagonegro succession (Vitale and Ciarcia 2018) or from the San Mauro and Monte Sacro formations (Sgrosso *et al*. 2010; see Chapter 7.7). Other raw materials are attested only in a few samples. Sedimentary rocks, mudstones and argillite (ARF-Sal2 and Sedim-Sal3) are common in the Lagonegro unit, characterised by various flysches outcropping near to Sala Consilina (Sgrosso *et al*. 2010). All the suggested supply basins are located within the Vallo di Diano, within a maximum radius of 16km around the site.

8.3.2. Preparation of the ceramic paste

A predominant paste recipe can be recognised, comprising a non-calcareous clay enriched artificially by the addition of monocrystalline and polycrystalline quartz (Qtz M, 71%, Table 8.2C). This recipe is easily recognised macroscopically and accounts for 75% of the whole ceramic assemblage of the site. The remaining 25% is represented by four minor recipes, apparently reserved for specific products. Three of these show a preference for a clay-rich ceramic paste with a few mineral inclusions or mostly clay-rich inclusions such as ARFs (occasionally recognisable as grog, Sal2), mudstones (Sedim-Sal3) or, alternatively, a fine ceramic paste (Fine-Sal4), probably subject to some form of refinement. A further recipe involves the use of a highly calcareous clay containing a calcareous sand or a marly clay (Ca-Sal5).

Only in the case of the quartz metamorphic fabric (Qtz M-Sal1) can the addition of temper be inferred due to the type of rocks involved. In the case of the sedimentary recipe (Sedim-Sal3), the angularity and the uneven distribution of mudstone fragments also points to their artificial addition to the base clay. In the other cases, possible refinement processes are suggested by the absence of very coarse grains, particularly in the fine fabric, Sal4. The use of different types of tempering might also reflect different requirements in the characteristics of the vessels, such as mechanical strength and toughness, as further addressed in Chapter 9.2.2.

8.3.3. Fashioning and vessel types

The combined macroscopic and archaeometric data reveal a strong correspondence between paste recipes and vessel types or categories (Figure 8.2). Hanging jars, jars and large bowls are made exclusively of the quartz metamorphic fabric, with the exception of a single large, truncated cone-shaped bowl with an unusual horizontal tunnel handle, which is made with the calcareous fabric. Despite the different paste recipe used for this bowl, the main characteristics, shape, surface treatment and reducing firing conditions are consistent with other vessels in this category. The quartz metamorphic fabric is also used for smaller shapes such as small bowls and small jars, which are also made of the sedimentary fabric. The fine, sintered fabric is attested only for one vessel form: the small hanging jar. Overall, two main recipes can be distinguished: quartz-rich (Qtz M) and clay-rich (Sedim, ARF, Fine). These two trends might relate to specific strength and plasticity requirements, with larger vessels mostly made of the quartz-rich paste.

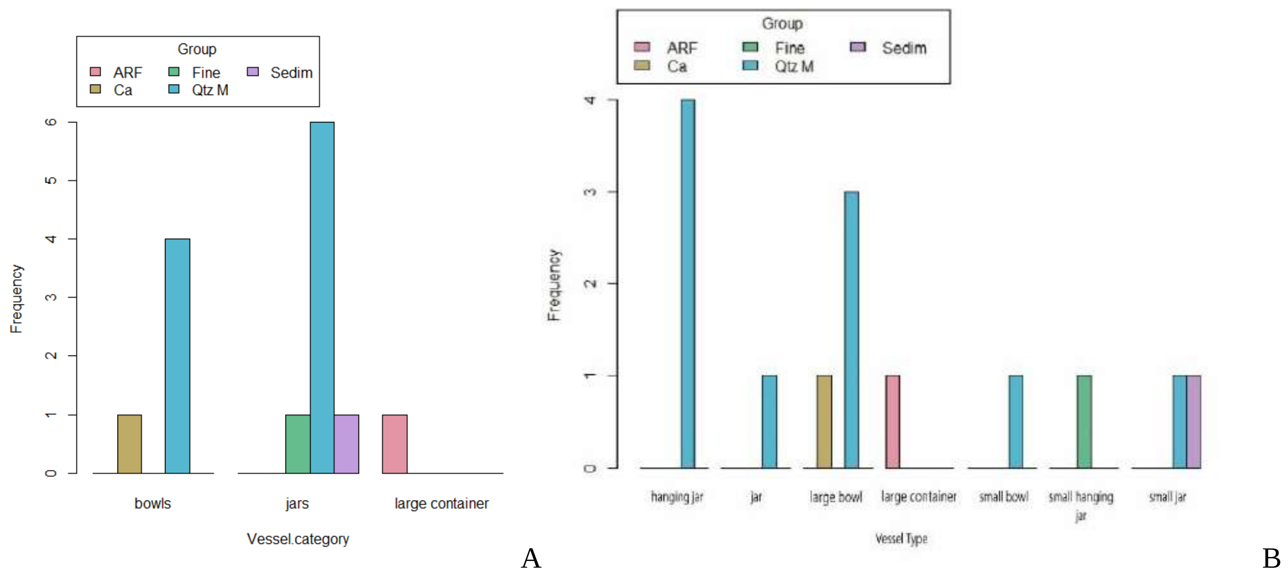


Figure 8.2. Sala Consilina, Taurasi culture. Distribution of fabric groups with respect to vessel category (A) and vessel type (B).

Coiling was widely used for the manufacture of vessels (Table 8.2D). For large hanging jars, the spiral breakage pattern might also suggest the use of spiral coiling (Roux 2019: 57; Gosselain 2018) and of slabs. Large, truncated cone-shaped bowls show traces of the use of moulds. The tunnel handles on large bowls or jars are fixed to the vessel wall by spreading onto the outer surface.

The morphology of the vessels in this period is still quite simple but with a wider variety of types. Truncated cone shaped large bowls with shiny surfaces are still widely attested. Compared to their Early Copper Age parallels, these bowls have walls slightly flaring rather than straight and they often display a single horizontal tunnel handle probably used to help suspend the vessels when being stored or transported when empty, rather than for handling when in use. Ovoid jars without handles, small hemispheric bowls, sometimes slightly bell-shaped, are also attested. Hanging jars with two or three vertical tunnel handles are a peculiar vessel type of this site. These are generally ovoid, in some cases with a low vertical or slightly flaring rim as in the case of one small hanging jar.

The most common surface treatments are accurate smoothing and smoothing/burnishing (Table 8.2D). The most representative vessels of this period, the jars and large bowls, display smoothed/burnished, accurately smoothed or burnished surfaces. Small vessels such as cups and small bowls also are also very accurately smoothed, sometimes with burnished surfaces, while ovoid jars with loop handles also occur with roughly smoothed and scaled surfaces.

Decoration is attested on 19% of the assemblage (Table 8.2D), mostly as light grooves on the outer surface of hanging jars, and in one case also on the inner surfaces of a large bowl. Scaled decoration is quite common (27%), while other techniques are scarcely attested, each on just one or two examples.

8.3.4. Firing

Most of the vessels reflect irregular firing conditions with a tendency towards reducing firing atmospheres, with colours ranging from blackish, to reddish brown, and irregularly brown. Only in six cases do the firing conditions appear to have been more controlled (either reducing for large, truncated cone bowls, or oxidising for jars and bowls) as indicated by the homogeneous colour of their surfaces.

The Equivalent Firing Temperature of the vessels was below 800–850°C as indicated by the lack of high temperature phases and sintering, but was probably much below this limit as suggested by one sample of fabric Sal1, where temperatures did not exceed 650°C as evidenced by the presence of chlorite/kaolinite.

An exception is the small hanging jar (fabric Sal4, fine fabric group) which was probably exposed to high temperatures after the original firing (possibly during the cremation process) as evidenced by cracks on the surfaces, the presence of pores and the sintering of the clay matrix. XRD analysis confirmed the high temperature reached, possibly between 850 and 1100°C given the presence of wollastonite.

8.3.5. Wares

For this phase, the ceramic assemblage was divided in wares based on the criteria proposed in Chapter 5 for Copper Age pottery products, distinguishing between scaled, rough and finished wares. Finished ware is the most common at Sala Consilina (52%), with a good representation of rough ware (31%) and rough/finished ware (14%), and only a few samples of the scaled ware (Table 8.2G).

As displayed in Figure 8.3, rough and finished wares are made with completely different fabric recipes.

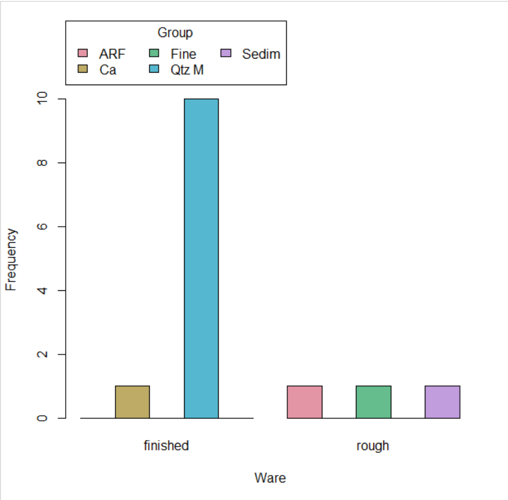


Figure 8.3. Sala Consilina, Taurasi culture. Distribution of fabric groups with respect to wares.

Wares also correspond strongly to vessel categories and types, supporting that macroscopically identified wares reflect slightly different operational sequences and functions. As displayed in Figure 8.4, finished ware is mostly reserved for large bowls, jars and hanging jars, but was also used for one small bowl and one small jar. By contrast, the rough ware, though less frequently represented, is reserved for large containers, a small hanging jar and a small jar (Figure 8.4B). The same trend can be detected across the whole ceramic assemblage from the site. Differences in the thickness ranges of the different wares can also be detected, with the finished ware (and the finished/rough ware) characterised by thinner walls (0.3– 1.0cm), with higher values for the rough ware and scaled ware (0.4–1.5cm and 1.2–1.5cm respectively).

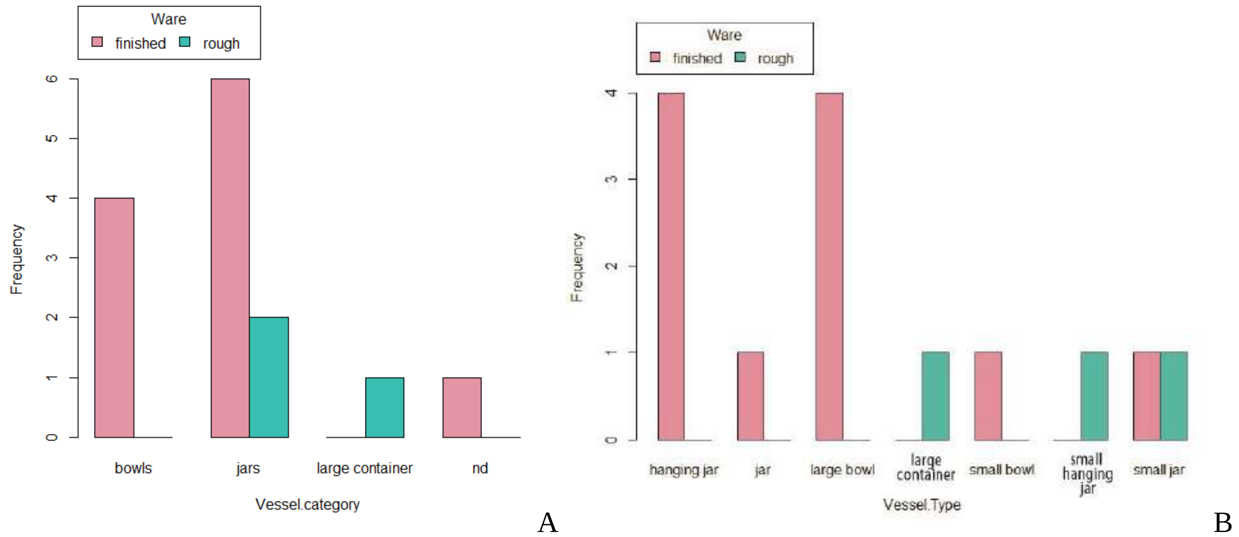


Figure 8.4. Sala Consilina, Taurasi culture. Distribution of wares in relation to vessel category (A) and vessel type (B) as presented in Chapter 5.2.1.

8.3.6. General observations regarding Taurasi culture ceramic production

Observations regarding the ceramic production of the Middle Copper Age in Campania, which is characterised by cremation burials, are restricted in this study both to the evidence from a single site and to one with a mortuary use. The lack of archaeometric data for other sites attributed to the same cultural tradition prevents a more comprehensive consideration, but, based on typological and technological observations, some general observations can be offered.

Taurasi style ceramic production at Sala Consilina is characterised by well-defined vessel types and by a high degree of consistency in raw materials selection and processing, and in shaping techniques, morphology, and surface treatments. The use of local raw materials demonstrates a specific technological choice favouring the quartz-rich fabric. Fashioning techniques display some innovative introductions such as the possible use of spiral coiling for jars (not otherwise attested in other published contexts from the same period), the use of moulds for large bowls, and the shaping of tunnel handles attached to the outer surface of the vessel. The form of large, truncated cone-shaped bowls seems to follow the trend previously seen for Early Copper Age Italy (Section 8.2.6). It must be noted that the typology of the vessels at Sala Consilina differs significantly from that of vessels at the eponymous Taurasi cremation cemetery in Campania. At Taurasi, no ovoid hanging jars or large, truncated cone bowls are attested, and the necked jugs, ovoid bowls and cups show greater resemblance to the Gaudo culture repertoire. The vessels from Sala Consilina do, however, find strong parallels with the site of Casalbore, where both cremations and inhumation burials were excavated (see Chapter 2, Figure 2.12E). Casalbore (3650–3532 to 3362–3102 cal BC, see Chapter 2, Table 2.2) is slightly earlier in origin than Taurasi (3522–3373 to 3488–3108 cal BC, see Chapter 2, Table 2.2), which may help to explain its stronger links with Early Copper Age products. This is also the case for Sala Consilina, although here some clear innovations in the manufacturing process can also be seen (such as the use of moulds and different shaping of the handles).

The types, the decoration technique and the surface finishing find further parallels with the Early Copper Age Piano Conte style, which was broadly distributed in southern Italy between the end of the first half and the second half of the 4th millennium BC (Pessina and Tine 2008). Grooved decoration is attested at both Sala Consilina and Taurasi, as well as at other cremation sites such as the tumuli of Salve in Apulia (Aprile *et al*. 2018) and the cave of Pavolella in Calabria (Carancini and Guerzoni 1987; Guerzoni 2004). Parallels between the latter site and Sala Consilina can also be seen in the morphology of the vessel types (Piano Conte 1 and 2A, Guerzoni 2004).

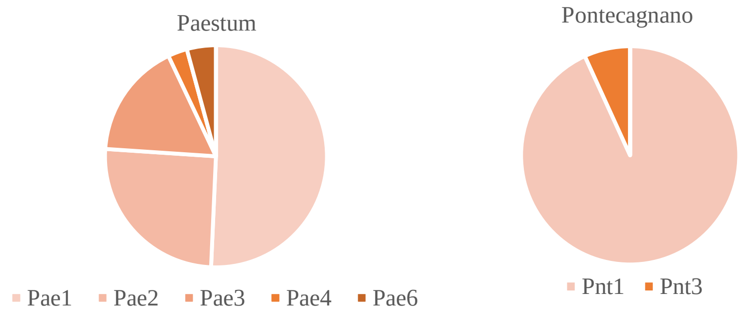
Overall, the ceramic production reflected by the ceramics deposited in the cremation cemetery of Sala Consilina is characterised by a new set of technological choices and ceramic types. Its relationship with the ceramics from the eponymous Taurasi cemetery and the partly contemporaneous Gaudo culture products is, however, difficult to assess given the lack of archaeometric analyses available for comparable sites. These issues will be further addressed in Chapter 9.

8.4. Middle and Late Copper Age (3600–2500 BC): Gaudo culture

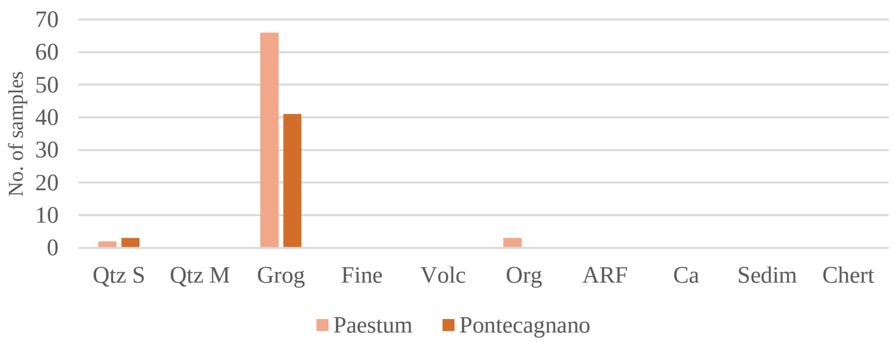
The Gaudo cultural tradition is the second to be recognised for the Middle Copper Age in Campania, and continues into the Late Copper Age. It is radiocarbon dated at Paestum to between about 3631 and 2500 BC, and is associated with large cemeteries of collective rock-cut tombs, which are widespread, especially in Campania and to some extent in neighbouring regions. Ceramics from Paestum and Pontecagnano, the two largest Gaudo cemeteries currently known in Campania, were included in the present research. The main observations on these ceramics are summarised in Table 8.3 and discussed in detail below.

<table>
<tr><th colspan="2">Middle/Late Copper Age – Gaudo, 3600-2500 BC</th></tr>
<tr><td>A. Chronology</td><td>3631- 2500 ca. BC
Radiocarbon dates of the main contexts (see Chapter 1)</td></tr>
<tr><td>B. Sites - contexts</td><td>Paestum - Gaudo cemetery, funerary
Pontecagnano - Gaudo cemetery, funerary</td></tr>
<tr><td>C. Raw materials procurement and processing</td><td>

Petrographic Fabrics



Fabric Groups



Mineral composition (XRD)

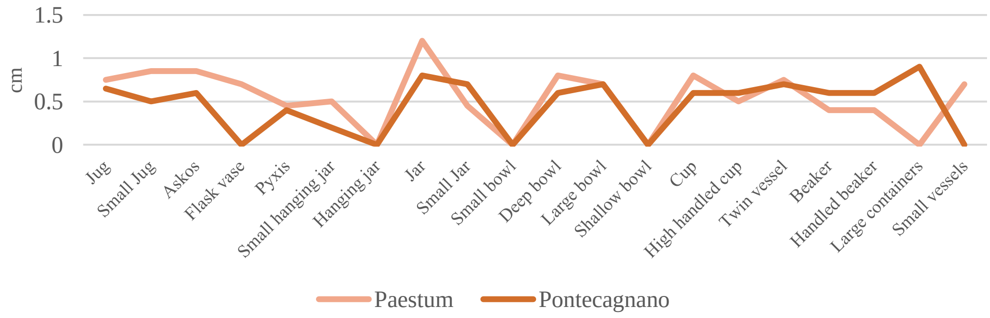
- Main composition with few exceptions: Quartz, plagioclase, k-feldspars, illite/muscovite, smectite component.
- 3 samples from Paestum and 1 from Pontecagnano, same composition with the addition of chlorite/kaolinite
- Hematite attested in one sample from Paestum, calcite in two from the same site, hornblende in one from Pontecagnano
- 6 samples from Paestum lack the smectite component, in 2 cases with chlorite/kaolinite attested

</td></tr>
<tr><td>D. Fashioning</td><td>

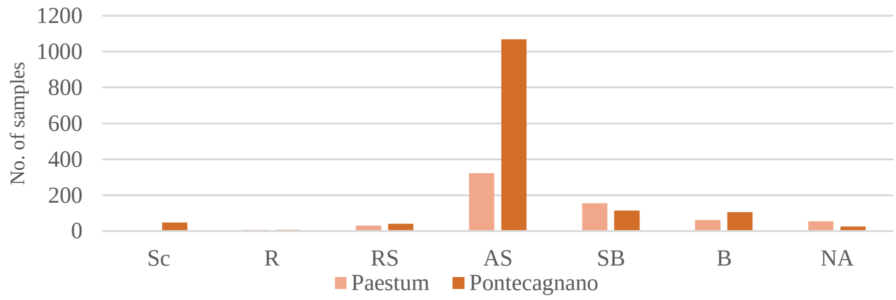
Shaping techniques attested

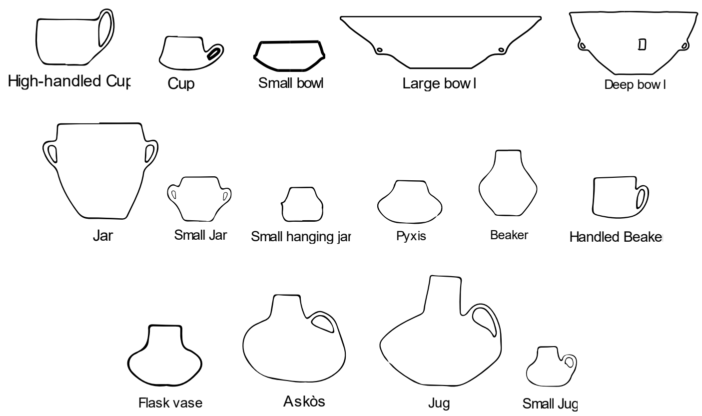
- Coiling of jars, upper parts of closed vessels and in some cases also the lower
- Moulding of the lower portion of closed vessels, and slab building
- Handles are fixed by piercing the vessel's surface

Wall thickness

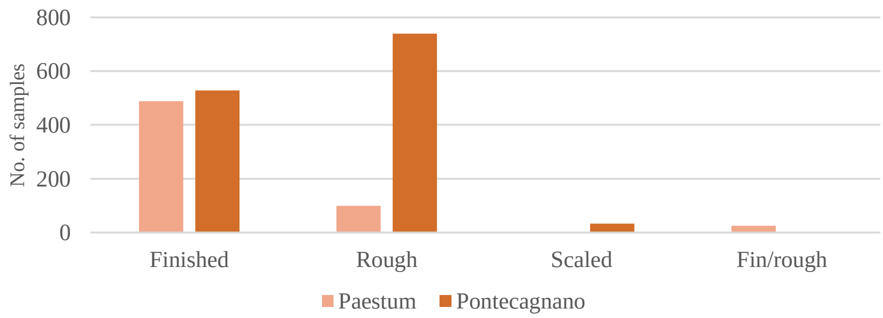


</td></tr>
</table>

<table>
<tr><td>D. Fashioning</td><td>Surface treatment


Decoration
Decorated (24%) – Undecorated (76%)
Incised (45%), plastic (16%), impressed (10%), impressed and incised (8%), plastic and impressed (7%), grooved (5%), scaled (5%), plastic and incised (4%), grooved and incised (0.4%), plastic incised and impressed (0.4%), graffite (0.4%)</td></tr>
<tr><td>E. Forms</td><td>Types


Morphology
• Coded shapes, mostly composite
• High number of types but low internal variability

<u>Other ceramic objects:</u>
• Truncated cone shaped lids
• Miniaturised vessels</td></tr>
<tr><td>F. Firing</td><td>Conditions
Mostly irregular, with almost equal amount of oxidising and reducing conditions
A peculiar condition is attested in both sites for vessels homogeneously light brown
Temperature
• between 700 and 850 °C, for the samples where hematite is present and possibly also the samples with only illite/smectite;
• between 500 and 650°C, for the samples where chlorite/kaolinite is attested.</td></tr>
<tr><td>G. Wares</td><td>

</td></tr>
</table>

Table 8.3. Main characteristics of Gaudo culture ceramic production from Paestum and Pontecagnano, Middle and Late Copper Age

8.4.1. Raw materials selection

The ceramic repertoire of the Gaudo culture cemeteries at Paestum and Pontecagnano is clearly made with local raw materials (Table 8.3C), consistent with the geology of the Sele River Plain (Chapter 7). Local procurement of raw materials within the alluvial plain and surrounding hills can be inferred, within a radius of up to 10km from each site, although the complex geology of the area prevents identification of the exact sources (Chapter 4.2).

At both sites, potters selected only non-calcareous clays composed of a mixture of illite and smectite, in some cases with minor quantities of chlorite/kaolinite. Chlorite/kaolinite occurs in samples of several different petrographic fabrics and therefore is not consistently present in a specific paste recipe. This inconsistency suggests either different clay raw materials used interchangeably for the same recipe, or, more likely, a lower firing temperature for these vessels (below 600°C), accounting for the intact crystalline structure of the chlorite/kaolinite, not detectable in samples fired at higher temperatures.

Despite the similar composition of the clayey raw materials, the origin of the clays used at the two sites appears different. In the case of Paestum, the raw materials are mostly rich in iron bodies, pisoliths and volcanic tephra, which might point to an alluvial origin (Muntoni *et al*. 2015) as suggested for Paestum's Early Copper Age production. The use of a further clayey raw material can be inferred at Paestum in the case of a finer, non-calcareous clay, rich in artificially added organics (Org-Pae6), geochemically distinct from the other fabrics. At Pontecagnano, the base clay (Grog-Pnt1) contains a higher incidence of volcanics and organics. Also in this case, as suggested for the Early Copper Age, the use of a clay formed from the alteration of pyroclastic soils (De Bonis *et al*. 2013: 486) can be hypothesised based on the high levels of Zr and Nb in the samples (Chapter 7.3.3, Figure 7.22).

As far as non-plastic inclusions are concerned, the sandy fraction of fabrics Pae3 (Grog), Pae4 and Pnt3 (Qtz S) could be easily procured due to the abundance of alluvial and coastal sands around the Sele Plain. These are mostly attributed to the Gromola and Campolongo Units, as well as sandy alluvial sediments (Cinque *et al*. 2009).

The slightly different volcanic compositions of the samples from the two sites suggests that raw materials were sourced from areas specific to each site: from the northern part of the Sele Plain for Pontecagnano and from the southern part for Paestum. Only two samples from Paestum contained volcanic grains similar in size and type to those in Pontecagnano fabrics, suggesting either the use of raw materials from the northern Sele Plain or the presence of (at least) two vessels made by potters from Pontecagnano. Though this hypothesis cannot be confirmed, the similarity in the chemical composition of the samples from the two sites can be regarded as possible evidence of contact between the communities using the two cemeteries.

8.4.2. Preparation of the ceramic paste

The preparation of the ceramic paste appears very consistent across the two sites. The main ceramic recipe involves the use of non-calcareous clays tempered with grog (Table 8.3C). At Paestum, the grog-tempered paste has varying amounts of quartz-feldspathic inclusions linked either to slight differences in the base clay (fabric Pae2, characterised by a different fine fraction), or to different refinement actions (the finer subfabric Pae1a) or to the addition of sandy sediments (Pae3). The sources for the base clay may have varied, given the compositional variability of the samples, especially in minor and trace elements. At Pontecagnano, the grog fabric is characterised by a higher amount of organic materials, often burnt, and a slightly reduced amount of quartz-feldspathic inclusions in favour of larger volcanic ones. The organic materials might have been naturally present in the clay or artificially added given the consistency in the occurrence of elongated charred voids, possibly the result of plant remains added to the paste.

Only two other paste recipes are attested. One is characterised by a sandy component, in the case of Paestum most likely carefully selected and artificially added, given the well-sorted sandy inclusions (Pae4). By contrast, the sandy fabric from Pontecagnano shows no traces of refinement and retains occasional grog fragments (Pnt3). A further fabric recipe peculiar to Paestum, Org-Pae6, is characterised by a fine base clay with large voids due to the presence of organic inclusions, in some cases burnt. Clay pellets recur, suggesting an irregular clay mixing; the absence of other coarse inclusions suggests refinement by hand picking, and the addition of organics as temper.

Overall, as highlighted in Table 8.3C, the two sites display a significant homogeneity of tempering recipes, despite slightly higher variability in the fabrics and subfabrics at Paestum.

8.4.3. Fashioning and vessel types

The combined macroscopic and archaeometric data reveal a strong correspondence between paste recipes and vessel types. A high degree of homogeneity in the use of the same ceramic recipes can be recognised with respect to vessel types and categories (Figure 8.5). The grog-tempered fabric dominates across all the vessel categories. The quartz sandy fabric is used only for closed vessels, jars and cups, but in minor amounts. The organic fabric is reserved for jars. This type of temper is commonly attested for storage or large vessels, and can be explained with reference to the increased secondary porosity of the ceramic body, which reduces the weight of the vessel and increases its capacity for thermal isolation (Skibo *et al*. 1989; Martinón-Torres and Rehren 2014: 123–4) as well as the reducing excess water in the clay (Albero 2010; Maritan *et al.* 2006), allowing control of the hydration of the clay and its malleability. Jars found in Gaudo contexts are also characterised by an oxidising firing that produces a black core, probably due to the presence of organic matter, suggesting a certain standardisation of the production process.

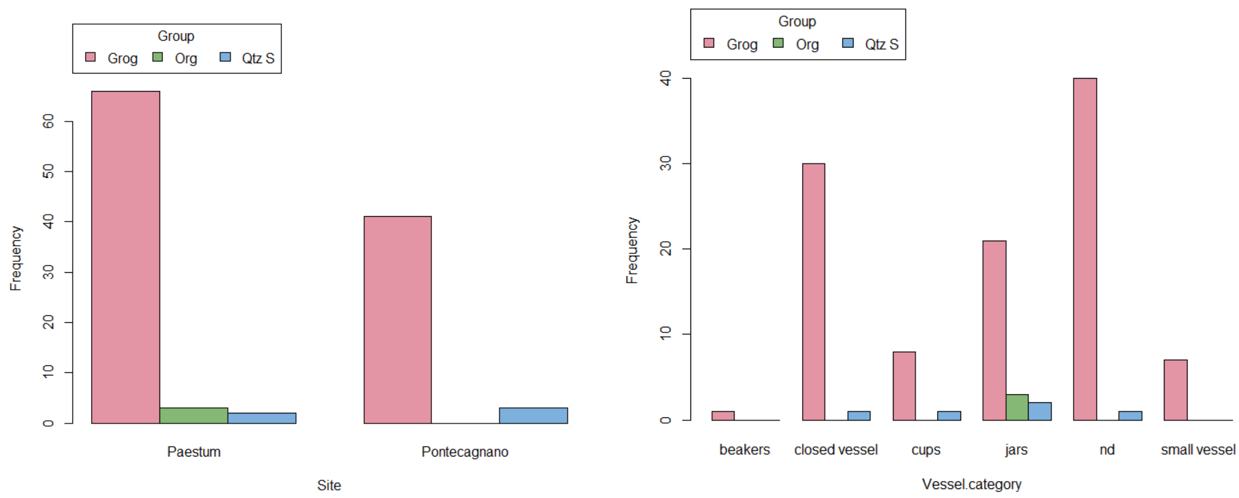


Figure 8.5. Gaudo culture. Distribution of fabric groups with respect to site and vessel category (combining both sites).

The morphology of the Gaudo ceramic assemblage at both sites is characterised by mostly composite shapes, combining more than one geometrical form. Both sites show an increase in the number of vessel types for this period, but each type has a strong internal homogeneity, including the technique of decoration and the decorative motifs used. An example is provided by the pyxides lids, generally with a truncated cone shape and mostly impressed decoration. A further type of ceramic object attested at both sites is the miniature vessel, generally roughly made and reproducing very simple shapes. In two cases these had possible holes, either for hanging or to affix an additional component made from a perishable material.

The fashioning of the vessels is homogeneous between the two sites. Coiling is widely applied (Table 8.3D), particularly for jars. The complex form of closed vessels and of some cups indicates that most were made in two stages by moulding the lower portion of the body and using coiling/slab building to create the upper part and the neck. In a few cases, however, coiling is also attested for the lower body, suggesting more than one production process. Handles were attached exclusively by inserting the protruding end of the handle into the vessel wall.

The surfaces of the vessels are mostly accurately treated, either by smoothing or burnishing (Table 8.3D), the latter being particularly common at Pontecagnano, where it is used to produce a full shine. Jars display more variability in surface treatments, with more scaled and roughly regularised surfaces. Nevertheless, smoothing and occasionally also burnishing are still the most attested treatment on jars, demonstrating a particular attention to surface treatment even for less elaborate vessel types.

Decoration is attested on 24% of the Gaudo pottery assemblage at both sites, but for Paestum, where mostly whole vessels were attested, this rises to 45%. The decorations are mostly incised (45%), in some cases combined with impressions (8%), followed by plastic (16%) and impressed (10%). The distinctive Gaudo decoration shows a recurrence of specific techniques and motifs on specific forms. The location of the decoration also follows specific rules, especially for the incised decoration of the main vessel types (jugs, small jugs, cups, *askoi*, twin vessels and handled beakers). It is particularly applied to the neck, and/or the shoulder of the vessel, with a combination of horizontal and vertical motifs (Aurino and Bailo Modesti 2007). In its linear simplicity, Gaudo decoration develops in close relation with the shape of the vessel, following or highlighting it. The decorative schemes also recurs at most sites associated with the Gaudo cultural tradition.

8.4.4. Firing

Most vessels reflect irregular firing conditions with colours ranging between brownish, reddish brown and blackish (Table 8.3F). Only a few indicate homogeneous firing conditions: mostly reducing among the closed vessels, especially jugs and small jugs, and oxidising (with a black core) for jars. A few vessels also display a homogeneous light brown colour that suggests a lower iron presence in the clay and some control of oxidising firing conditions.

All the vessels were fired at temperatures below 800–850°C, and possibly above 700°C when haematite is present (Table 8.3F). The presence in some samples of chlorite/kaolinite (detected by XRD) suggests that some vessels were fired at temperatures below 650°C. The high optical activity of the matrix in thin section and the flaky texture of most vessels, especially at Paestum, also points to firing temperatures that were not particularly high.

8.4.5. Wares

The various wares (scaled, rough and finished) seem to correspond to other characteristics. Finished ware is the most common at Paestum, while rough ware dominates at Pontecagnano (Table 8.3G). As mentioned above, this might be due to a higher presence of fragmented vessels at Pontecagnano compared to Paestum, which was excavated in unusual circumstances and with a possible preference for the collection of whole vessels, especially from the burial chambers. The scaled ware and finished/rough ware are represented by only a few samples (Table 8.3G). As displayed in Figure 8.6, all the wares are associated with the predominant grog-tempered fabric and, in far smaller amounts, with the quartz sandy fabric. Only the organic-tempered fabric is used for rough ware, particularly for jars (see Figure 8.7). The finished ware occurs in most of the vessel types, often exclusively. Jars have only rough and scaled finishes, which also occur on closed vessels, cups and handled beakers. The same trends can be detected across the whole ceramic assemblage.

Differences in the thickness ranges of the different wares can also be detected, with the finished ware (and the finished/rough ware) characterised by thinner walls (0.2–1.5cm, generally thicker for large, closed vessels), with higher values for the rough and scaled wares (0.3–2.0cm and 0.4–1.1cm respectively).

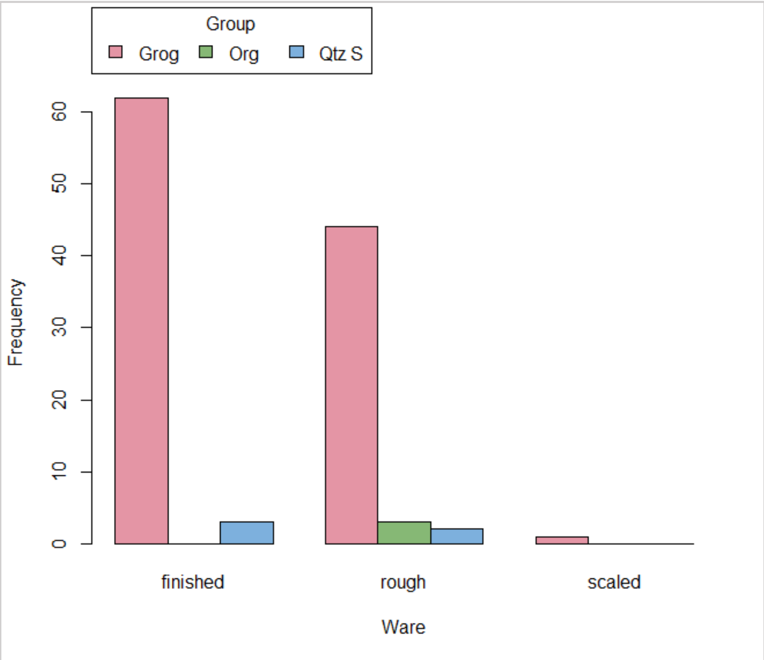


Figure 8.6. Gaudo. Distribution of fabric groups with respect to wares.

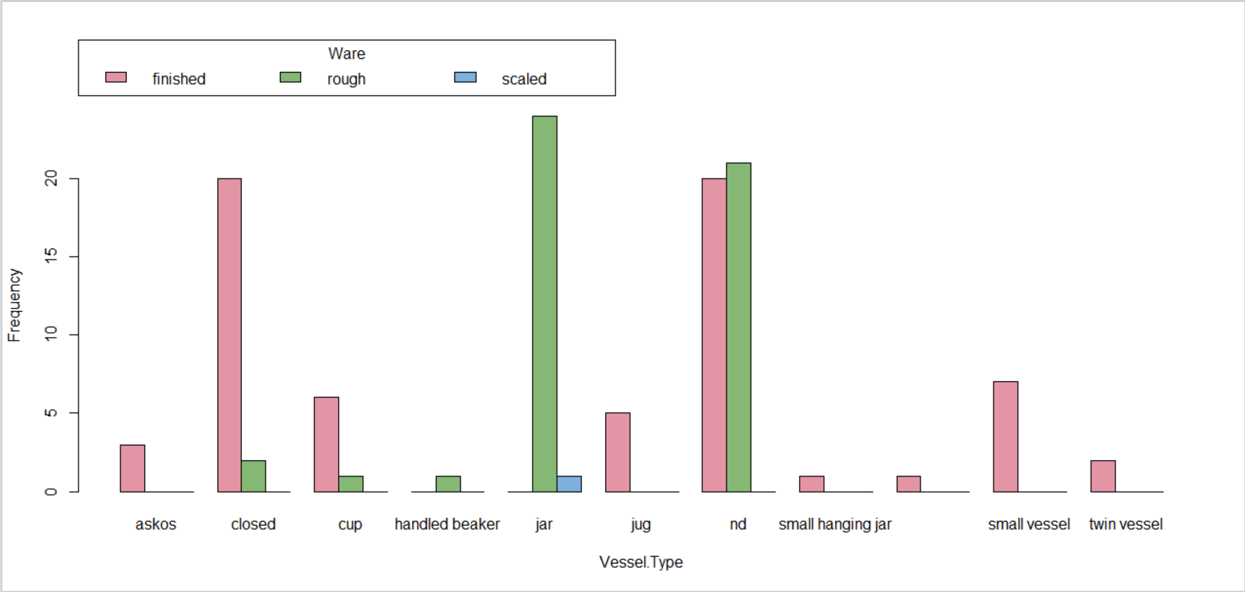


Figure 8.7. Gaudo. Distribution of wares with respect to vessel type.

8.4.6. General observations regarding Gaudo ceramic production

Overall, the ceramic production attested at the Gaudo cemeteries of Paestum and Pontecagnano shows great typological and technological homogeneity, suggesting a common production process used by potters of the two communities, each using their own local raw materials. The high number of types and their strong internal consistency proves a shared knowledge and operational sequence at the basis of this highly coded ceramic repertoire, reflected also in the codified use of the vessels in the funerary ritual, as exemplified by the distinction between vessel types occurring in shafts and those in chambers (see Chapters 2 and 6.2-3).

Despite its accuracy, especially in surface treatment, the highly finished Gaudo culture repertoire is rarely made of fine paste recipes. The use of coarse fabrics might relate to the complexity of many of the shapes, requiring an enhanced workability of the clay and increased stress resistance, ensured by the addition of temper (mostly grog) and use of slightly coarser clays (Rice 1987). The composite vessels were shaped with multi-staged processes involving moulding for the lower part and coiling/slab building for the upper part, with intermediate drying phases (Roux 2019: 160). In the case of some smaller closed vessels or irregular ones such *askoi*, coiling and slab building are also attested for the lower portion. This variety in forming techniques perhaps suggests different degrees of skill or slightly different forming traditions.

As mentioned in Chapter 2, the typology of Gaudo vessels has often been interpreted as Aegean-derived based on parallels made with varying degrees of rigour. The macroscopic and archaeometric analyses carried out in the present study proved that all the vessels were produced with local raw materials and in continuity with previous practices (such as the use of grog, the raw materials exploited, the use of the scaled decoration, etc.).

Archaeometric and technological data are available for only a few other sites attributed to the Gaudo cultural tradition: the cemetery of Piano di Sorrento in Campania (De Rosa and Piccioli 2006), and three sites in the area of Rome (Forte 2020). At Piano di Sorrento, radiocarbon dated to 2921–2696 cal BC (see Chapter 2, Table 2.2), petrography in thin section was carried out on nine samples, highlighting the use of a raw material rich in volcanics - probably a clay derived by the alteration of pyroclastic materials, quite common in the area given the proximity to Campanian volcanic complexes. Also in this case, firing temperatures appear to have been quite low (estimated between 600 and 800°C) due to the incomplete decomposition of clay phases.

In the area of Rome more comprehensive data are available for two settlements, Casetta Mistici (3350–3010 to 2920–2830 cal 2σ) and Tor Pagnotta (3340–3000 to 3030–-2830 BC cal 2σ) (Anzidei and Carboni 2020: 147) and a cemetery, Torre della Chiesaccia 3100–2890 cal 2σ; Anzidei and Carboni 2020: 147). These archaeometric data also indicate a preference for grog-tempered fabrics often rich in volcanics, with an illitic non-calcareous base clay, except for one calcareous sample from Torre della Chiesaccia (Aurisicchio and Medeghini 2020). Grog temper was preferred for jars, probably to enhance their refractoriness (Forte *et al*. 2018). Firing temperatures were mostly between 800 and 950°C, and the same fashioning techniques by coiling and moulding can be recognised. The use of beating as a primary or secondary shaping technique is also hypothesised based on X-ray analyses on jugs from the cemetery (Hamon *et al*. 2005; Martineau 2005; Forte 2020: 106). This type of shaping technique was not detected at the sites analysed in Campania, where the high finishing of the vessels hinders its detection. Nevertheless a targeted observation, with the help of X-ray analysis might further clarify this point. The surface treatment, analysed in detail through macro-traces on ceramics from both settlements and tombs in the area of Rome, is particularly accurate, including some features unique to the Rome area (sites of Casetta Mistici, Tor Pagnotta and Torre della Chiesaccia) such as regularisation of the surface using the fingers followed by smoothing or burnishing with soft tools. Overall, the ceramic products from settlements and cemeteries in the Rome area appear homogeneous in terms of technological choices, while differing for the vessel types attested.

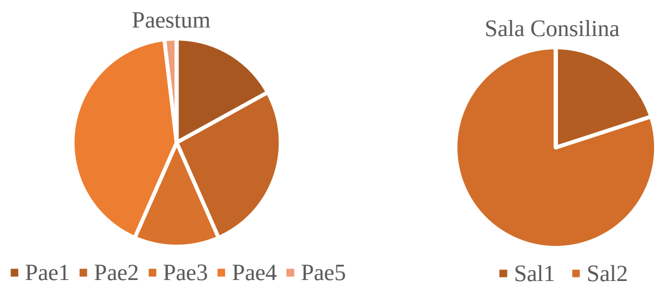
While distinctive Gaudo vessel types such as jugs, *askoi*, pyxides and twin vessels are attested in cemeteries, they are rare in villages. The lack of forms suitable for pouring and of the twin vessels in domestic contexts within the Gaudo communities may suggest a partly differentiated ceramic production for living and funerary purposes with these specific forms reserved for mortuary ritual, as further addressed in Chapter 9.

8.5. Middle and Late Copper Age (3100–2300 BC): Laterza culture

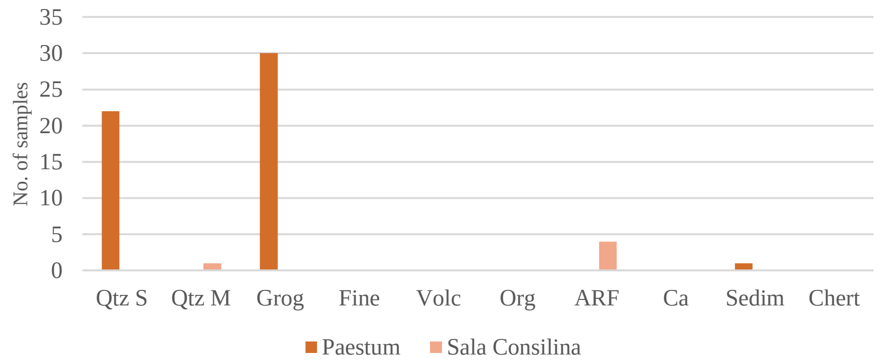
A third cultural tradition, known as Laterza, starts in the 4th millennium and continues into the 3rd millennium BC, with radiocarbon dates from sites in Campania mostly concentrating between 2900 and 2350 BC, with the addition of an earlier date centred on 3300 BC for the site of Castel Baronia. The archaeology of this culture in Campania is mostly characterised by a few rock-cut, collective tombs and large villages with attached cemeteries of single flat graves. In the present study, the Laterza cultural tradition was analysed at the sites of Paestum and Sala Consilina, Phase II. As a further means of comparison, the few Laterza culture funerary and ritual contexts known for Pontecagnano, locality S. Antonio, were also analysed. The main observations are summarised in Table 8.4 and discussed in detail below.

<table>
<tr><th colspan="2">Middle/Late Copper Age – Laterza, 3300-2300 BC</th></tr>
<tr><td>A. Chronology</td><td>3339 - 2350 ca. BC
Radiocarbon dates of the main contexts (see Chapter 1)</td></tr>
<tr><td>B. Sites - contexts</td><td>Paestum - Cerere cemetery, funerary; Agorà II, living area and funerary
Pontecagnano – S. Antonio burials, funerary, <u>only macroscopic data</u>
Sala Consilina – pit graves, Phase II, funerary</td></tr>
<tr><td>C. Raw materials procurement and processing</td><td>

Petrographic Fabrics



Fabric Groups



Mineral composition (XRD)

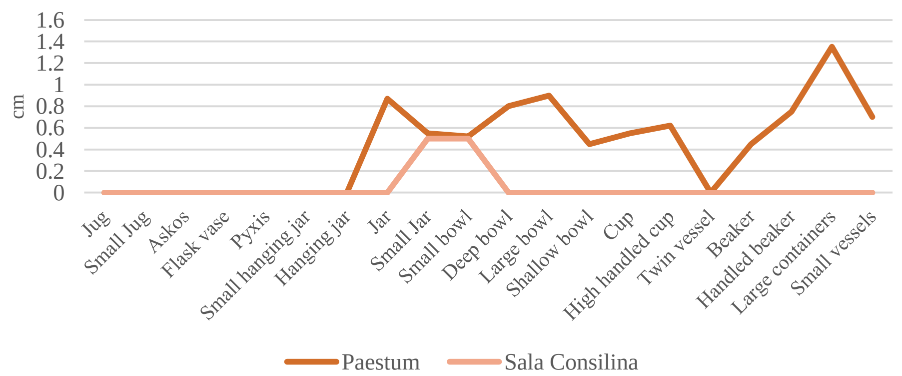
Main composition with few exceptions: Quartz, plagioclase, k-feldspars, illite/muscovite, smectite component
6 samples from Paestum lack the smectite component
Hematite, pyroxene and hornblende are attested respectively in three samples from Paestum

</td></tr>
<tr><td>D. Fashioning</td><td>

Shaping techniques attested

Coiling and slab building
Moulding for small and shallow bowls
Handle fixed either by spreading or piercing on the vessel surface

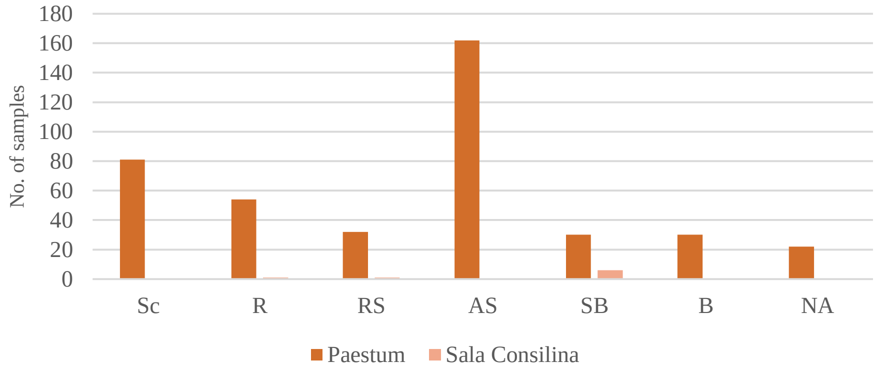
Wall thickness



</td></tr>
</table>

<table>
<tr><td>D. Fashioning</td><td>

Surface treatment

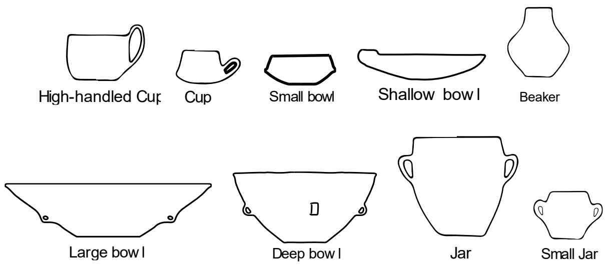


Decoration

Decorated (55%) – Undecorated (45%)
Scaled (37%), plastic (27%), incised (20%), impressed (7%), impressed and incised (4%), grooved (2%), plastic and impressed (2%), plastic and incised (0.4%)

</td></tr>
<tr><td>E. Forms</td><td>

Types



Morphology

- Simple shapes
- Low number of types but high internal variability

<u>*Other ceramic objects (from Paestum):*</u>

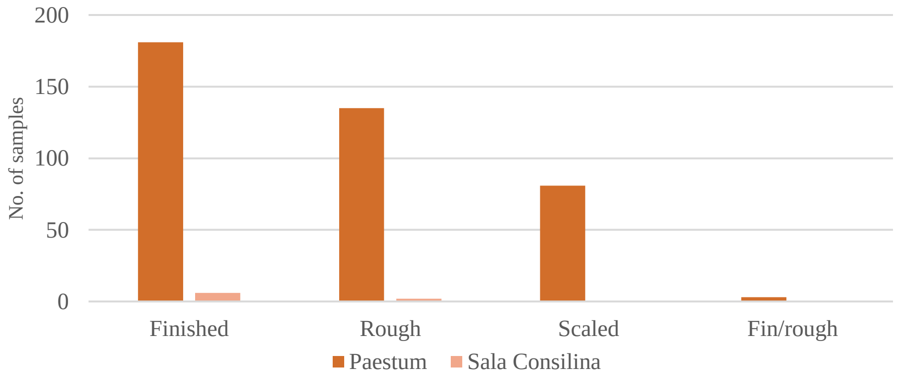
- Movable slabs
- Tuyere
- Boiler lids/spout
- Spindle whorl and loom weights
- Fragment of wattle and daub

</td></tr>
<tr><td>F. Firing</td><td>

Conditions: Mostly irregular or oxidising, in some cases reducing especially for small and shallow bowls

Temperature: 700-850 °C
In the sample where hematite is detected by XRD surely above 700°C

</td></tr>
<tr><td>G. Wares</td><td>



</td></tr>
</table>

Table 8.4. Main characteristics of Laterza ceramic production, Middle and Late Copper Age.

8.5.1. Raw material selection

The Laterza ceramic repertoire at Paestum and Sala Consilina is clearly made with local raw materials (Table 8.4C and Chapter 7), consistent with the geology of the Sele River Plain and of the Vallo di Diano.

The raw materials used for Laterza style ceramics at Paestum clearly match those used for Gaudo style ceramic production at Paestum, sourced to the alluvial plain and surrounding hills. The clay composition is a similar mixture of illite and smectite but lacking any chlorite/kaolinite component. In 6 of the 31 samples analysed by XRD, no smectitic component was detected, suggesting either the use of a different smectite-poor clay or, most likely, a higher firing temperature used for the samples lacking the smectite peaks, as also suggested by the lower optical activity of Laterza samples in thin section. Despite this homogeneity in the raw materials with the partly contemporaneous Gaudo tradition (grog-tempered, quartz sandy and sedimentary), there is a sharp increase in the exploitation of quartz-feldspathic sandy fabric, used in 37% of the samples, though the grog-tempered fabric still dominates (51%).

A contrast in procurement of raw material is evident only for the sedimentary fabric, Pae5, which is rich in mudstones, and lacks the main quartz-feldspathic component characterising the other fabrics. This clay-rich fabric is attested only in one sample. Similar clay-rich pastes are used at Sala Consilina, where the most used raw material is a clay rich in ARF and clay pellets and a few coarser inclusions. Only in one sample was the quartz metamorphic fabric typical of Taurasi culture ceramic production at the same site (see Section 8.3 above), suggesting a degree of continuity with this earlier tradition.

8.5.2. Preparation of the ceramic paste

Preparation of the ceramic paste is not easily comparable between the two sites due to the small number of samples from Sala Consilina, but some major trends can be recognised (Table 8.4C). Potters exclusively selected non-calcareous clays which were either tempered with grog or which were rich in a quartz-feldspathic sand that was either naturally present or artificially added. Non-calcareous fabrics rich in ARF and mudstones are also common (Pae5 and Sal2) clearly pointing to the use of a clay-rich paste. These different compositions result in differences in the performance of the vessels: greater resistance to physical shock for quartz-rich vessels (Kilikoglu *et al*. 1998; Vekinis and Kilikoglou 1998) and greater resistance to thermal shock for those tempered with grog (Tite *et al*. 2001; Warfe 2015).

8.5.3. Fashioning and vessel types

Combined macroscopic and archaeometric data reveal a moderate correspondence between paste recipes and vessel types, but with slightly different traditions evident for each site (Figure 8.8A, Table 8.4D). Overall, two main trends can be recognised: the use of a quartz-rich temper (sandy for Paestum, Qtz S; metamorphic for Sala Consilina, Qtz M), and the use of a clay-rich fabric (grog-tempered for Paestum, Grog; rich in ARF for Sala Consilina, ARF and, in one case, in Paestum, Sedim).

The distribution of the fabric groups with respect to vessel categories and types reveals preferences in the use of specific recipes for particular vessel types (Figure 8.8B–C). Grog temper was preferred for boiler lids, high-handled cups, small vessels and the tuyère. Jars are made exclusively with the quartz sandy fabric, preferred also for small bowls and small jars. Large containers appear in all the fabric groups. Clay-rich grog or ARF fabrics were probably more suitable for small, highly finished containers, while the quartz-rich fabric enhanced the toughness and shock resistance of jars. Overall, a moderate specialisation of the paste recipes relative to vessel shapes can be inferred, although this is never exclusive.

The morphology of the vessels at both sites is characterised by a great simplicity, with geometric shapes that are rarely composite, and by a preference for open vessels over those with closed necks (Table 8.4E). The number of vessel types is reduced compared to the Gaudo culture, but they display a high level of internal variability in terms of morphology and decoration. For example, small bowls, which are characteristic of the Laterza cultural phase, especially as grave goods, are either simple hemispheres or rounded forms, but may have overhanging rims, slightly everted rims, a small carination, etc.

At Paestum, where a Laterza culture domestic area was also investigated, several objects are documented that are suitable for daily activities, such as portable slabs, a tuyère, a boiler lid, a possible spouted vessel, spindle whorls and loom weights. These technical ceramic forms hint at a diversification of the ceramic production process for certain activities that is rarely attested in earlier contexts in Campania or more in generally in Southern Italy.

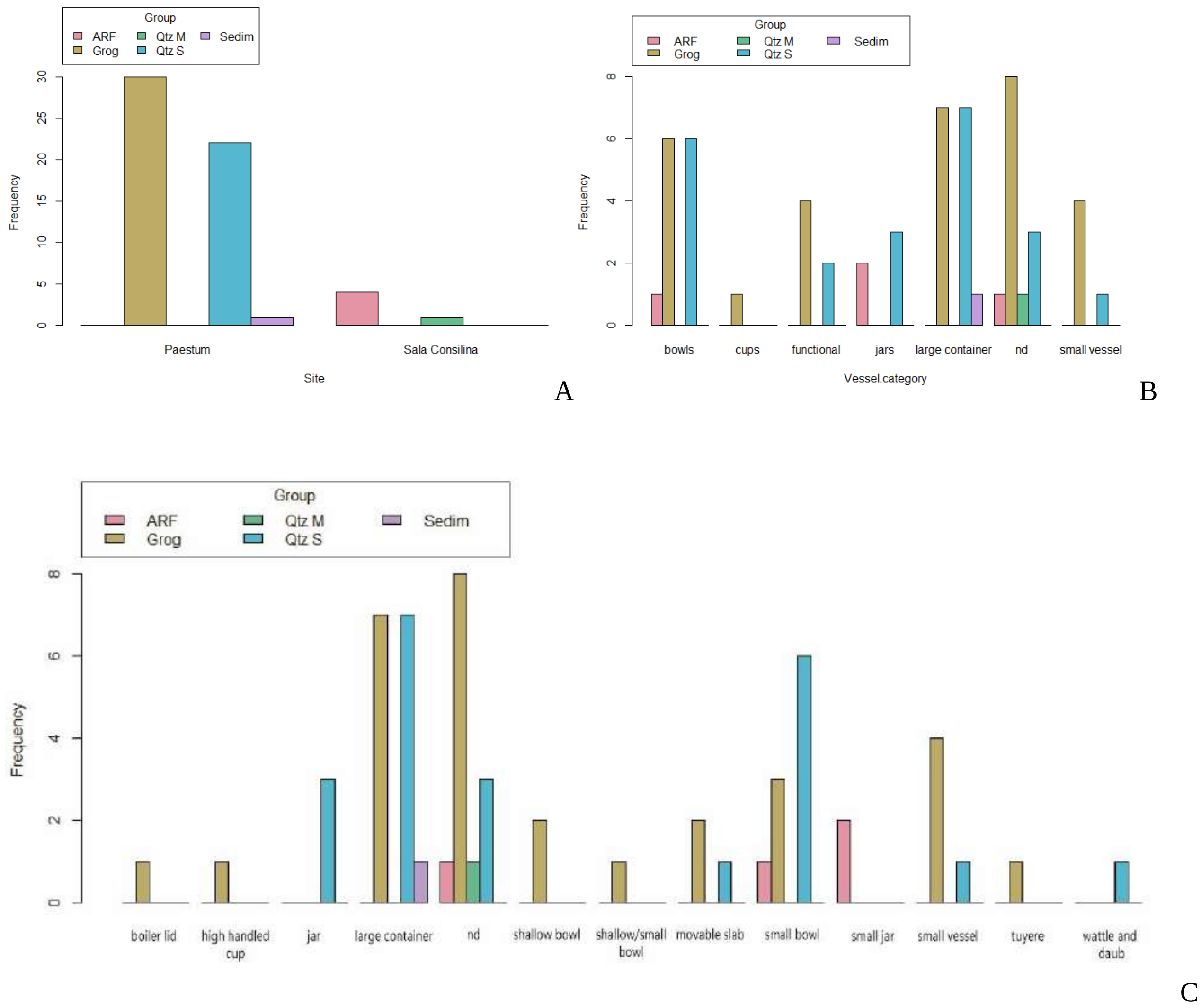


Figure 8.8. Laterza. Distribution of fabric groups in relation to site (A), vessel category (B) and vessel type (C).

The manufacture of Laterza style vessels most commonly employed long-standing traditions such as coiling and slab building (Table 8.4D). In the case of shallow and small bowls, moulding was the preferred shaping technique, in some cases combined with coiling for the upper part of the vessel. Handles were either fixed to the vessel wall by spreading or by piercing the vessel surface.

The treatment of the surfaces depends on the vessel category. Small vessels such as small bowls, shallow bowls, cups and small jars were mostly accurately treated, either by smoothing or burnishing (Table 8.4D). Accurately smoothed surfaces are the most common, especially for grave goods, which in some cases also display smoothed/burnished and burnished surfaces. By contrast, large containers, jars and large and deep bowls are mostly roughly smoothed or rough. There is also a higher incidence of scaled surfaces covering a large portion of the vessel, in some cases extending to the base.

Decoration is an important feature of Laterza ceramic production, observed on 55% of the total sample. Scaled decoration is the most common, and generally reserved for jars or large/deep bowls, followed by plastic (27%) and incised (20%) decoration, and minor amounts of the other techniques. The decoration of Laterza ceramics is distinctive in its high variability of motifs and techniques. Smooth or impressed cordons, and incised and impressed motifs show recurring features, such as their occurrence near the rim of the vessel, but they are combined in varied and innovative ways, and rarely duplicated. Within this varied repertoire, some motifs do however recur; for example, an incised radial decoration on shallow bowls or a band filled with impressions or incisions on small bowls. These patterns are often combined with plastic decoration on the rim or handles. The decoration on the Bell Beaker fragment, produced using a comb, is a clear innovation compared to the usual repertoire.

8.5.4. Firing

Most vessels show evidence of irregular firing conditions, with colours ranging between brownish, reddish brown and blackish (Table 8.4F). Only a small proportion (represented especially by small and shallow bowls) are characterised by more homogeneous reducing firing conditions.

Vessels were all fired below 800–850°C, and above 700°C when haematite is present (Table 8.4F). The low optical activity of many of the samples and their compact texture suggests relatively high firing temperatures near to 800°C. The absence, in this phase, of any chlorite/kaolinite component might be further evidence of slightly higher temperatures for Laterza pottery production compared to Gaudo.

8.5.5. Wares

For this Laterza cultural phase, ceramic products were divided into wares based on the criteria proposed for Copper Age pottery, distinguishing between scaled, rough and finished wares. The finished ware is the most common at the sites analysed (Table 8.4G), but with a high representation of rough and scaled ware (Table 8.4G).

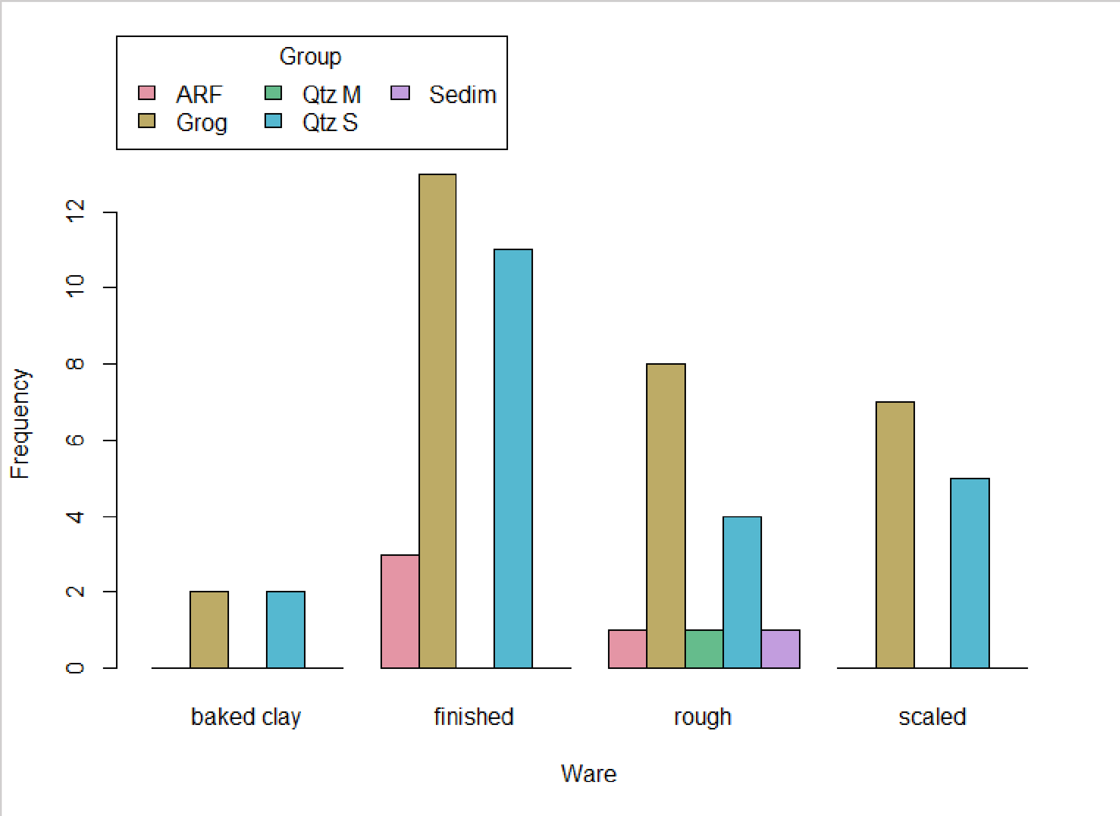
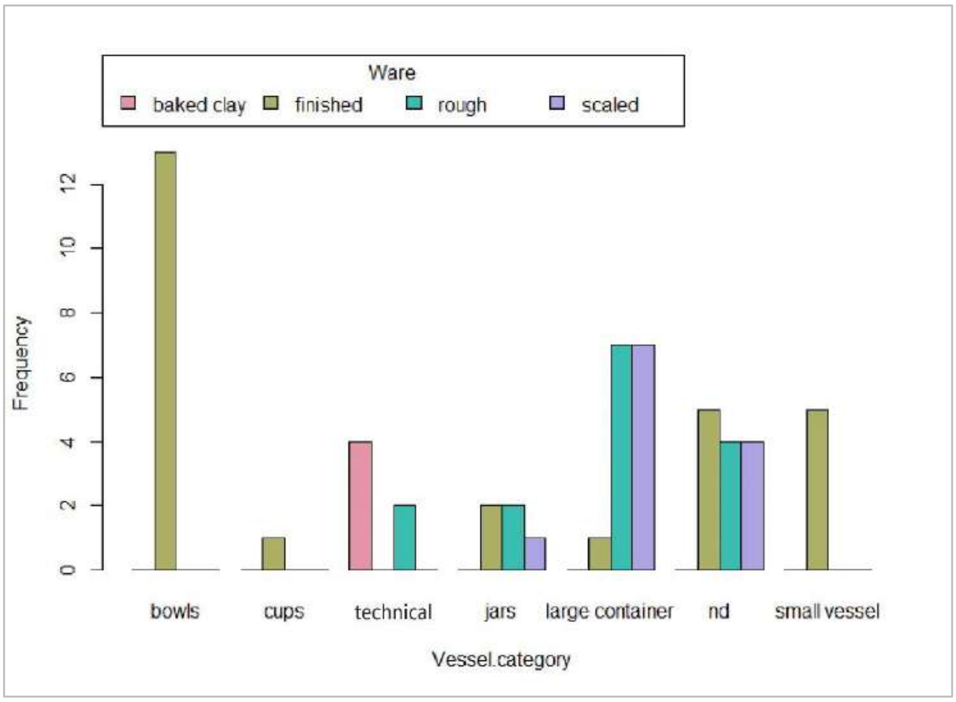


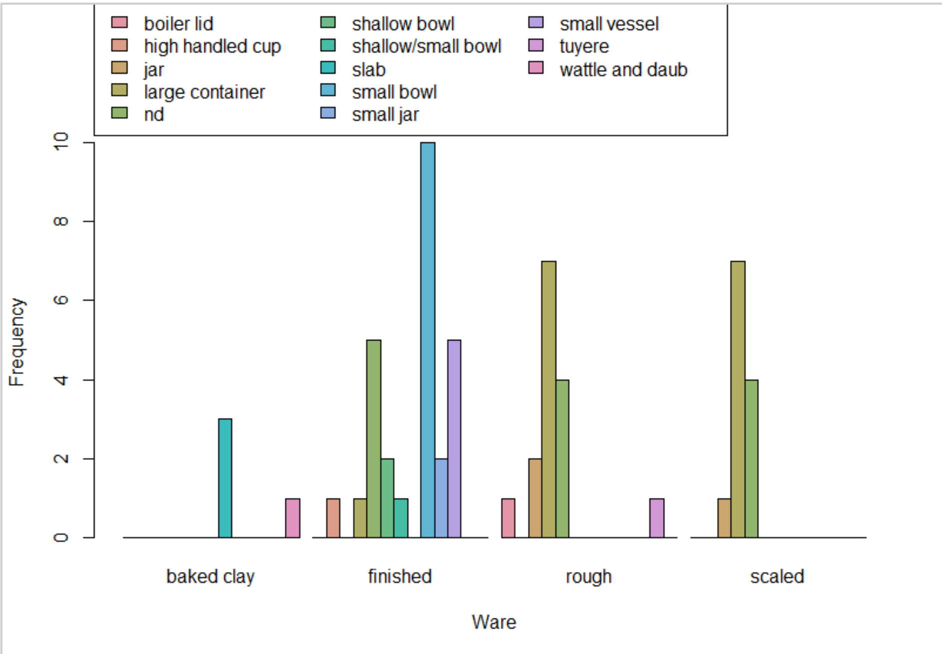
Figure 8.9. Laterza culture. Distribution of fabric groups in relation to wares.

As displayed in Figure 8.9, all wares are made with both the grog-tempered fabric and with the quartz sandy fabric. The ARF group is most common in the finished ware, while the quartz metamorphic and sedimentary fabrics are attested only in the rough ware.

Wares display a moderate correspondence to vessel categories and types. As displayed in Figure 8.10, the finished ware occurs in most vessel types, but small bowls, shallow bowls, small jars, high-handled cups and small vessels are exclusively made of finished ware. By contrast, jars and large containers are almost exclusively of rough and scaled wares. Differences in the thickness ranges of the different wares can also be detected, with the finished ware and the finished/rough ware characterised by thinner walls (0.2–1.2cm), compared to higher values for the rough ware and scaled ware (0.3–2.1cm and 0.5–2.0cm respectively).



A



B

Figure 8.10. Laterza culture. Distribution of wares with respect to vessel category (A) and vessel type (B) as presented in Chapter 5.2.1.

8.5.6. General observations regarding Laterza culture ceramic production

Overall, Laterza culture ceramic production at the Campanian sites analysed is characterised by a restricted number of vessel types but a high internal variability, both in morphology and in technological choices. The simple morphologies of the vessel types (which are rarely composite) display a high variability in single attributes (shape of the rim, carination, etc.) and in decorations. This trend is also reflected in the raw materials and fashioning traditions. The two sites analysed display different preferences for ceramic recipes: rich in quartz-feldspathic sand or grog-tempered at Paestum, rich in ARF at Sala Consilina. At the latter, however, the studied samples were all fine, small vessels deposited as grave goods, preventing a more comprehensive comparison with Paestum. Besides fabric recipes, no major technological differences can be detected between the contexts analysed. No closed vessels such as jugs or *askoi* were detected at either site. However, in the settlement context of Paestum, the ceramic repertoire extended to other technical objects involved in daily productive activities, such as processing of materials (portable slabs), food processing (boiler lids), metalworking (tuyère), and weaving (spindle whorls and loom weights).

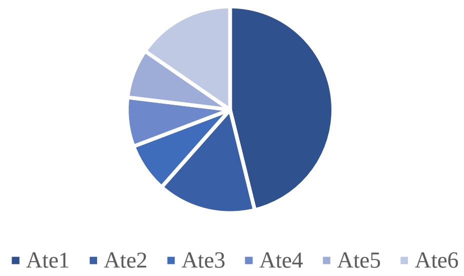
The Laterza culture ceramic repertoires from Paestum, Sala Consilina and Pontecagnano have a broadly similar style and aesthetic with recurring features such as shallow bowls with radial decorations, plastic appendages on handles, and bowls with raised rims. Nevertheless, the variability created by the combinations of these specific features is extremely broad, both between the sites analysed and compared with the wider Italian Laterza ceramic repertoire, which is associated with a variety of contexts in caves, rock-cut tombs, settlements and trench grave cemeteries, widespread across Southern and Central Italy (Anzidei and Carboni 2020: 152). In all these contexts, as in the sites analysed here, there are recurrent inter-regional features as well as local variations. The general impression is that potters had freedom to improvise creatively within and beyond a widely shared model, with ‘foreign’ influences often adopted and modified. The Bell Beaker style, for example, is represented by a fragment found at Paestum, while this style was also locally adapted at the Campanian site of Acerra, Gaudello (Aurino and De Falco 2022) and further north in the area of Rome (Forte 2020).

Middle-Late Copper Age ceramics have been particularly well investigated for the area of Rome (Forte 2020), and are generally assigned to the Laterza (c. 2800–2600 BC) and Ortucchio (2600–2150 BC) stylistic traditions. The sites analysed in the present study find comparisons mostly with the Laterza repertoire but characteristic Ortucchio style features have been identified at some coeval or slightly later contexts in Campania more generally assigned to the Laterza tradition, e.g., Acerra, loc. Gaudello (Aurino and De Falco 2022), and Afragola, V section (Nava *et al*. 2007). Ortucchio ceramic production is characterised by the common decorative use of dragged or impressed combs, reflecting a strong Bell Beaker influence in the patterns (Anzidei and Carboni 2020: 223–8). The data available for the area of Rome indicate a trend from coarser and less accurately finished vessels at Laterza culture sites to an increase in the use of fine fabrics at (slightly later, Late-Final Copper Age) Ortucchio culture sites, with highly smoothed or burnished surfaces, and a specialisation of fabric recipes, with fine fabrics used for small vessels and coarser ones for cooking pots. The repertoire analysed for Campania displays a moderate specialisation of the fabric recipes but still no trace of truly fine fabrics.

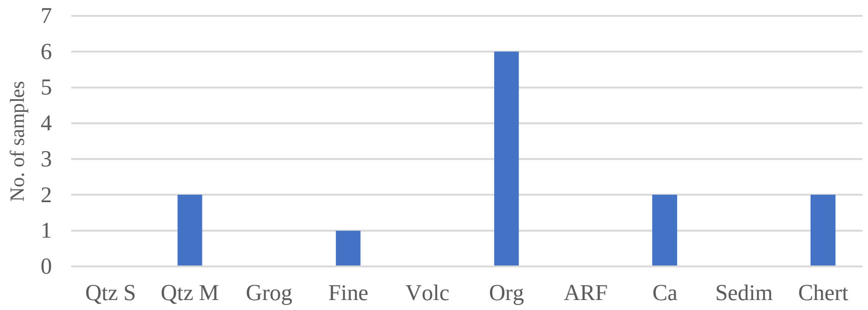
8.6. Final Copper Age (2300–2100 BC): Cetina style

The Final Copper Age in Campania is dated at only a few sites and overlaps with the earliest evidence of the Early Bronze Age Palma Campania cultural tradition (2366-1829 cal. 2σ; Lanos *et al.* 2020). This phase is characterised archaeologically by a variety of evidence (settlements, cemeteries etc.), only recently discovered and therefore not fully published (Talamo *et al*. 2011; Albore Livadie 2014; Arcuri *et al*. 2016). For the purposes of the present research, a preliminarily analysis for this period was carried out for Atena Lucana, a site that is still under investigation, radiocarbon dated to 2568–2067 2σ cal BC, and characterised by the occurrence of Cetina-style pottery (see Chapter 2, Table 2.2). The main observations are summarised in Table 8.5 and discussed in detail below.

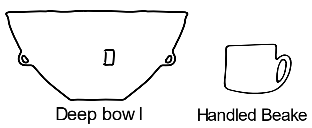
<table>
<tr><th colspan="2">Final Copper Age – Cetina style, 2300-2200 BC</th></tr>
<tr><td>A. Chronology</td><td>2568-2067 BC
Radiocarbon dates of the site of Atena Lucana (see Chapter 1)</td></tr>
<tr><td>B. Sites - contexts</td><td>Atena Lucana – Fossa Aimone settlement, living</td></tr>
<tr><td>C. Raw materials procurement and processing
(only for the representative vessels analysed)</td><td>Petrographic Fabrics



Fabric Groups



Mineral composition (XRD)
Ate1 (Org), Ate2 (Chert), Ate5 (Fine): Quartz, plagioclase, k-feldspar, illite/muscovite, smectite component
Ate3 (Ca): Quartz, illite/muscovite, smectite component, calcite
Ate4 (Ca): Quartz, plagioclase, k-feldspar, illite/muscovite, smectite component, calcite
Ate6 (Qtz M): Quartz, plagioclase, k-feldspar, illite/muscovite, smectite component, in one sample pyroxene</td></tr>
<tr><td>D. Fashioning
(only for the representative vessels analysed)</td><td>Shaping techniques, Wall thickness, Surface treatment
Not available due to the small sample preliminarily analysed
Decoration
Innovative decoration motives and techniques such as the impressed triangles</td></tr>
<tr><td>E. Forms
(only for the representative vessels analysed)</td><td>Most representative types



Morphology
Variety of simple and composite shapes
Innovative shapes in handles and everted necks for the beakers, holed handles
<u>Other ceramic objects:</u>
The preliminary macroscopic analysis highlighted several ceramic objects such as spoons, spindle whorls, loom weights, a sieve and a tuyere</td></tr>
<tr><td>F. Firing
(only for the representative vessels analysed)</td><td>Conditions: either oxidising or reducing but in both cases rather homogenous

Temperature: below 850°C in all the samples except for the fine fabric (Ate5) displaying a degree of vitrification and therefore suggesting a temperature of 850-900°C</td></tr>
<tr><td>G. Wares</td><td>All attested</td></tr>
</table>

Table 8.5. Main characteristics of Cetina style ceramic production at Atena Lucana, Final Copper Age.

As clarified for each section in Table 8.5, the following observations are representative only of specific vessel types and classes, given the preliminary stage of the analyses. A future, comprehensive analysis of the whole ceramic assemblage will allow further consideration of the overall compositional and technological features occurring at the site. Observations were carried out particularly on materials linked to specific products such as: a large bowl and five fine vessels of Cetina style; four large containers and one jar; one vessel with scaled decoration (representative of the typical Copper Age ware); and one fragment of baked clay probably belonging to a functional combustion structure (e.g., hearth or oven).

8.6.1. Raw material selection

The 13 samples analysed for Atena Lucana revealed a high degree of variability in the raw materials, all consistent with the local geology of the Vallo di Diano (Table 8.5C). The site is located about 6km north-west of (Middle-Late Copper Age) Sala Consilina in an alluvial plain rich in materials suitable for ceramic production.

Non-calcareous clays with a mixed illite-smectite composition were preferred for pottery making. Only in the case of the baked clay (Ca-Ate4) might the base clay be calcareous, but the abundant presence of calcareous inclusions and secondary calcite prevents a clear identification. The raw material used for the most abundant fabric (Org-Ate1) is quite poor in mineral inclusions, suggesting a possible refinement of the base clay or the use of a fine raw material that was rich in organics (which do not appear to have been artificially added). The occasional inclusions attested are mostly sedimentary with a few volcanics, matching the sedimentary profile of the alluvial plain. Iron-rich bodies and pisoliths in fabric Ate2 (Chert) also suggest an alluvial origin for the base clay. A trait of the ceramic production peculiar to Atena Lucana is the common presence of chert (Ate2) and silicified bioclasts/radiolarites (Fine-Ate5), specific to the Rhaetian–Jurassic radiolarites and reddish, greenish and violet silicified argillites typical of the 'Scisti Silicei' formation outcropping in the area of Sala Consilina (Vitale and Circia 2018: 14), but probably also outcropping in the detrital conoids of the area of Atena Lucana.

Calcareous inclusions are attested in three fabrics (Ate1b, Ate3 and Ate4), mostly occurring as micritic calcite and, in a few cases, spathic calcite. Their occurrence is also consistent with the local geology since the site of Atena Lucana lies on the piedmont of the Maddalena Mountains, a carbonatic massif of the Apennine Platform (Amicucci *et al*. 2008; Sgrosso *et al*. 2010). As already described for the nearby site of Sala Consilina

(Section 8.3.1) the Quartz metamorphic fabric is also used in this Final Copper Age phase, occurring in two samples, and can be traced to a raw material procurement tradition already present in the second half of the 4th millennium BC.

8.6.2. Preparation of the ceramic paste

In the few samples analysed, a degree of variety in the preparation and processing of the raw materials can be detected: the six petrographic fabrics recognised correspond to six different recipes. Two finer fabrics, Org-Ate1 and Fine-Ate5, seem to lack any addition of temper. They are characterised by very different compositions and sorting which, in the case of the organic-rich clay (Ate1 and its variants), suggests an artificial refinement by removal of coarser grains. The poorly sorted quartz-rich fabric, Ate5, indicates the use of a naturally finer base clay with few coarser grains. The ARF and organics-rich fabric (Ate1) is characterised by an internal variability, probably due to variations in the source and in its processing and, in one case, the presence of rounded calcareous grains.

A clear paste recipe, Ate2, not attested in any of the other contexts analysed, comprises an iron-rich clay with the addition of angular chert as temper. In the coarse calcareous fabric, Ate3, the angular micritic calcite probably represents an artificial addition as temper together with grog which occurs frequently. Another tempering tradition is indicated by the quartz-metamorphic grains (QtzM-Ate6), previously attested at Sala Consilina during the Taurasi phase.

The ceramic paste used for the baked clay (Ca-Ate4) is coarse, with various poorly-sorted inclusions, suggesting the use of an unrefined base clay rich in carbonatic inclusions, or a clayey sediment, to which were added large organic components, visible macroscopically, to construct a functional structure.

8.6.3. Fashioning and vessel types

The combined macroscopic and archaeometric data allow various observations to be made regarding the use of specific paste recipes for particular vessel types (Figure 8.11). Large containers were made using a variety of paste recipes: the finer organic-rich fabric group (Ate1), the chert-tempered (Ate2), and the carbonatic and grog-tempered fabric (Ate3). Finer fabrics (Ate2 and Ate5) were used for the large bowl and the jar. Differences in the fabrics might also relate to functional differences within the same category of large containers, which includes large jars and a large/deep bowl generally suitable for storage, processing and cooking. The large bowl does not show any exposure to fire and is the only vessel that is finely decorated. The different fabrics have specific characteristics reflecting the properties of the various ceramic pastes. The organic-rich pastes resulted in fabrics with increased porosity and thermal isolation (Skibo *et al*. 1989; Martinón-Torres and Rehren 2014: 123–4), whereas pastes tempered with chert or grog and calcite had enhanced workability and the resulting fabrics had increased shock resistance (Rice 1987: 354).

A different composition was reserved for fine vessels. Four cups or beakers were made with the ARF and organics-rich recipe, Ate1, which was particularly suitable for thin, smoothed/burnished vessels, all fired in reducing conditions. In only one case was the quartz metamorphic fabric, Ate6, used for a small vessel, characterised by an accurately smoothed surface but a firing in fully oxidising atmosphere. The scaled vessel was manufactured with a quartz metamorphic fabric similar to those attested at Sala Consilina.

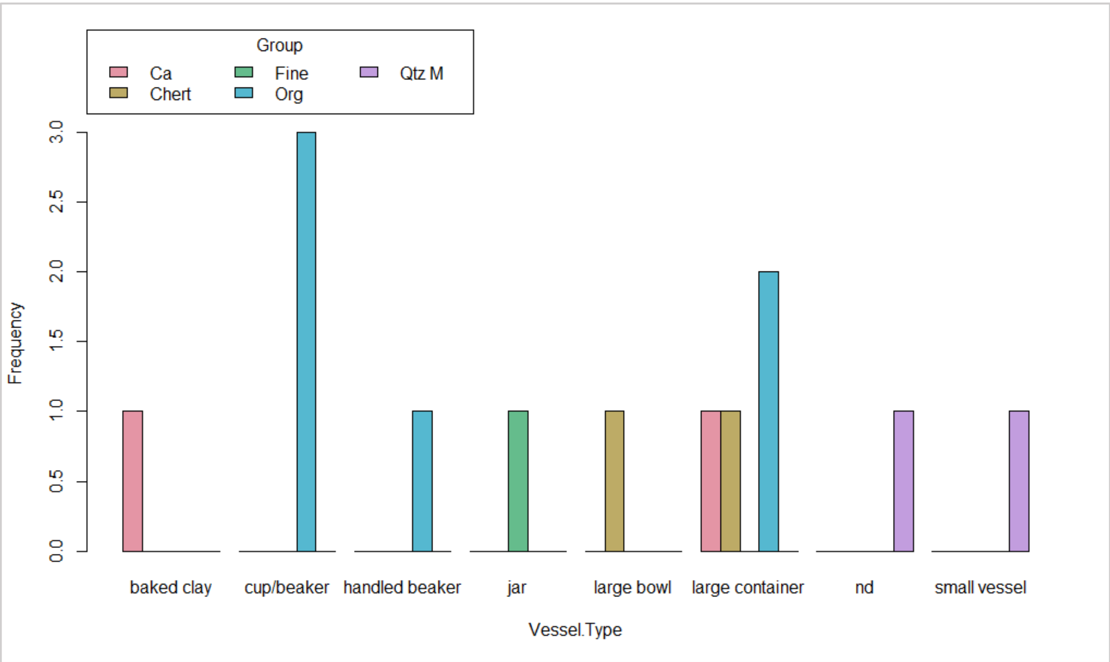


Figure 8.11. Atena Lucana. Distribution of fabric groups in relation to vessel category.

Rough wares are common, especially for storage and processing vessels like jars, with thick walls (1.3–1.5cm), and roughly smoothed or accurately smoothed surfaces. Finished ware is mostly associated with small vessels such as handled beakers and small bowls, characterised by finer walls (0.3–0.8cm). The large, decorated bowl is finished with a smoothed/burnished surface and accurate surface treatment. The surface treatment is particularly accurate on small vessels such as cups, small bowls and beakers with blackish and accurately burnished surfaces.

The preliminary analysis of shaping techniques did not highlight any major change from the previous phases. Coiling and slab building are attested for the large bowl and large containers. An innovative aspect is the morphology of the most characteristic vessels of the Cetina style, which display new features including handles slightly restricted near the middle and expanding towards their ends, flaring rims on the beakers and a thickened rim on the large bowl, though combined with local features such as elbow shaped handles. Overall, the shapes seem to continue the trend started during the Late Copper Age, with a preference for open vessel types and a minor incidence of closed-necked vessels. The surfaces are mostly smoothed to burnished for small vessels such as beakers, cups and the large bowl, while roughly smoothed in the case of large containers.

A notable feature is the presence of several ceramic objects suited for specific functions. These include spoons, a sieve, a tuyère, spindle whorls and loom weights, hinting that more varied productive activities were taking place at Atena Lucana.

The unusual Cetina style of decoration was mostly made by impression and incision. Compared to the other sites analysed, there was an innovative use of tools for impressed decoration, resulting in triangular, wedge-shaped and straw impressions. However, the impressed cordons and impressed notches on the rim, both associated with large containers and jars, show continuity with Laterza tradition. The presence of typical Copper Age scaled decoration should also be noted probably linked at the same time of production of Cetina style pottery.

8.6.4. Firing

The preliminary evidence obtained suggests a higher level of control over firing temperatures and conditions than in previous phases. The homogeneous colour of the vessels, either reddish or blackish, points to firing in a controlled atmosphere. A preference for oxidising conditions can be noted for the large bowls and jars, while reducing conditions were used for the typical Cetina-style handled beaker and the small bowls with impressed decoration on the inside of the rim. The firing temperatures appear to be below 800–850°C, except in the case a single jar displaying signs of vitrification.

8.6.5. Wares

The preliminary research did not allow the characterisation or quantification of the whole ceramic assemblage, but, allowing for the small and incomplete sample, some observations can be made. Specific wares seem to correspond to aspects such as surface treatment, wall thickness, fabric recipe and vessel type. The fabric groups are attested in each ware, with the quartz metamorphic fabric represented only in the finished and scaled wares, while the fine and calcareous fabrics are attested in the rough ware.

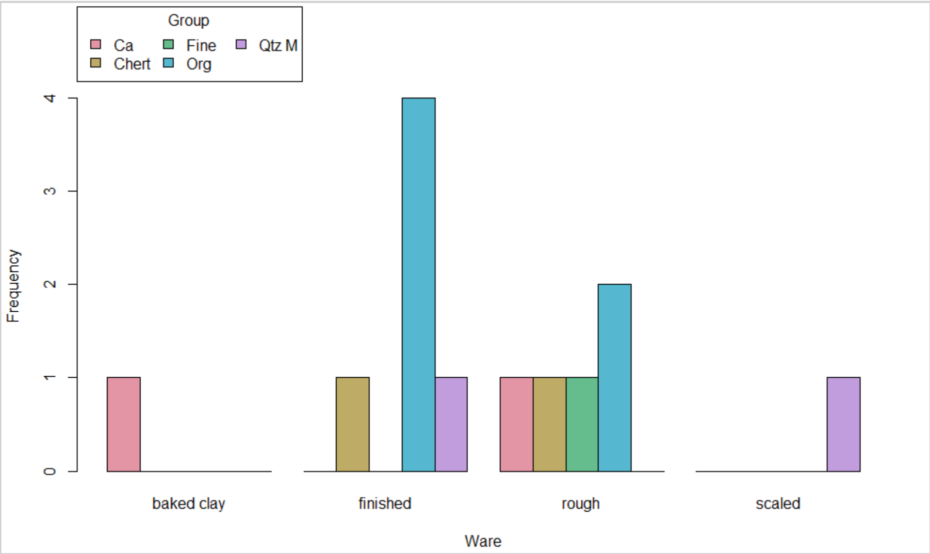


Figure 8.12. Final Copper Age Atena Lucana. Distribution of fabric groups to wares.

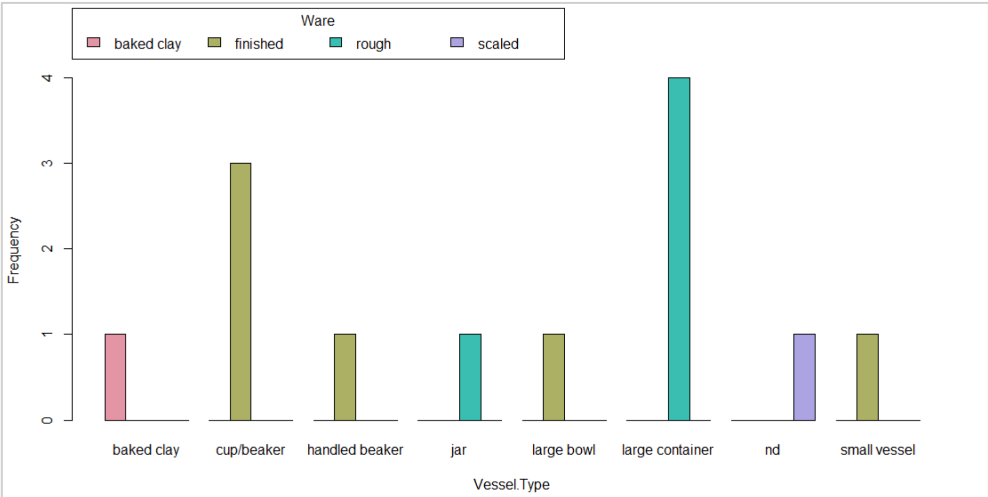


Figure 8.13. Distribution of wares with respect to vessel type at Atena Lucana, as presented in Chapter 5.2.1.

A strong correspondence can also be noted between wares and vessel types (Figure 8.13). The finished ware is exclusively used for cups/beakers, handled beakers, large bowls, and small vessels. The rough ware is restricted to jars and large containers, while the scaled ware could not be typologically attributed, but was probably used for a large container. The thickness of the fine ware ranges between 0.5 and 1.1cm, the scaled ware between 0.8 and 1.0cm, and the rough ware between 1.0 and 1.5cm,.

8.6.6. General observations regarding Final Copper Age Cetina style ceramic production

The preliminary examination of ceramic production in the Final Copper Age context of Atena Lucana allows just a few general statements to be made. The typological and stylistic characteristics of some vessels support a connection with the Cetina style (see Chapter 2). However, although this might have been interpreted in terms of the 'foreign' provenance of either the vessels or of members of the local community, the archaeometric analyses confirm the local production of these unusual vessels. The vessels analysed display a degree of variability in the exploitation of raw materials, with a preference for carbonatic inclusions. Overall, the ceramic assemblage indicates greater control of the different stages of ceramic production: varied and probably specialised fabric recipes, and a higher control of firing conditions and possibly of temperatures. This is matched by the introduction of innovative types and fabric recipes. The classic Cetina-style decoration (Forenbaher 2018) is in some cases combined with local features, such as on the typical decorated large bowl (Chapter 6, Figure 6.37) combined with an elbow-shaped handle, characteristic of the local Early Bronze Age. This process of local adaptation suggests a more complex dynamic of contacts and adoption of foreign models that previously envisaged by archaeologists.

As at Laterza culture settlements, technical ceramic objects are quite common. These were suitable for different types of processing activities (portable slabs, spoons and strainers) and production activities (tuyère for metalworking, spindle whorls and loom weights for weaving).

The Cetina phenomenon has recently become the focus of several research projects aiming to clarify its development and distribution (Gori *et al*. 2018; Forenbaher 2018; Recchia 2020). As mentioned above, this cultural tradition originated in the Dalmatian valley of the River Cetina but the associated ceramic style is attested in several areas of the Italian Peninsula, especially in the south-east. An ongoing programme of archaeometric analyses will help to clarify the features of this phenomenon in relation to ceramic production. Apart from the results presented here, archaeometric data are available only for two tumuli sites in Dalmatia (Amicone *et al*. 2019), where fabrics seem to be made from sedimentary clays whose composition is compatible with the surrounding geological environment - marked by clastic and carbonated clastic sedimentary rocks, in some cases tempered with grog, and with the presence of chert and calcite. The high optical activity of the matrix suggests low firing temperatures.

As highlighted by Forenbaher (2018) the data currently available for Cetina ceramic production (restricted to decorated vessels), and for its settlement and socio-economic dynamics, is extremely scarce. In the case of Atena Lucana, we can conclude that, instead of imports, it is possible to determine locally manufactured ceramics decorated in the Cetina style, but also that these need further investigation in relation to the broader archaeological record, including undecorated products, which have tended to be often overlooked by archaeologists in Cetina contexts (Forenbaher 2018).

Chapter 9 - Ceramic production in Campania between the 4th and 3rd millennia BC

9.1. Aims of this chapter

This chapter aims to draw a general picture of the development of ceramic production in Campania between the 4th and 3rd millennia BC. The results of the analyses of the four sites compared to contemporary sites in Campania, Southern Italy and Central Italy shed new light on several aspects of pottery manufacture in the Campania region over this time span. Indeed, the holistic, integrated analysis of typological and technological features has demonstrated the potential of this approach to deepen our understanding of production processes highlighting trends and cultural dynamics that could not be detected by simple typological observations (e.g., demands on production, symbolic, and economic drivers of change). At the same time, the consideration of technological processes in combination with an understanding of the distribution and changes in vessel types has allowed inferences to be made regarding changes in ritual practices, demands on production, and daily activities.

This integrated use of typological, technological and archaeometric observations has revealed a certain correspondence between typological changes (traditionally recognised as relating to cultural traditions) and technological changes, alongside some strands of continuity. As presented in the following sections, traditional typological distinctions were shown to be valid for better-defined entities such as the Gaudo and Laterza cultural traditions, but more problematic for poorly defined periods such as the Early and Final Copper Ages and Middle Copper Age Taurasi contexts, which are characterised by limited archaeological evidence.

After some general considerations on the main themes and research questions on Copper Age Campania, the main trends detected in the ceramic production related to broader cultural processes will be presented.

9.2. Unpacking Copper Age ceramic production in Campania

This section addresses all the main research themes and questions outlined in the Introduction (Chapter 1), in order to highlight the advances made by the present research. First, the continuities and discontinuities in the ceramic production over the *longue durée* (research question 1) and the interconnection between ceramic types/style and technological choices (research question 2) in Copper Age Campania will be addressed. Secondly, specific aspects of ceramic production will be discussed, such as: the provenance of the ceramics (research question 3) and the relationship between people and landscape (research question 4), the circulation of pottery and peoples (research question 5), cross-crafts interactions (research question 6), and the organisation of production (research question 7).

9.2.1. Style, technology and cultural traditions

From the selection of raw materials onwards, all the choices by potters made during ceramic production reflect specific ways of doing things within an established ‘community of practice’ and reveal the passage of information across generations (Wenger 1998). In this respect, shared learning through collaborative practices entails the creation of common ideas about technologies and styles of material culture which can be identified in the archaeological record. The transmission of information on supply basins, shaping techniques, style, etc. would have been shared on different levels: household, kin based groups, village, up to several villages at a regional to extra-regional scale. Their extent and development depended on a multiplicity of factors, such as: the social organisation of human groups, the organisation of ceramic and other craft production, the mobility of potters and their network of contacts. The mechanisms of learning and manufacturing would have been intertwined with group identity, strengthened and developed through learning and practicing together, along with networks linking to other human groups.

In this context, the concept of 'tradition' plays a particularly important role both with regard to ceramic production alone and when considering all the available aspects of material culture and cultural practices in a given time and place. As pointed out by Robb (2008: 341), following Gell (1998: 255), ‘the transmission of a tradition involves the recapitulation of a collectively held ideal model’. This recapitulation and reproduction of a shared model can be detected in the funerary contexts analysed, such as the collective cemeteries in Paestum and Pontecagnano, where potting practices, shapes and ritual forms were consistently reproduced. In the other contexts analysed the relation between the technological choices involved in pottery production are less clearly distinguishable as proper 'traditions' given a higher variability both in the ceramic record and in the archaeological evidence.

When considering the whole dataset, continuities and discontinuities in ceramic production can be detected between the five cultural traditions (or *facies*, see Chapter 2.4 and Appendix 1) associated with the contexts analysed, affecting different stages of ceramic *chaînes opératoires* between the 4th and 3rd millennia BC, as summarised in Figure 9.1.

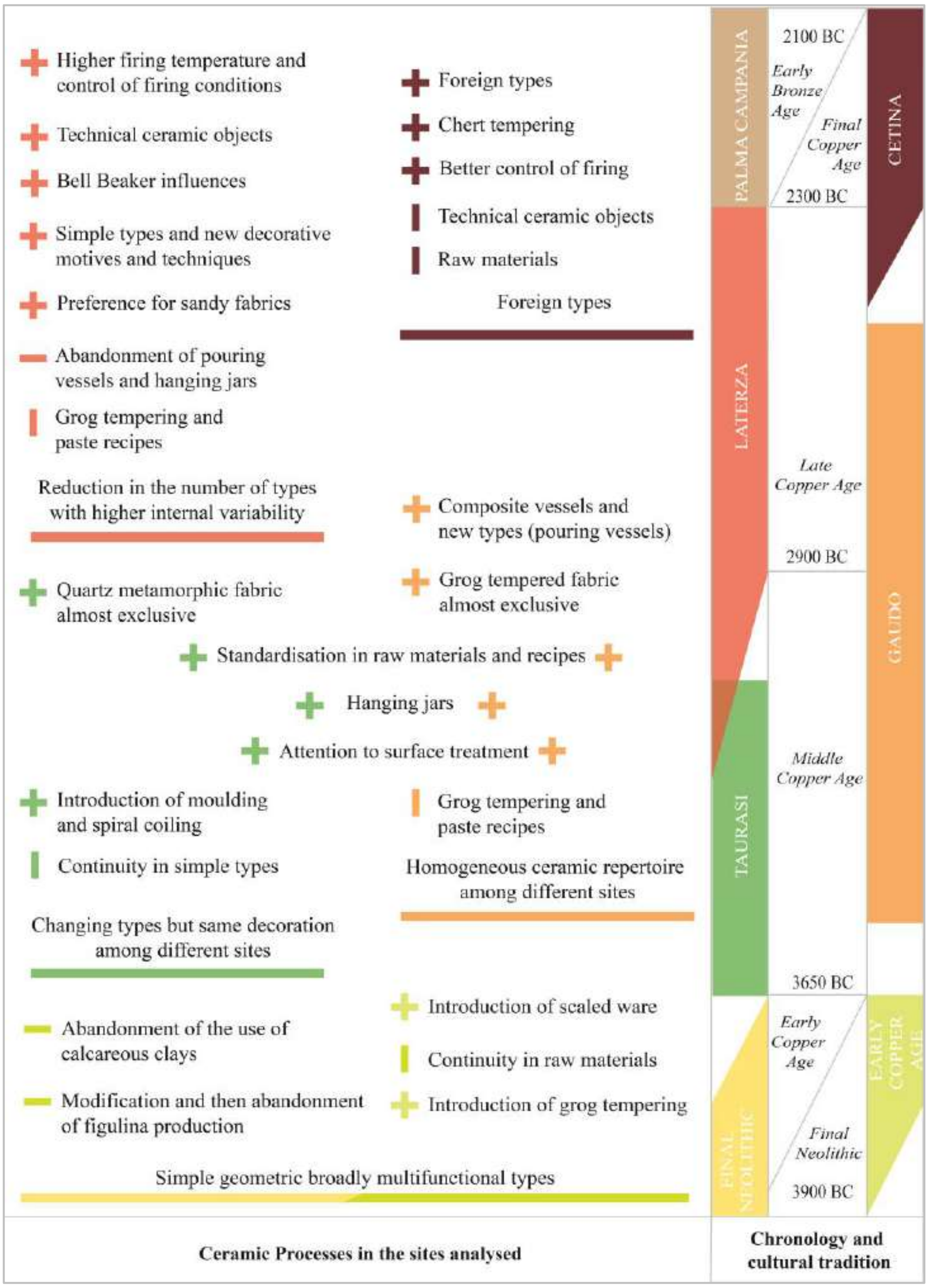


Figure 9.1. Continuity and change in ceramic production during the Copper Age in Campania in relation to chronology and cultural traditions. Key: + innovation; - abandonment; | continuity.

The main innovations and breaks in the productive process (research question 1, see Chapter 1 section 1.2) displayed in Figure 9.1, such as the abandonment of fine *figulina* production and the introduction of grog temper in the first half of the 4th millennium BC, the use of moulds in the second half of the same millennium, a stronger control over firing temperatures and conditions regained by the second half of the 3rd millennium BC, seem related to the emergence of different cultural traditions (with different funerary customs, domestic structures and material cultures). Attention to surface treatment increased during the Copper Age, both through the introduction of textured surfaces such as scaled decoration and through a careful smoothing or burnishing of vessel surfaces to achieve a degree of polish and shine. While simple vessel types are attested throughout the Copper Age, more complex and peculiar shapes are typical of specific cultural traditions (e.g., Gaudo composite shapes) and in some cases were triggered by external influences, as in the case of the Bell Beaker and Cetina style pottery.

To unlock new lines of interpretation from a social and productive perspective, the identification of pottery traditions besides cultural labels would be extremely interesting. Nevertheless, this task proved to be complex for two main reasons addressed in the following paragraphs: the limitations of the archaeological data and the relative dating of some of the contexts.

In the delineation and interpretation of different cultural traditions and communities of practice in Copper Age Campania, a fundamental aspect to take into consideration is the partiality of the archaeological data in reflecting all the different 'activities' carried out by the human groups that constituted a 'social world' (Strauss 1993; Furholt 2020). In fact, for some time periods and cultural traditions in Campania either only the village or the mortuary sphere is currently visible archaeologically, as highlighted in Figure 9.2.

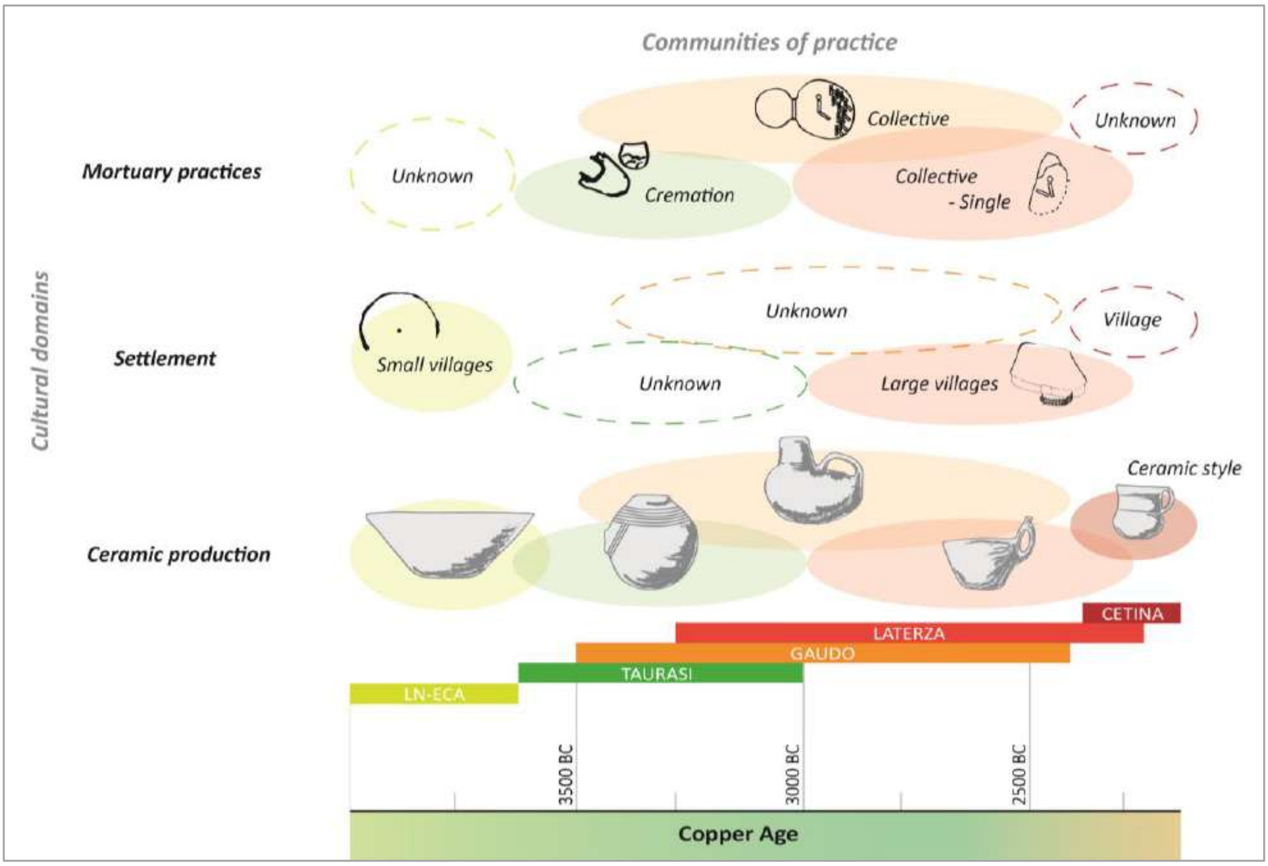


Figure 9.2. Visual representation of the cultural domains and communities of practice analysed for Copper Age Campania.

Therefore, only some of the constituent domains of a polythetic culture (Clarke 1968; Furholt 2020) can be linked and interpreted. However, it cannot be excluded that some of these domains (e.g., settlement organisation, mortuary practices etc.) could have overlapped between what we currently recognise as different cultural traditions. Indeed, overlaps in material culture and mortuary practices can be detected among the different cultural traditions identified, such as the presence of both Gaudo and Laterza style vessels in some rock-cut tombs (e.g., Pontecagnano tomb 1497, see Chapter 6.3.1).

A further element to consider is the relative dating of many of the contexts analysed. The absence of extensive radiocarbon dating in the cemeteries and dwelling contexts, either for lack of resources or lack of datable sample materials, does not allow the absolute dating of ceramic production for each context analysed without taking into consideration the relative chronology based on typo-chronological parallels with dated assemblages. This implies a possible bias when comparing and connecting archaeological sites and contexts.

In order to test the continuities and discontinuities displayed in Figure 9.1, and answer the related research questions (n. 2 and 8, see Chapter 1), the only three contexts among those analysed directly by radiocarbon dating were considered and their ceramic production assessed without taking cultural labels into consideration.

Beyond cultural traditions and archaeological cultures

Among the sites considered in the present dissertation only three contexts were directly radiocarbon dated: Tomb IX from the Paestum rock-cut cemetery in the Gaudo locality; four single flat graves from Sala Consilina; and the habitation layers of the village of Atena Lucana. The ceramic *chaines opératoires* identified at the three sites is summarised in Table 9.1. From Sala Consilina only two tombs (1073 and 1076) were considered: those yielding the larger ceramic repertoire.

Context	**Tomb IX Paestum, loc. Gaudo**	**Tombs 1073 and 1076, Sala Consilina**	**Atena Lucana**
Type of context	Collective, double chambered rock-cut grave	Single flat graves	Living area
Radiocarbon Date (cal. 2)	3516-3104, chamber A 3356-3018, chamber B	2867-2583, 1073 2851-2573, 1076	2568-2067
Raw material provenance and paste preparation	Local non calcareous iron rich clays Grog tempering	Local non calcareous iron rich clays Grog/ARF tempering Quartz metamorphic tempering	Local non calcareous iron rich clays Organic tempering, Chert tempering, Quartz metamorphic tempering Sedimentary Ca rich Fine
Shaping	Coiling and moulding of lower body	Bowls moulded Jar coiled	Coiling and slab building
Surface treatment	Burnishing and smoothing equally distributed Rare roughly smoothed Absent scales	Dominance (80%) smoothing/burnishing, Remaining rough and scaled surfaces	50% Accurately smoothed, 25% roughly smoothed, rare burnishing, smoothing/burnishing, and scaled surfaces
Decoration	Complex and recurring impressed, incised and plastic decorations, often combined	Undecorated except for 1 decorative false handle	Complex and recurring impressed and incised decorations often combined
Types	2 askoi, 6 cups, 1 Jar, 10 jugs, 1 pixys, 1 small jug, 5 twin vessels, 2 closed, 2 small vessels.	1073: 3 small bowls 1076: 1 small jar, 2 rough	Small bowls, handled beaker, large bowl
Firing	Almost exclusively irregular, rarely reducing	Mostly irregular, in one case reducing or with black core	Either oxidising or reducing, in some cases with black core, rarely irregular

Table 9.1. Main stages of the *chaîne opératoire* attested in the 3 contexts directly radiocarbon dated taken into consideration in the present research.

These three sites are chronologically subsequent to ane another: the collective grave tomb IX was radiocarbon dated using samples taken from two individuals and spans the second half of the 4th millennium BC (though some yet unpublished radiocarbon dates prove its continuity also into the first half of the 3rd millennium BC, Aurino 2013); the flat graves date to the first half of the 3rd millennium BC; while the living area at Atena Lucana dates to the second half of the 3rd millennium BC.

By looking exclusively at the ceramic data some considerations can be made. At all the three sites potters preferred the use of local non calcareous iron rich clays, widely available in the surrounding alluvial area, both in the Sele Plain and in the Vallo di Diano, with slightly different tempering procedures. Forming practices appear quite homogeneous, with the use of moulding for the bases of complex vessels in Paestum and for open shapes in Sala Consilina, while coiling and slab building are attested for the upper body of complex forms and large containers such as jars or large bowls at all sites. Surface treatments are accurate in all three sites with burnishing and smoothing preferred, and scaled treatment attested only at Sala Consilina and Atena Lucana. Looking at the overall technological choices it can be argued that at Paestum potters repeatedly applied a consistent set of technological choices to a broader range of ceramic types (jugs, cups, askoi etc.) while at the other two sites they applied a wider range of paste preparation methods and surface treatments to a more restricted repertoire of shapes. Decoration techniques consist mostly of impressions and incisions with a wider repertoire employed at Paestum and Atena Lucana, where some new types of tools for impressing are attested, while extremely poor at Sala Consilina where only a plastic decoration is attested mimicking an handle. Firing conditions are extremely irregular at both Paestum and Sala Consilina, while at Atena Lucana they are homogeneously either oxidising or reducing.

Based on these data, seven potting *chaines operatoires* can be recognised at the three sites, as summarised in Figure 9.3.

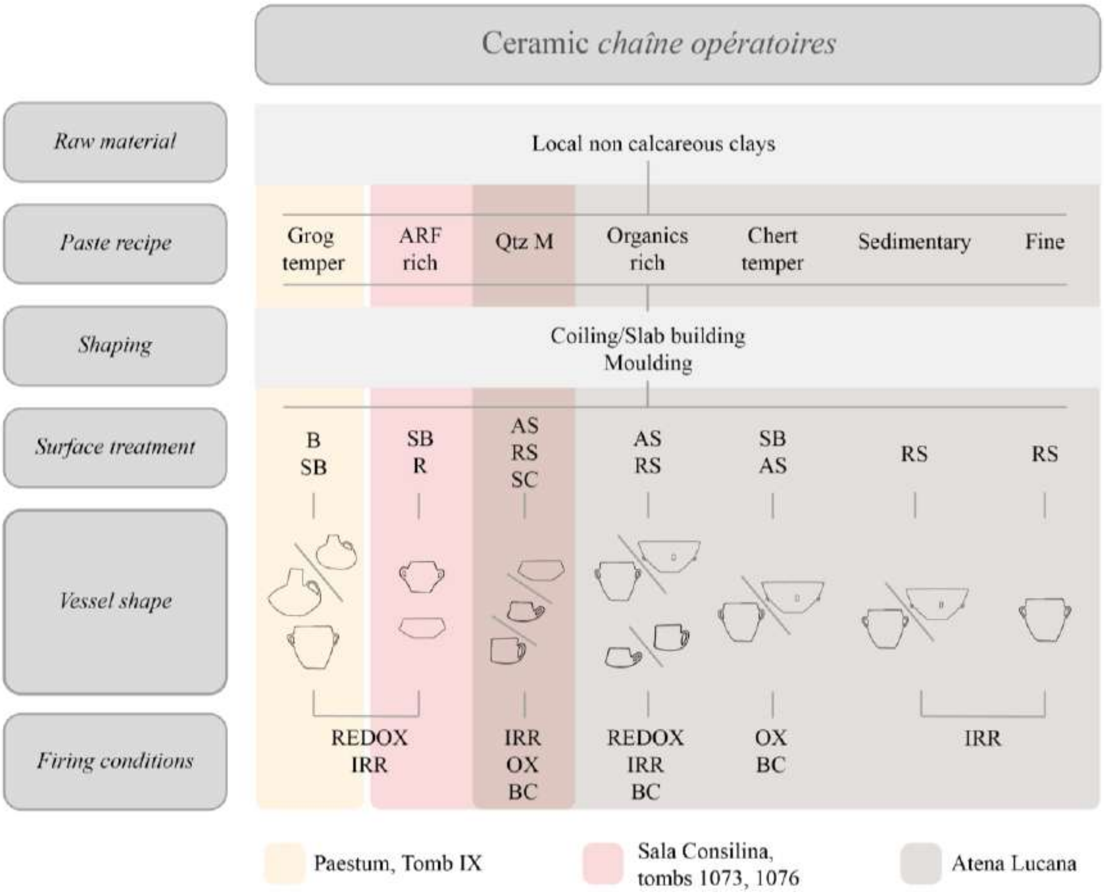


Figure 9.3. Overview of the ceramic *chaines operatoires* detected in the radiocarbon dated contexts of Paestum, tomb IX, Sala Consilina tombs 1073 and 1076, and Atena Lucana, based on the samples that underwent both macroscopic and archaeometric analyses. Keys: Sc = Scaled; R = Rough; RS = Roughly Smoothed; AS = Accurately Smoothed; B = Burnished; SB = Smoothed/Burnished; REDOX= Reducing; IRR= Irregular; BC= Black Core; OX= Oxidising.

In the case of Paestum, a consolidated production can be recognised, with a single *chaîne opératoire* applied despite the wide repertoire of vessel forms. Besides the use of moulds and local non calcareous clays no major correspondences can be inferred with the other two sites which are located in a different area in the Vallo di Diano (about 50 kms far from Paestum). In the other two contexts, potting traditions appear more variable, with a wider range of tempering traditions and surface treatments, which are even broader at Atena Lucana (with 5 different *chaines operatoires* compared to 2 attested at Sala Consilina). The two sites share one tempering tradition with surfaces more-or-less accurately treated, suggesting some degree of continuity between the two, chronologically subsequent, productions.

Overall, when compared to the chronological/cultural distinctions displayed in Figure 9.2, the data seem to confirm the general trends detected for all the sites analysed in the present research, further highlighting the consistency and distinctiveness of operating procedures for pottery making in collective graves, while highlighting some continuity between the Late Copper Age site of Sala Consilina and Final Copper Age one of Atena Lucana. Ceramics destined to be used in the complex rituals of the collective graves appear as a distinctive and controlled strand of production, probably associated with a smaller group of highly skilled potters, compared to a more variable production at the sites of Sala Consilina and Atena Lucana. For these sites access to pottery making traditions and practices could have been broader and extended to a larger group of potters. Nevertheless, the increased attention to and control over firing conditions suggests an advancement and specialisation at least in this step of the production process at the site of Atena Lucana.

Given this, it could be that the different steps of pottery making could have been carried out by different people in relation to other tasks and even religious beliefs, as further developed in Sections 9.2.2 and 9.2.5.

Keeping these considerations in mind, the data gathered in the present research were used to reconstruct aspects directly related to ceramic production, such as provenance and relation to the landscape, circulation of ceramic vessels, cross-craft interactions and organisation and demands on production.

9.2.2. Provenance and landscape

Raw material procurement appears to have been the most conservative stage of the manufacturing process, as commonly attested elsewhere in prehistoric Europe and the Mediterranean (research questions 3 and 4, see Chapter 1). Local raw materials were exploited throughout the Copper Age, with a long-lasting and consistent preference for iron-rich, non-calcareous clay mixtures of illite and smectite. Copper Age products are distinctive compared to Late Neolithic ones for the introduction of grog tempering and the almost complete abandonment of calcareous clays. Most raw material sources can be traced to the immediate hinterland of the sites up to a maximum distance of 10km. This evidence closely matches ethnographic observations made by Arnold (1985, 2005) and by Gosselain and Linvigstone Smith (2005), who report the use of raw materials generally within a radius of 7km from the sites. Choices in the raw materials used for ceramic production are often explained by archaeologists either from an ecological perspective (Matson 1965; Arnold 1985), with variation related to the geological variability of the surrounding environment, or from a functionalist perspective (Rye 1976; Schiffer 1990; Schiffer and Skibo 1987), based on the raw materials' properties and suitability for specific functions. As highlighted in the following sections, in Copper Age Campania ideology and symbolic purposes also played an important role in the determination of the sourcing and processing of raw materials, including the abandonment of calcareous clays and the use of grog temper (see sections 9.3.1

and 9.3.2). No significant variation of raw materials could be detected between chronological/cultural contexts at the same site, testifying to a high degree of continuity in the exploitation of sources and a shared knowledge of their locations and properties.

A further aspect to take into consideration in the interpretation of raw materials procurement is the relationship between people and landscape also in connection with other tasks. In the concept of *taskscape* developed by Ingold (1993), tasks, understood as daily activities in the life of ancient people, are considered as mutually interlocking, and therefore "just as the landscape is an array of related features, so - by analogy - the taskscape is an array of related activities" (Ingold 1993: 158). Therefore, raw material procurement should be seen as a part of the wide variety of tasks ancient people carried out in the surrounding landscape (Michelaki *et al* 2015). The sites taken into consideration in the current study are located in a landscape rich in raw materials, where potters had a wide choice but displayed clear preferences towards non-calcareous alluvial and volcanic clays, as well as sandy, quartz rich tempers or artificial ones. Calcareous and non-calcareous clays are widely available in the area from the coast to the nearby hills (Chapter 7.7). This suggests that raw material procurement could have been carried out in the immediate surroundings of the sites, near the main watercourses (Sele river and Picentino river for Paestum and Pontecagnano, the Tanagro river for Sala Consilina and Atena Lucana) probably in connection with other types of tasks. The tendency towards watercourses might be connected to the procurement of water and wood and other sorts of materials from the surrounding wooden area (see Chapter 4). Among these are possible wooden tools for decorating vessels, pebbles for burnishing, but also plant fibres for basketry, etc. Given the funerary use of most of the contexts analysed, no major information are available on grinding stones, and other types of daily tools. Watercourses appear as a fundamental resource and pole of attraction in the landscape for local communities. A deeper understanding of the dynamic relation between Campanian Copper Age people and the surrounding landscape could be further investigated through detailed surveys for raw materials in the area (e.g., Michelaki *et al* 2015) focusing both on sources of clay (e.g., De Bonis 2018) and temper.

9.2.3. Circulation of pottery and people

As highlighted in Chapter 2 (2.2 and 2.4), the issue of mobility and the circulation of objects and ideas (research question n. 5, Chapter 1.2) in the period between the 4th and 3rd millennia BC is central to ongoing archaeological debate, particularly in relation to two inter-regional influences: the Bell Beaker phenomenon spreading throughout Europe (Vander Linden 2007; Heyd 2013) and the Cetina culture, advancing especially along the Adriatic shores and Central-southern Mediterranean (Gori *et al.* 2018; Recchia 2020). For the 4th millennium BC, the hypothesis of an additional 'foreign' Aegean provenance has also been put forward, both for the Gaudo cultural tradition and to some extent also for the Rinaldone culture in Central Italy (Laviosa Zambotti 1943; Puglisi 1959; Trump 1966; Bernabò Brea 1968–69, 1985; Cazzella 1992: 551–9). In most of these cases, theories of mobility and connections are based on ceramic style. The archaeometric analyses carried out as part of the present research allow a number of inferences to be drawn regarding these issues.

The pottery attested in Gaudo cemeteries is clearly locally produced. Except for a degree of continuity in the procurement of raw materials in the Early Copper Age, the vessel types and manufacturing techniques are certainly innovative compared to the previous tradition. The lack of firm scientific evidence of the movement of peoples makes it hard to assess whether this was due to the 'foreign' provenance of the communities that populated the Campania region from the middle of the 4th millennium BC. One consideration is that this pottery assemblage, mainly from burial contexts, represents the first evidence in Campania of a ceramic repertoire intended for complex funerary rituals. These events involved collective burials, food and liquid offerings, ritual fragmentation and secondary manipulation of human remains, and were accompanied by an equally complex and highly codified ceramic repertoire. In fact, the consistency of both the ceramic repertoire and the production process—between relatively distant sites—indicates a strong pottery tradition shared by multiple communities and a local development of such a ceramic tradition, even if also drawing on widely circulating models (Cazzella and Recchia 2020: 133-4).

As previously outlined, Laterza communities appear to have been more permeable to outside influences than Gaudo ones. The Bell Beaker fragment from tomb 1 in the Cerere cemetery at Paestum is too small for any archaeometric characterisation of its fabric and composition. The macroscopic fabric appears sandy, in line with the common trend in Laterza contexts. The most relevant feature, however, is the comb decoration, typical for Bell Beakers of the 'International style', and produced by a tool not otherwise used on pottery at the site. Beside its adherence to the typical Bell Beaker model in terms of decorative type and technique, no major inferences regarding its provenance or manufacture can be made. However, a local production, as occurs in the area of Rome (Aurisicchio and Medeghini 2020), would not be surprising.

The innovations detected in the paste recipes and firing techniques at Atena Lucana suggest the introduction of different methods and an enhancement in the expertise of the potters. This site is generally identified as strongly representing the influence of the Cetina phenomenon from Dalmatia (Gori *et al.* 2018; Talamo *et al.* 2011). The preliminary analysis of Cetina-style vessels in the ceramic record here clearly proves that they were produced locally, with a degree of adaptation (e.g., the large bowl, see Chapter 6.5.1, Figure 6.37). Nevertheless, strong elements of novelty can be detected in the vessel types, in the motifs and tools used for decoration, and in the use of innovative recipes, especially the addition of chert as temper, never previously attested in the area. A further innovative aspect is the greater level of control of firing temperatures, suggesting a possible enhancement of firing techniques and the introduction of kilns. A comprehensive characterisation of the ceramic record from Atena Lucana and the determination of the ceramic recipes used for Cetina-style pottery in the Balkans and in South Italy will be extremely important in clarifying whether the designs or the technologies of Cetina-style pottery were transmitted to local potters, or whether pots were locally produced by foreign potters (with the help of aDNA and isotopes analyses on human remains), and how this fitted with contemporary local production.

Although the acquisition and adoption of a style can most easily occur through the simple imitation of visually acquired models (Gosselain 1998), the use of tools and decorative schemes very close to the originals may also suggest the mobility of people (including potters), allowing the transmission of knowledge, as hypothesised for Swiss contexts affected by the Bell Beaker phenomenon (Derenne and Carloni 2022).

The picture outlined by archaeometric analyses for the sampled Copper Age sites in Campania shows that finished ceramic objects were rarely moved over long distances, while models and ideas had a wider circulation. This finding matches published data for the Rome area (Forte 2020). Ceramic types external to the local tradition appear to have been absorbed into the local Campanian repertoire, e.g., Laterza production in Campania (and Ortucchio in the Rome area), either in their original form, as the Bell Beakers at Paestum and Olevano sul Tusciano (Aurino and De Falco 2022) or as a local reworking of forms, patterns and decorative techniques, as at Acerra, loc. Gaudello (Aurino and De Falco 2022).

9.2.4. Evidence for cross-craft interactions

During the Copper Age a new category of ceramic tools develops, alongside the longstanding tradition of spindle whorls and loom weights. The analysis of different clay crafts and their relation to other productive activities, such metalworking, can give important information both on the technical advancement of these societies (Amicone *et al* 2022), on the organisation of productive activities (De Groot *et alii* 2023), and on social differentiation, labour organisation and division (Brysbaert 2007).

In particular, at the sites of Paestum, attributed to the Laterza cultural tradition, and at Atena Lucana, dated to the Final Copper Age, a wider range of tools is attested that were previously never identified in earlier Campanian contexts. In particular, these objects are related to different productive activities such as specialised cooking, in the case of boiler lids and strainers, metalworking, as suggested by tuyeres/blowing pipes, and movable slabs useable in different types of activities, from cooking to processing. These objects, attested for the first time in these contexts in Campania, would later become widespread in the Bronze Age, testifying an increased production and cross-craft interaction (research question 6, Chapter 1.2; Brysbaert 2007), with pottery making becoming an essential step in the development of other daily tasks and productive activities.

Archaeometric analyses revealed that ceramic tools and vessels were made with the same *chaînes opératoires*In fact, fabric recipes widely used for fine to coarse vessels were used also for these types of tools at the site of Paestum, and firing temperatures and conditions are all similar to those attested for ceramic vessels. This data suggests that while a specific branch of ceramic production starts in the 3rd millennium BC, targeted procedures and technological choices are not yet developed, as attested in other contexts especially for ceramic crucibles (Orfanou *et al* 2022).

Particularly interesting is the connection between the emergence of evidence relatable to metal working (tuyéres from Paestum and Atena Lucana), the increase in the number of metal objects in Late-Final Copper Age and Early Bronze Age contexts, and the increase in the mastery of firing conditions attested in the Final Copper Age. The poorly controlled conditions with generally low temperatures, together with the lack of known firing structures during most of Copper Age in Italy, suggests the use of open firing, either in bonfires, pits or similar structures (Roux 2019: 110–20), which were limited to oxidising and irregular reducing conditions (Maritan *et al.* 2006; Amicone *et al.* 2021). No clear evidence of kilns can be identified for this period, while experimental firing has confirmed that open firing results in irregular reducing conditions (e.g., Amicone *et al*. 2021). However, from the Final Copper Age onwards, an improvement in firing techniques can be recognised, possibly linked to greater control of the process and/or more stable firing structures such as kilns. This co-emergence of activities requiring a higher control of pyro-technology is notable and might suggest a specialisation in the firing process and possibly of the people managing it, not necessarily to be identified with potters themselves, set within the context of a division of labour.

9.2.5. Ceramic technology and social organization in Copper Age Campania

Identifying and characterising the organisation of the production of ancient craft activities is a long-standing topic in archaeological research. Despite several approaches and models proposed to address this issue (e.g., Van der Leew 1977; Peacock 1981; Costin 1991, 2005; David and Kramer 2001), there is still no agreement on types and modes of organisation or on ways to recognise these, especially in small-scale (Spielman 2002) broadly egalitarian prehistoric societies, where the structure of society is itself hard to assess (the debate on social complexity in the Copper Age is an example of this issue, see Chapter 2.2.2). One reason for this ongoing debate (recently reviewed in Duistermaat 2016) is that productive organisations can be seen as 'dynamic entities' (Neupert 2007: 138) implying multiple materials, actors, interactions and entanglements (Hodder 2012). Interpretative models can therefore be only considered as points of reference for more complex explanations that need to be linked to other lines of evidence (besides pottery manufacturing) and to broader cultural processes to avoid reductive classifications in 'black-boxes' (Duistermaat 2016: 114–5).

A common distinction in studies of the organisation of production is between 'domestic' (consumed by the producers and their immediate households/families) and 'specialised' production (consumed by individuals other than the producers, Costin 2020: 179) and therefore between 'household' and 'workshop' production (located in a specific, dedicated space, Peacock 1981). This distinction is extremely problematic when no evidence of production areas can be detected in the archaeological record and also, as recently argued (Costin 2020), in cases of highly specialised production.

Copper Age Campanian production displays few traces of standardisation or organisation in specific places, given the lack of proper kilns and specific tools such as rotating supports, attested in Italy only from the Middle Bronze Age (about 1700-1350 BC; Borgna and Levi 2015; Caldana *et al.* 2019). The introduction of moulds (mid-4th millennium BC) and combed decorations (mid-3rd millennium BC, Figure 9.1) might, however, suggest the gradual development of a more specialised toolkit for pottery-making. Taking traditional typologies into consideration, I would argue that the evidence presented for Copper Age Campania lies between 'household' and 'household industry' production as defined by Van der Leew (1977), summarised in Figure 9.4, with differences seen mostly in the degree of specialisation, the time invested and personal (household) or group consumption.

	variables	household production	household industry	individual industry	workshop industry	village industry	large scale industry
Economy	Time involved	Occasional	Part-time	Full-time	Full-time	Part/Full-time	Full-time
	Number involved	One	Several	One	Several	Several	Many
	Organisation	None	None	None	(Guild)	Certain	Certain
	Locality	Sedentary or itinerant	Sedentary or itinerant	Itinerant	Sedentary	Sedentary	Sedentary
	Hired hands	None	None	None	Some	Some	Labour force
	Market	Own use	Group use	Regional	Village/town	Region(wide)	Regional and export
	Raw materials						
	Clay	Local	Local	Local	Neighbourhood	Neighbourhood	Neighbourhood/distant
	Temper	Local	Local	Local	Neighbourhood	Neighbourhood	Neighbourhood/distant
	Water	Local	Local	Local	Local	Local	Local
	Fuel	Local	Local	Local	Neighbourhood	Neighbourhood	Neighbourhood/distant
	Investments	None	None	Few	Some	Some	Capital
	Seasonality	Production as needed	Season w/o other work	All year except winter	All year/good weather	All year/good weather	All year
	Labour division	None	None	None	Some-considerable	Some-considerable	Detaled
	Time involved per pot	High	High	Medium	Medium-low	Medium-low	Low
	Status	Amateur	Semispecialist	Specialist	Specialist	Specialist	Specialist (few techniques)
Technology	Manif. Techniques	Hand/small tools	Hand/small tools	Hand/small tools	Mould/wheel	Mould/wheel	Wheel/cast/press
	Tools						
	Sed. Basin	None	None	None	When needed	When needed	Needed
	Wheel	None	None; rotary support	Turntable	Various kinds	Various kinds	Kickwheel or similar
	Drying shed	None	None	None	Needed	Needed	Needed
	Kiln	Open firing	Open firing/impermanent	Impermanent	(semi-)permanent	(semi-)permanent	Permanent
	Raw materials						
	Clay	Wide range	Wide range	Wide range	Narrower range	Narrower range	Narrower range
	Temper	Wide range	Wide range	Wide range	Narrower range	Narrower range	Narrower range
	Water	Any	Any	Any	Any	Any	Any
	Fuel	Wide range	Wide range	Wide range	Narrower range	Narrower range	Narrower range
	Range of pottery	Narrow	Narrow	Wide	Narrow or wide	Narrow or wide	Narrow or wide
	Range of functions per pot	Wide	Wide	Wide	Narrower	Narrower	Narrower

Figure 9.4. Types of organisation of ceramic production after Van der Leew 1977.

While for the Early Copper Age these aspects are not easily evaluated, due to the limited archaeological data, from the Middle Copper Age onwards the archaeological evidence allows a few inferences to be made. As explained in the previous chapter, in the Taurasi and Gaudo cemeteries a distinct ceramic production for funerary or ritual purposes can be hypothesised due to the presence of vessel types found exclusively in burials. A strong 'demand for socially valued goods' (Spielmann 2002: 201) driving a specific branch of ceramic production can be inferred. This hypothesis is supported by the unique character and high number of ceramic objects found only in graves, and by their codified use in ritual practices. This might imply a targeted production of these types of vessels for ritual practices by a household, a group involved in mourning, or by individuals with specialised expertise who were commissioned with the task.

In fact, the manufacturing of these objects implies a level of skill and expertise which is also recognised for comparable sites in the area of Rome where settlements were also excavated (Forte 2019; 2020). Different operational sequences and levels of expertise were detected in the production of funerary pottery compared to those used in the domestic contexts of settlements. This led Forte to define of a system of 'household specialisation', where only a few highly skilled individuals in the community were responsible for the production of the important pottery involved in ritual practices. This implies 'the emergence of figures through a long and intentional apprenticeship system involving a limited number of people in the group obtaining specific skills in ceramic production that were not achieved by the rest of the community' (Forte 2019: 19). This mode of production is suggested for the area of Rome, for Gaudo, Rinaldone and for some Laterza and Ortucchio ceramic productions.

The interpretative model developed by Forte is applicable also to the Campanian sites analysed in this research. In contrast to the area of Rome, this kind of distinct system can be hypothesised in Campania only for Gaudo and possibly Taurasi funerary productions. In contrast again, no major differences between funerary and domestic productions can be detected in Middle-Late Copper Age Laterza and Final Copper Age contexts; in fact, grave goods are simpler both in the shapes and manufacturing processes (e.g., highly irregular vessels from the Agorà, phase II). The number of vessels involved in ritual practices also diminishes, as exemplified by the flat graves of Sala Consilina, Phase II. Ritual demands on production became less of a driving force now. Between the Late and Final Copper Age, greater specialisation can be recognised in the technical advancement of improved control over fire, with regard to both temperatures and firing conditions, and in the development of technical ceramic objects used in other crafts such as metallurgy and advanced food preparation.

Over the course of the Copper Age, a gradual shift can be inferred in the social demand for ceramic objects, from a 'ritual demand' (Spielmann 2002) requiring greater skills, longer apprenticeships, codified practices and types, and probably a different mode of production undertaken by a few specialised artisans, to a 'functional demand' for technical objects needed in other activities, with a simpler ceramic repertoire, that was homogeneous between funerary and domestic activities, characterised by fewer vessel types.

9.3. Ceramic production and cultural processes

This section aims to highlight the continuities and discontinuities in the local pottery making traditions and demands for production in Copper Age Campania within their productive and social contexts (research question n. 1, Section 1.2). These can be better understood in relation to the broader archaeological context and can in turn contribute to clarifying cultural dynamics (research question 9). As highlighted in Figure 9.5, during the Copper Age ceramic production undergoes three main typological and technological turning points, traditionally also recognised as shifts between cultures.

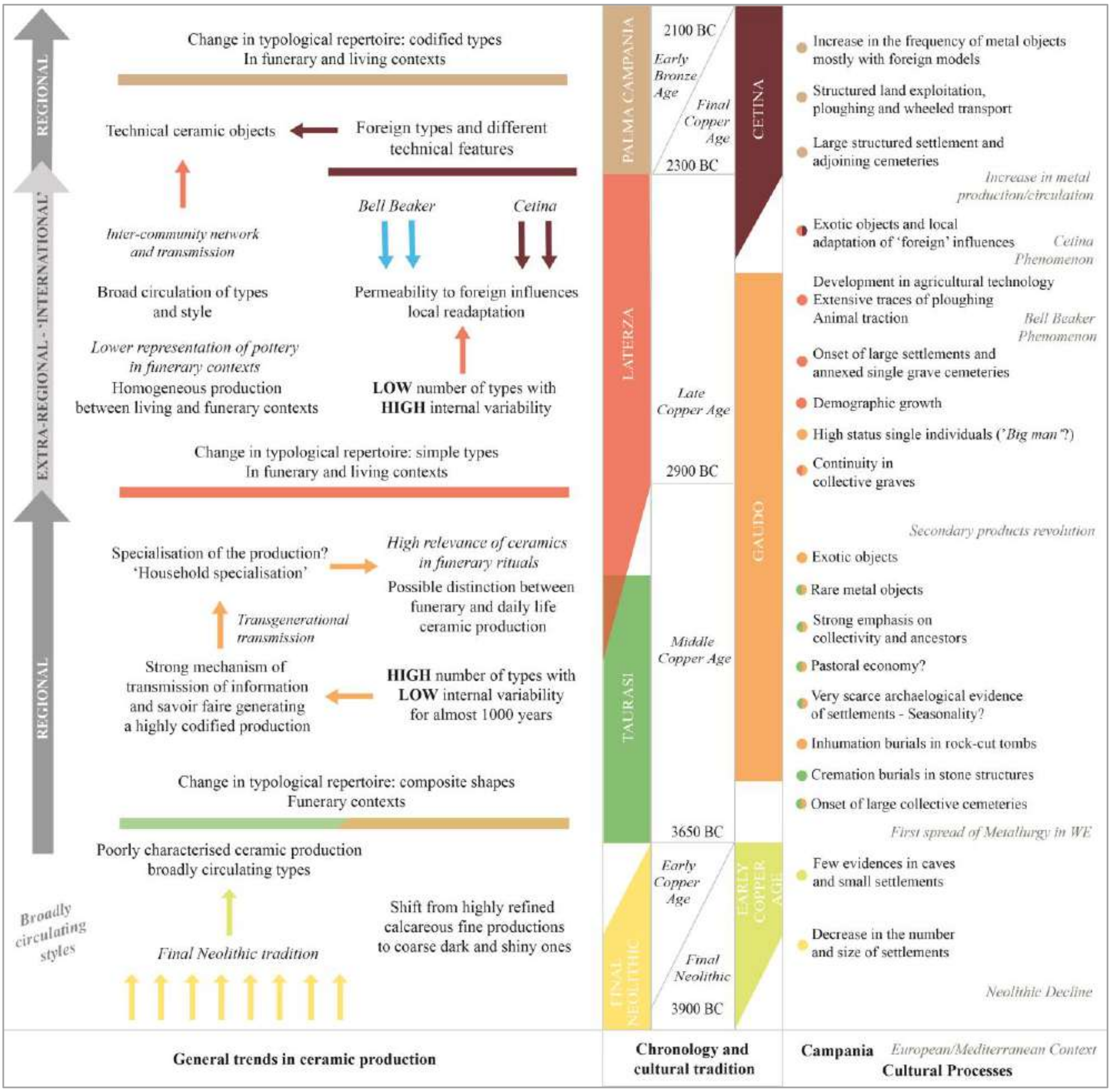


Figure 9.5. Major trends recognised in ceramic production in relation to chronology, cultural tradition and cultural processes at a regional and broader scale.

These turning points can be roughly set in the first half of the 4th millennium, at 3650 BC, 2900 BC and 2500 BC, and correspond to important cultural processes taking place both in Southern Italy and more broadly across Europe. These points will be addressed in the following sections connecting each ceramic turning point with the broader cultural processes.

9.3.1. The first half of the 4th millennium: between tradition and innovation—the dawn of the 'Age of Shine'

During the first half of the 4th millennium BC potters in the Campania region preferred a ceramic repertoire characterised by simple, broadly circulating multifunctional ceramic types (e.g., jars, bowls, cups) in continuity with Late Neolithic Diana traditions (Figure 9.5). Regional and micro-styles disappear, replaced by models that are interchangeable and recognised across larger territories, representing the influence of Late Neolithic Diana, Ripoli and Chassey/Lagozza styles (Pessina and Tiné 2008; Borrello and van Willingen 2014). This connection is unsurprising since a certain continuity can be detected in sites' occupations between the Late Neolithic and Early Copper Age in Campania, but also in Central Italy (Manfredini *et al.* 2009). This is testified in Campania by the two coastal sites analysed in the present study, Paestum and Pontecagnano, where a scarcely characterised Early Copper Age frequentation follows a more intense Middle and Late Neolithic one (see Chapter 2.4). This period is incompletely characterised in Italy and beyond and is generally termed the 'Neolithic Decline' due to a consistent demographic decrease across Europe (Shennan *et al.* 2013; Kristiansen 2014) and partly in the Italian Peninsula (Shennan 2013; Palmisano *et al.* 2021). In the latter, this apparent demographic trend might also be affected by a gap in the archaeological record due both to the major research focus on earlier or subsequent phases as highlighted in targeted study on settlement patterns in Central Italy (Manfredini *et al.* 2009) and by demographic estimations (Palmisano *et al.* 2021). In particular, in Campania evidence dated to the first half of the 4th millennium BC is characterised by short-lived settlements that leave more ephemeral archaeological evidence and poorly documented occupations in caves (Fugazzola Delpino *et al.* 2003; Manfredini *et al.*,2005; Dolfini 2019).

Several attempts have been made using a traditional typological approach to distinguish between different phases and *facies* in Campania during the Early Copper Age (see Chapter 2.4 and Appendix 1). Based on the present analysis, the ceramic types of this first phase are seen to be quite homogeneous for most South

Italian contexts (Chapter 8.2.6), with differences largely limited to the decorative motifs. Therefore, the clear distinction of chrono-typological sequences has been particularly difficult in different areas of the Peninsula (e.g., Robb 2007; Manfredini et al. 2009; Pacciarelli and Talamo 2011; Steffé et al. 2016; La Marca 2020). In order to better distinguish these Early Copper Age ceramic productions, larger programs of archaeometric and technological analysis, quite rare for this period, would be beneficial in future research. In fact, it is in this period that an aesthetic shift that started in the Late Neolithic (monochrome horizon, Pessina and Tinè 2008: 47; Robb 2007: 171) reaches its completion: the ornately decorated fine wares of the Middle Neolithic are completely replaced by plain, dark, glossy or textured surfaces that dominate the whole Copper Age, for this reason termed by Robb as 'the Age of Shine' (Robb 2007: 171).

This important aesthetic shift is evident in the progressive abandonment by potters of fine, light coloured, calcareous fabrics (*figulina* pottery), widely documented at Middle-Late Neolithic sites, used for vessels of exceptional quality (e.g., Serra d'Alto ware). Until the 5th millennium BC, *figulina* ware was used for high quality consumption vessels (e.g., complex cups with smooth surfaces, homogenous firing condition, buff colour, often painted decoration and baroque handles), partly by virtue of its fine appearance. It required more complex manufacturing operations including the depuration of the base clay, and higher levels of expertise in fashioning, as a result of its enhanced plasticity, and control of the firing process, due to its calcareous composition and homogeneous oxidising firing (Laviano and Muntoni 2009). The social value of these vessels is highlighted by their visual distinctiveness, by the complexity of their production process, by their long-distance exchange (Mazzieri and Bernabò Brea 2012, Binder *et al.* 2018) and by their preferential occurrence in ritual contexts (e.g., Geniola and Sanseverino 2014; Malone 1985, 2003). Nevertheless, *figulina* wares such as Serra d'Alto are attested also in settlement sites in contexts that suggest they were used in everyday life as well, probably on social occasions involving drinking and food consumption (due to the type of vessel shapes, mostly cups). Their role in social display and as valued means of exchange was probably part of their embedded practical functions (Skeates 2016: 346).

From the first half of the 4th millennium BC, this highly valued *figulina* pottery became obsolete. This process is particularly evident at the site of Paestum where the fine calcareous clay recipe used for Serra d'Alto and Diana *figulina* wares at the same site (Muntoni et al. 2015) was modified in the Early Copper Age plain bowls and cups from the Agorà through the addition of grog, probably to enhance the workability of the clay.

This shift implies the abandonment by potters of specific clay sources for fine wares in favour of iron-rich, non-calcareous ones already in use for coarse wares (e.g., jars, large bowls etc.; see Chapters 7 and 8). This important change has several implications and possible concurrent causes. A clear shift in the demand for socially valued goods (Spielmann 2002), caused or followed by a change in the use of ceramic vessels can be recognised. As expected, cups and small bowls are still attested and manufactured with finer fabrics, though they display a lower incidence in the ceramic record (Chapter 8.2, table 8.1G). This might indicate a change in people's ritual and social consumption practices or a change in the role that ceramic objects played in these. From a technological point of view, this disruption in the production of calcareous fine wares can be also understood in terms of a loss of potters' expertise in fashioning and controlling the firing of calcareous ceramic pastes (see Shoval *et al.* 2006; Maggetti *et al.* 2011). This could either be due to a break in the transmission of information and practices between potters across time, or to a lower time investment in the production of high skilled ceramic vessels, as suggested also by the modification of the original recipe in favour of a greater workability of the clay.

The modification of earlier, more demanding traditions (the *figulina* ware now tempered with grog) and their subsequent abandonment are the first significant changes happening in the first half of the 4th millennium BC, suggesting that potters tended to a simplification of the ceramic production process. At the same time, they developed innovative features, such as the scaled decoration that characterises domestic ceramic production (particularly jars) across the whole Italian Peninsula until the final centuries of the 3rd millennium BC. In this context, ceramic production expresses an inter-regional similarity characterised by simple types lacking particularly highly finished, regionally distinguished, exchanged ceramic vessels.

As previously outlined, the archaeological evidence for this period in Campania exists only in settlement sites, while funerary evidences are completely lacking. The rarity of mortuary and clearly ritual sites, together with the apparent decrease in the symbolic meaning of pottery, suggest that during the first half of the 4th millennium BC important ideological, symbolic and possibly economic changes were ongoing, but not yet defined, resulting in the substantial changes evident in the subsequent Middle Copper Age phases.

9.3.2. 3650 BC-2500 BC: the rise and fall of collective graves and symbolic ceramic repertoires

This transitional period is followed in Campania by a restructuring of local communities around 3650 BC, when marked changes can be recognised in the ceramic record and other archaeological evidence, with the onset of large cemeteries and a decrease of settlement sites. Funerary contexts that were rare in the Late Neolithic and Early Copper Age become predominant, with dedicated tomb and cemetery spaces and complex ritual practices, often involving the deconstruction of individual identity in favour of a non-individualised community of the dead (Skeates 1995; Cocchi Genick 2004; Dolfini 2019). This wide range of changes, occurring in different ways across the Italian Peninsula and Europe, is accompanied by a substantial transformation of ceramic production processes and repertoires. Production becomes influenced by a 'ritual demand' (Spielmann 2002) that causes significant changes in the repertoire and technology (see section 9.2 above). This sees the emergence of skilled potters sharing a clear community of practice responding to demands for, and dedicated to the production of high quality, socially valued goods used by mourners in complex and codified funerary rituals. The broadly circulating vessel types of the Final Neolithic/Early Copper Age were replaced by regional repertoires, characterised by representative vessel types rarely circulating outside their main, mostly funerary, contexts, such as Taurasi and Gaudo in Campania and surrounding regions, but also Remedello and Rinaldone in North and Central Italy (de Marinis 2013; Dolfini 2015). In the Campania region, for a 500 year period (about 3650-3100 BC) relatively large cemeteries and collective graves with cremation or inhumation in different structures become the most common features of the archaeological record, attributed to the Taurasi (cremation) and Gaudo (rock-cut inhumation burials) cultural traditions.

Cremation burials

Ceramics associated with cremation burials are highly problematic and deserve a separate discussion. At cremation sites, attested in a patchy manner in Southern Italy, ceramics represent different styles (e.g., Early Copper Age style at Sala Consilina and Caivano, but Gaudo-like style at Taurasi, see Chapter 2.4) and presently cannot be linked to other forms of archaeological evidence (e.g., settlement sites, see Figure 9.2). Therefore, in order to address their production systems in a more comprehensive way, further technological and archaeometric analyses on all cremation contexts attested in Campania and Southern Italy are an essential development for future research. Taking only the site analysed for the present research, potters at Sala Consilina (phase I) produced simple vessel shapes in continuity with the Early Copper Age but with slightly different techniques. For the first time they used moulds for the shaping of large bowls and attached tunnel handles on the outside of the vessel rather than on the inside as attested in Early Copper Age Pontecagnano. The large hanging jars and bowls typical of the site were accurately produced with smoothed or burnished surfaces and with the almost exclusive use of crushed quartz of metamorphic origin as temper. Following the trend started in Early Copper Age, potters at Sala Consilina preferred coarse fabrics in order to give large vessel shapes a stronger matrix to avoid collapse during their construction process (Forte 2020: 121; Forte *et al.* 2020; Roux 2019: 160). Fine fabrics were extremely rare, and only in one case is the use of a sandy calcareous clay attested for a large bowl fired in reducing conditions (contrarily to the oxidising *figulina* tradition).

The technological variation between the Early Copper Age and the (Middle Copper Age) Taurasi style at Sala Consilina is striking since the continuity in the vessel types is not paralleled by technological continuity in the forming techniques, suggesting that potters adhered to a different potting tradition but produced types still connected to the previous trends. It must be noted that cremation burials in Southern Italy do vary, both in vessel types and in burial practices, e.g., in vessels or in pits, inside or near house-like stone structures at Taurasi, Sala Consilina and Giardinetto in Puglia (Tunzi *et al.* 2014); cremations in tumuli at Salve (Aprile *et al.* 2018); and in caves at Grotta Pavolella (Carancini and Guerzoni 2004). This variety in ceramic style and associated ritual practices might also suggest that cremations were funerary or ritual practices carried out by different groups with their own pottery traditions for exceptional (i.e., uncommon) situations that took place in specific circumstances, rather than being dominant cultural traditions *per se* (Bailo Modesti 2006; Aurino 2013).

Collective rock-cut cemeteries

In contrast, the typological and contextual analysis shows that the ceramic products deposited in collective rock-cut cemeteries (of the Gaudo culture) are characterised by a strong internal consistency in types and technological choices across different burial sites (e.g., Paestum and Pontecagnano, 25km apart). Towards the middle of the 4th millennium BC, potters in Campania exerted a strong creative effort for the formalisation of a completely new ceramic repertoire destined to be deposited in rock-cut collective tombs, introducing pouring vessels, different types of hanging jars, pyxides, etc., for a total of 11 new shapes (see Chapter 8.4). This creative process, already visible in some of the earlier cremation burials, is particularly evident in the long standing Gaudo tradition, where this new repertoire becomes codified and continues with a strong homogeneity for almost 1000 years (about 3500-2500 BC, according to radiocarbon dates from the cemetery of Paestum, Chapter 2.4). In fact, vessel types, forming techniques and decorative schemes show a certain variability and creativity but always within well-defined boundaries. The data gathered in the Campania region for the Gaudo cultural tradition (with parallels in the area of Rome, Forte 2020), display an impressive consistency in terms of production, resulting in a codification of all stages of the *chaîne opératoire*, including the recipes adopted, the types and morphologies of vessels, the careful smoothing/polishing of surfaces, and the normative use of decoration. This strict codification of the ceramic vessels, both in their visible features (e.g., shape, decoration and surface treatment) and invisible features (e.g., fabric and firing temperatures), finds correspondence in the equally formalised ritual practices performed at the Gaudo rock-cut burials (e.g., fragmentation of jars in the entrance shaft, depositions in the chambers, secondary manipulation of the human remains, etc., see Chapter 2.4.2, figure 2.21). The most unusual ceramic specimens, from a stylistic point of view, can be found at Paestum, where the extended period of use of the cemetery (1000 years) and potential for long-distance connections (e.g., as expressed by the T-headed bone pins) might have resulted in different influences and variations in style.

As seen for (Middle Copper Age) Sala Consilina, also in (Middle-Late Copper Age) Gaudo potters preferred almost exclusively coarse iron-rich, non-calcareous clay mixtures of illite and smectite with the addition of non-plastic inclusions (25–40%) of different types. Potters clearly avoided fine recipes and calcareous clays and calcareous inclusions despite their physical properties (Hoard *et al.* 1995; Rye 1976; Shoval *et al.* 2006; Steponaitis 1984), such as the buff colour and the refractoriness widely exploited in previous and subsequent phases (Muntoni *et al.* 2015; Muntoni *et al.* 2018; Levi 2010; Cannavò *et al.* 2017). It could be argued that the colour desired for the vessels was the determinant: shiny brownish surfaces are consistently reproduced in Gaudo (and Taurasi) ceramics. For this reason, the use of non-calcareous iron-rich clays was more suitable, compared to the light colours of calcareous clays (Molera *et al.* 1998; De Bonis *et al.* 2017). The presence of a few carbonatic fabrics, still identifiable as local, however, suggests that the artisans might have known how to manage such material, but largely rejected it for large-scale productions. Given the abundance of carbonatic materials around the sites, this can be explained only in functional or cultural terms as previously highlighted for *figulina* ware (i.e., simplification of the fashioning and firing process and preference for darker surfaces). The visual and aesthetic requirements of containers for social display clearly changed, probably as a result of important transformations of the ceremonial practices now concentrated on the complex rituals of the mortuary sphere. These practices, and therefore ceramic vessels, were exclusively internal to these human groups, since no major sign of circulation of Gaudo vessels is attested outside of Gaudo funerary contexts, in contrast to the extensive circulation of the *figulina* ware, especially Serra d'Alto, during the Middle and Late Neolithic.

In addition to these symbolic changes, the organisation of pottery production also underwent major changes. These were directed, on the one hand, at a higher complexity of the vessel shapes and more varied repertoire of types, and on the other at a higher flexibility and simplification of the supply strategies and fabric recipes. In fact, pottery objects with different shapes and sizes mostly possess similar physical properties; the use of the same fabric to achieve multiple forms demonstrates that the material used had broad application for producing several types of vessel (e.g., Gliozzo *et al.* 2008; Kretier *et al.* 2007; Spataro 2002, 2006). The predominant use of coarse clays rich in quartz-feldspathic, volcanic or grog inclusions suggests the need for a paste with enhanced structural strength to support the forming of complex shapes as jugs, *askoi*, etc. (Rice 1987: 229–330) for which moulding was also used.

Only one distinctive practice can be identified in the ceramic assemblage from the Gaudo cemetery at Paestum: the use of organic tempering with a fine clay for the production of large jars. This can be linked to the ability of organic temper to decrease the weight of the vessel and increase its thermal isolation (Skibo *et al.* 1989; Martinón-Torres and Rehren 2014: 123–4), as well as reducing excess water in the clay (Maritan *et al.* 2006), allowing potters to control the hydration of the clay and its malleability. Jars found in Gaudo contexts are also characterised by an oxidising firing that produces a black core, probably due to the presence of organic matter, suggesting standardisation of the production process. Large jars were deposited in Gaudo graves exclusively fragmented in the entrance shafts, suggesting that vessels which possibly bore a closer link with daily life, and therefore with the living sphere, could enter the mortuary space only after a ritual de-functionalisation. The lack of specialisation of fabric types for the most distinctive shapes (*askoi*, twin vessels, pyxides, etc.) and the lower firing temperatures of the vessels compared to the other cultural traditions analysed (Chapter 8.4.4.) support the hypothesis that at least part of the Gaudo ceramic repertoire was produced for the purpose of social display and ritual practices, not requiring the same resilience of those vessels used for more dynamic daily activities. In fact, the most distinctive vessel types are generally deposed whole in the tomb entrance shaft or chamber, at times in direct contact with the deceased, and are extremely rare in the few settlement sites attested in Campania and Lazio, whilst jars are widely documented (Chapter 8.4.6).

A further argument for the highly symbolic value of Gaudo ceramic production is linked to the almost exclusive use by potters of grog tempered fabrics. This has clear technological implications since it increases the workability of the clay (Rice 1987: 229–330) while having a similar thermal expansion coefficient to that of the clay matrix (Tite *et al*. 2001: 310), implying a lower risk of cracking during firing and subsequent exposure to fire (Cuomo Di Caprio 1985). Nevertheless, in such a codified and ritualised production, the use of grog may also have carried a strong symbolic meaning (Rye 1976). Potters recycled and incorporated older pots inside new vessels destined to accompany or celebrate the deceased while joining the community of ancestors. In this way, the biography of the old and new objects could have merged and in turn contributed to the biography of potters, users, the deceased and ancestors (Chapman and Gaydarska 2007: 8). The ritual meaning of the almost exclusive use of grog temper in Gaudo ceramics, especially when compared to its lower incidence in other cultural traditions, certainly should not be underestimated. A further clue to the symbolic value of pottery in these contexts is the practice of ritual fragmentation of ceramic objects (Bailo Modesti and Salerno 1998), with fragments of the same vessels deposited in different burials, as in tombs 6512 and 6514 at Pontecagnano, generating also in these cases ‘enchained relationships’ between tombs and between the living and the dead (Chapman and Gaydarska 2007).

The predominance of collective mortuary rituals, including both inhumation and cremation, emphasised bonds with ancestors and kin-based groups. Together with the codification and relative standardisation of ceramic production for funerary purposes, this suggests the presence of close-knit human groups that invested in the transmission and perpetuation of communal bonds for almost 1000 years. These were reinforced through rituals, and through a particular set of practices and self-representations expressed in material culture (both ceramic and lithic, such as typical flint daggers, Chapter 2). The complex vessel types developed were particularly linked to serving and consuming liquids, suggesting possible ritual feasting during funerary practices (Hamilakis 1998). During the second half of the 4th millennium BC especially, as also hypothesised for Central Italy (Dolfini 2015, 2019; Robb 1994), mortuary areas seem to have become an important new medium around which social relations were developed and reinforced, in contrast to the Neolithic village.

It could be argued that the large Neolithic village-based human groups broke down during the 4th millennium BC with a greater emphasis on smaller kin-based groups. In fact, evidence of large settlement sites are extremely rare in Campania for Gaudo cultural tradition as well as in adjoining regions. The widespread occupation of Campania is mostly funerary or hinted at by sporadic finds (see Chapter 2, Figure 2.11), located in the major plains and communication routes, suggesting a system of smaller and possibly shifting settlements. The Sele River plain is particularly relevant in the definition of the settlement pattern of local Gaudo groups (see map in Chapter 2, figure 2.11). In fact, the area is characterised by two larger coastal sites (based on the extension of the cemeteries), Paestum and Pontecagnano, the smaller site of Eboli on the hills surrounding the plain, and the site of Buccino further inland, along the main communication artery across the Apennine Mountains. Recent aDNA analyses proved that people buried at these four cemetery sites were related between the 7-15th degree of kinship (Mittnik *et al.* 2022). This genetic and settlement pattern suggests that different, and probably small, kin-based human groups related to each other were organised in the territory to occupy areas favourable to different types of economic and subsistence activities (e.g., agriculture in the plains, pastoralism in the hills). This diversification in the production system, and possible interconnection between different human groups, is in line with the trends in the settlement organisation detected also in Central Italy during the Copper Age (Manfredini *et al.* 2009).

These close-knit Gaudo groups display a strong homogeneity in funerary ceramics and also in other classes of their material record, such as distinctive flaked stone daggers and arrowheads (Bailo Modesti and Salerno 1998: 133–9), supporting the existence of common traditions and stable contacts between different groups possibly reinforced through shared ceremonies at the mortuary sites (the presence at Paestum of two vessels possibly produced at Pontecagnano lends support to this hypothesis, see Chapter 8.4.1). In this respect, it could be hypothesised that potters reserved a tightly defined strand of ceramic production for the mortuary sphere while a simpler production was destined to daily activities (e.g., jars), possibly with a larger use of perishable materials.

Evidence of distant contacts are also attested, as testified by metal and bone objects such as T-headed bone pins (see Chapter 2.4.3). The first metal objects attested in the region were certainly made with non-local raw materials, as there are only minor copper or silver sources in the whole of Southern Italy (e.g., some possible mining sites in Calabria but currently with no clear sign of suitability for copper extraction, Larocca 2005; Dolfini *et al.* 2020; Iaia and Dolfini 2021). Exchange routes with Central-North Italy, and especially with metal-rich Tuscany, might have opened the way to networks where a wider range of exotic ideas, objects and peoples started circulating through the Alps and beyond, especially during the 3rd millennium BC.

Villages and adjoining single grave cemeteries

Roughly around 2900 BC, alongside large rock-cut tomb cemeteries (that endure until about 2500 BC), large settlements with annexed cemeteries, mostly with single trench graves and more varied funerary goods, emerge once again in several plains and inner areas of Campania (see Chapter 2.4.1.2). In these contexts, attributed to the Laterza cultural tradition, greater typological and technological variability in the ceramic production can be found both within the same site and between different sites, while ceramic assemblages from settlements and burials cannot be distinguished. Potters continued to use the technological innovations introduced during the 4th millennium BC such as grog temper and moulds for shaping especially shallow and small bowls. The ceramic repertoire is characterised by a smaller number of vessel types than the Gaudo culture (jugs, pyxides and hanging jars are no longer attested) and it has greater internal variability. For example, small bowls are particularly common, but may have a hemispherical, sinuous or carinated profile, an everted, raised or inward bending rim, etc. This variability is also reflected in technological choices, such as paste recipes, surface treatments and decorations, which are not standardised in contrast to the Gaudo tradition.

The same paste recipes are broadly attested for vessels used both as grave goods and for domestic activities. The use of grog is still dominant but accompanied by an increasing use of sandy quartz-feldspathic fabrics, both for coarse and fine vessels. The use of sand as temper instead of grog might be indicative of a slight change in the production process. In terms of structural strength, quartz-tempered fabrics are similar to those tempered with grog, although the thermal expansion of the quartz when heated repeatedly makes it less suitable for cooking pots (Tite *et al.* 2001; Warfe 2015). The increasing use of sand in vessels used both in domestic and funerary contexts implies a change in the production process, rendering the breaking and grinding of large quantities of pots no longer necessary. The reduction in the use of grog may also imply a decrease in its symbolic meaning paralleled by a decrease in the importance of ceramic vessels in mortuary rituals.

Indeed, the normative Gaudo ceramic repertoire is replaced in Laterza mortuary contexts by fewer vessel types with greater morphological simplicity, rarely composite and displaying greater variability in single attributes (shape of the rim, carination, etc.) and decorations. Pouring vessels (jugs and *askoi*) and hanging jars (including pyxides) disappear from both cemeteries and villages, which have similar pottery productions with the main vessel types widely attested in both contexts. Compared to rock-cut cemeteries, the ceramic repertoire involved in the funerary rite differs significantly, suggesting a change in the ritual practices carried out during the funerary rite. Funerary practices themselves appear more varied within different structures. Rock-cut collective burials are less common in Campania, except for the site of Paestum, in favour of single or double graves, mostly in trenches or pits, organised in cemeteries or located inside the settlements. Tombs are always characterised by fewer grave goods, involving one or two pottery vessels and in some cases metal or stone objects, also in this case typologically differing from Gaudo products.

As displayed in Figure 9.6, the incidence of ceramics in burial contexts greatly decreases, as does their quality and complexity. The large number of vessels previously deposited by mourners as grave goods (in close contact with the dead) or as ritual offerings in Gaudo burials is reduced to just a few ceramic vessels deposited in the single trench graves, either whole or ritually fragmented.

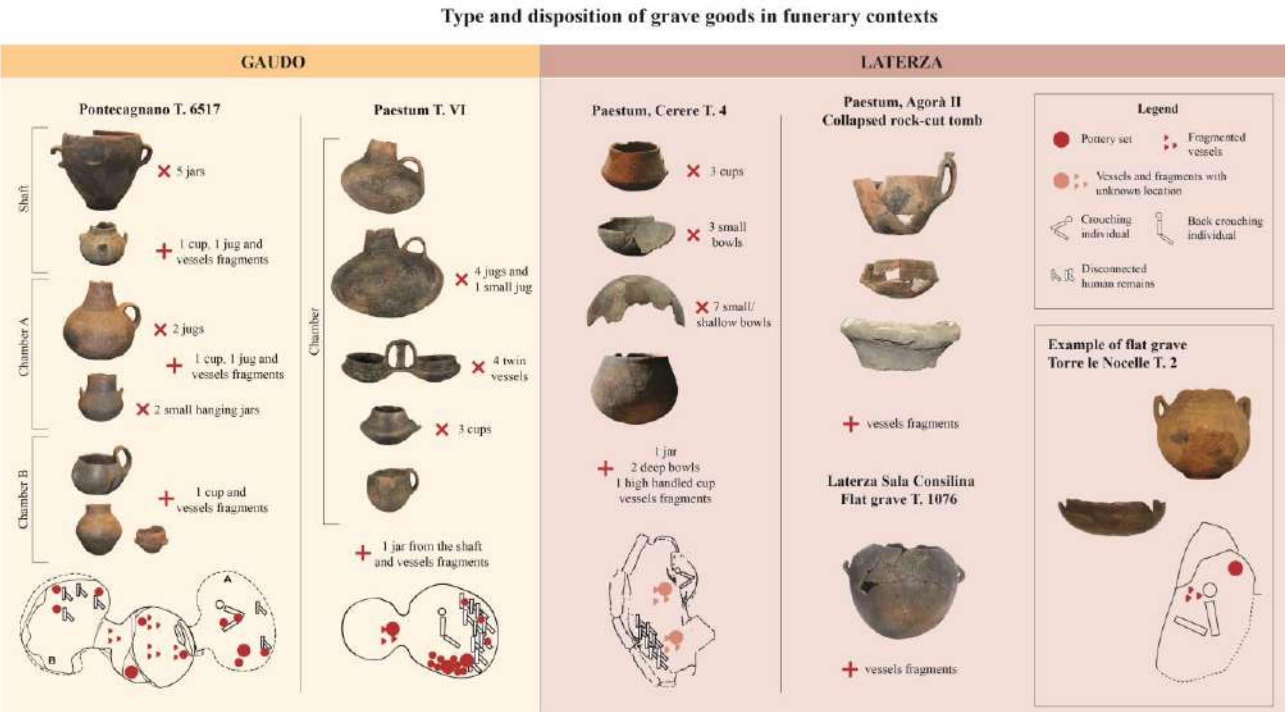


Figure 9.6. Comparison between the vessel type and disposition of ceramic grave goods in Gaudo and Laterza funerary contexts. (Tomb plans after Bailo Modesti and Salerno 1998; Albore Livadie *et al.* 2011; Palermo Rossetti and Talamo 2011.)

The strict connection between ceramic types and ritual performance typical of Gaudo graves is no longer visible, shapes vary from shallow and small bowls, to high-handled cups to small jars. Vessels for pouring or consuming liquids (jugs and cups) are no longer dominant in Laterza graves, despite the presence of a Bell Beaker fragment from tomb 1 in Paestum which suggests some sort of connection with rituals involving liquids offerings or drinking. As displayed in Figure 9.6, a larger number of vessels is attested in the partially rock-cut Laterza tombs at Paestum, continuing the tradition of collective graves. In contrast, in the trench graves, which become more common during the 3rd millennium BC, such as at Sala Consilina, Phase II, analysed in the present research and in the example from Torre le Nocelle, only one or two vessels are attested, mostly either a small jar or a small/shallow bowl or both.

This variation in burial customs and funerary rituals implies an important change in the symbolic world of Campanian human groups during the 3rd millennium BC. Alongside the longstanding tradition of collective rock-cut burials, flat single graves started to emerge and would become exclusive by the second half of the 3rd millennium BC. These changes in the mortuary sphere were accompanied by the onset of large settlements linked to agricultural exploitation probably boosted by the adoption and development of new agricultural technologies such as the plough and animal traction. This is particularly evident in the Campana plain where, preserved by eruption layers, traces of ploughing and carts can be recognised already in this period, and which increase conspicuously in the Early Bronze Age (Vanzetti *et al.* 2019), suggesting an intensification of subsistence practices in particular in large plains richly endowed with volcanic soils such as the Campana plain and the area of Rome. Villages occupy the same areas for long periods with a gradual shifting of the houses, probably due to land exploitation or rebuilding, as exemplified by the sites of Gricignano d'Aversa and Acerra where areas previously occupied by houses became dedicated to cemeteries (Fugazzola Deplino *et al.* 2003, 2007; Di Vito *et al.* 2021). Larger settlements allowed for a more conspicuous ceramic production dedicated to the residents' daily activities, such as large storage vessels and technical ceramics. In fact, in Laterza contexts pottery seems to respond more to the demands of everyday practicality rather than ritual. New categories of functional ceramic objects appear, such as the tuyère, the boiler lids, and portable slabs (mostly attested from the Bronze Age onwards). This suggests a development, both in ceramic production and in domestic activities such as processing of materials, food processing, metalworking and weaving, which required a new set of ceramic objects, also attested at the Final Copper Age site of Atena Lucana. This supports the hypothesis of an increase in the complexity of food processing activities, using boiler lids and strainers. At the same time, the presence of tuyères suggests the existence of other productive activities at Paestum and Atena Lucana possibly linked to metalworking.

Gaudo and Laterza

These processes occurring during the 3rd millennium BC represent an important turning point for the progressive development of the features that would later characterise Early Bronze Age communities and lead to a process of further cultural regionalisation in Italy. Two different spheres in particular interacted, with complex dynamics, represented by the Middle-Late Copper Age Gaudo and Laterza cultural traditions. Their main characteristics are summarised in Figure 9.7. They display an important socio-economic and ideological change, also seen in the organisation and types of ceramic production.

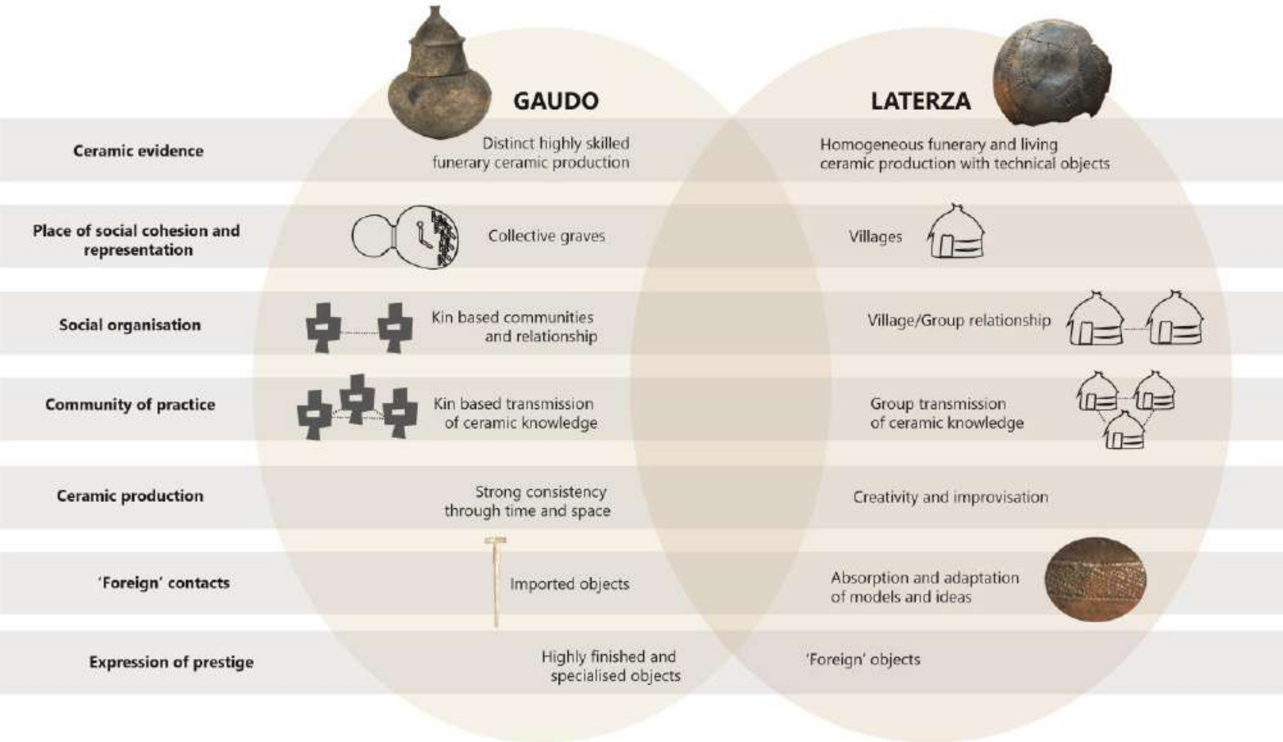


Figure 9.7. Main distinguishing features of Middle-Late Copper Age Gaudo and Laterza social and ceramic organisation.

The characteristics of what we identify as the Gaudo culture can be linked to a strong intention to perpetuate a specific tradition, expressed with an outstanding consistency in material culture for about one thousand years, and further highlighted in the mortuary practices devoted to the ancestors. In order to last for such a long time, people shared and carefully passed on these practices, one generation after the other of potters, mourners and community members. Collective graves and cemeteries appear as the area *par excellence* where social cohesion was formed, with complex rituals probably involving feasting, given the high number of jugs and cups always present in the graves. This system suggests a social organisation based on kin-groups, probably scattered in the landscape but still interacting one with the other and sharing the same practices for the production of objects for funerary purposes (pottery above all) and mortuary rituals. A kin-based transmission of ceramic communities of practices can be inferred as well, given the consistency in the production and the strong constraints on the outcome, with a reduced space for personal improvisation. The high quality and control over funerary ceramic production speaks of the high social value of these goods, charged with a strong connotations for social identity.

In contrast, what we identify archaeologically as the Laterza culture in Campania seems characterised by a different organisation and symbolic system. This is in particular expressed in different funerary rituals (fewer grave goods, reduced secondary manipulations) and in single rather than collective burials, abandoning the emphasis on collective, relatively undifferentiated, ancestors perpetuated for almost a thousand years. Villages appear once again, as during the Neolithic, as the place for social cohesion—evident in the construction of larger and more stable villages compared to Gaudo-related ephemeral traces. The ritual demand for ceramic production disappears, giving way to a progressive specialisation in ceramics for manufacturing purposes with possible cross-craft interactions, such as the use of specific ceramic objects for food processing or metalworking. From a stylistic point of view, pottery follows a general trend in shapes and decoration, which can be detected in most of Southern and Central Italy, but with a higher internal variability of types both at the same sites and at different sites. While the general aesthetic principle is reproduced almost everywhere (shallow bowls with incised decoration, plastic appendixes on handles, impressed and incised decorations, etc.), it is very rare to find vessel types made exactly in the same way. This phenomenon suggests that the community of practice at the base of pottery making was less close-knit and controlled compared to that of Gaudo. Learning and practicing of crafts may have taken place in larger social groups, forming part of the same village and composed of more than one kin-group. Putting aside the strong identity connotation of ceramics, potters appear to have had more freedom for creativity and personal improvisation, resulting in a variable style also open to foreign influences as further clarified in the following section.

The interaction between these the ceramic spheres of Gaudo and Laterza is particularly hard to assess. Based on radiocarbon dates they develop in parallel for about five hundred years (first half of the 3rd millennium BC, see Chapter 2.4, figure 2.7), and in the same territory, as exemplified by the site of Paestum where the Gaudo cemetery lasts roughly from 3500 to 2500 BC and where Laterza sites develop during the 3rd millennium BC just 2km away. Connections between the two entities can be detected only in the material culture, with a certain technological continuity in pottery making, and in the presence of objects attributable to the Laterza and Gaudo styles in the same grave, such as in tomb P at Paestum (Chapter 6.2.1), tomb 1497 in Pontecagnano (Chapter 6.3.1) and at the cemetery of Mirabella Eclano (Bailo Modesti and Salerno 1998: 129–30).

It could be argued that, alongside the Gaudo tradition, new forms of subsistence and social organisation started to emerge during the 3rd millennium BC among the same or different human groups commonly identified as Laterza (aDNA and isotope analyses could help to clarify this point). This socio-economic shift, followed or triggered also by an ideological change focussed more on the individual rather than on the ancestors proved more suitable to respond to the challenges of the 3rd millennium BC, such as a certain demographic growth (Palmisano *et al.* 2021) and consequent productive pressure and increase, as well as the impact of extra-territorial influences.

9.3.3. The second half of the 3rd millennium BC: extraterritorial contacts and the structuring of Early Bronze Age societies

The important changes in ceramics and society seen during the 3rd millennium BC in Campania can also be connected to increasing interconnectivity on inter-regional and even longer-distance scales in the Late and Final Copper Age, roughly from 2500 BC onwards, corresponding to the Bell Beaker and Cetina cultural phenomena. Human groups, including potters, in the Campania region were impacted by and engaged with these phenomena, as testified by the Bell Beaker fragments at Paestum and other key sites, and by the Cetina style of ceramics from Atena Lucana.

Compared to the societies of the Middle Copper Age, these Late Copper Age communities appear to have been more open and receptive to external stimuli, which were adopted in full or reworked. In this context, it is possible that, instead of ancestral kin-groups, villages and their communication networks served to consolidate the community and determine its status. In this way, material culture and especially ceramics also moved away from their previous codified ritual character, assuming more dynamic mechanisms for the transmission of information, with more space available for creativity and improvisation, albeit within a shared and recognisable aesthetic.

The social dynamics inherent in the formation of villages and cemeteries, in ritual performances, and in developments in ceramic production during the second half of the 3rd millennium BC laid the foundations for subsequent Early Bronze Age communities, defined in Campania as the Palma Campania cultural tradition, and marked by an even stronger contribution from long distance connections (Aurino and De Falco 2022) that also characterised Southern Europe on an even broader scale. The incomplete picture currently available for the final centuries of the 3rd millennium BC in Campania includes long-distance connections along different routes pointing to North-Central Italy, especially for the Bell Beaker and metal objects (Aurino and De Falco 2022), but also to the Balkan area for the Cetina style and the spread of tumuli in funerary contexts (e.g., Scala 2021). Ongoing projects focusing on the mobility of people and objects (e.g., Aurino *et al.* 2021; Mittnik *et al.* 2022) will help to further clarify this picture—one in which ceramic production was entangled with social and cultural processes.

Chapter 10 - Conclusions

This thesis has explored the ceramic production of Copper Age Campania by using a holistic approach integrating typological and stylistic analyses with a broader, theoretically informed technological approach involving macroscopic observations and archaeometric analyses on a completely new dataset.

The first aim was to fill a gap in the current archaeological research. The ceramic production of Copper Age communities in Italy, especially for Campania, is greatly under-researched from an archaeometric and technological perspective. A new dataset was therefore produced, with extensive macroscopic and microscopic analyses undertaken on ceramics from four key sites. This represents the first comprehensive typological, technological and archaeometric dataset on Southern Italian Copper Age ceramics.

The second aim was to adopt a methodological approach able to bridge the distance between traditional Italian chrono-typologies and more modern analytical methods, involving technological and archaeometric analyses, and to test their potential in clarifying production as well as broader cultural processes. This research has allowed a first characterisation of Campanian pottery production over the *longue durée*, and has added important information regarding the cultural traditions involved and their inter-relations and connections with broader cultural processes.

The research was rooted in a contextualisation of the sites analysed with respect to the Copper Age in Campania, Italy and Europe (Chapters 1, 2 and 4). This general framework allowed the identification of major cultural processes taking place between the 4th and 3rd millennia BC, which oriented both the initial research questions and the eventual interpretation of the results. Understanding of the Campanian Copper Age context benefited from a first-hand engagement with and knowledge of the ceramic assemblages from the main sites analysed, Paestum, Pontecagnano and Sala Consilina, as well as from other key Campanian sites analysed before and during this doctoral research (including the Gaudo cemetery of Mirabella Eclano, the Gaudo tombs of Napoli Materdei, the Copper Age and Early Bronze Age villages and cemeteries of Acerra, Gaudello locality, as well as cave contexts such as S. Angelo a Fasanella and Olevano sul Tusciano). From a methodological point of view, this direct and extensive study of different ceramic assemblages from Copper Age Campania, and knowledge of their limitations, allowed the selection and adaptation of the most appropriate approaches from among the current trends in European prehistoric pottery studies (Chapter 3). The integration of the analytical approaches adopted proved crucial in clarifying the various production and cultural aspects of ceramics, with each method of analysis and interpretation deeply interconnected as demonstrated in Figure 10.1.

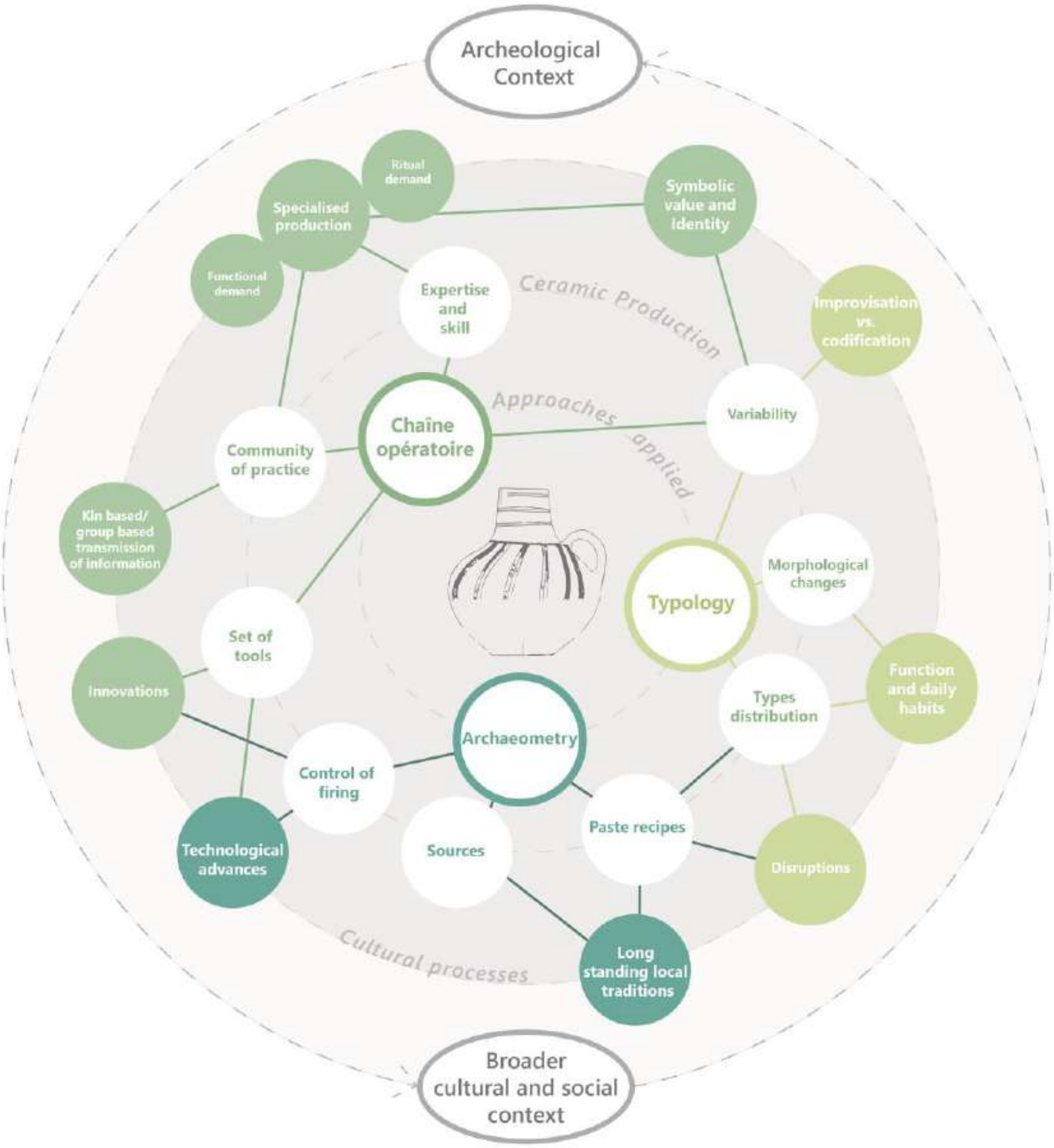


Figure 10.1. Visual representation of the main methodological approaches applied and their interconnection for the understanding of production processes and cultural processes.

To complement and enhance the predominantly typological studies previously conducted for this period and region, it was essential to rethink the traditional typological classification, taking into account the specificity of the vessel categories and types for each period considered, and also their functional aspects, so as to integrate typological and morphological considerations with technological and compositional analyses (Chapter 5). In this way, the typological and technological observations (Chapter 6) and the archaeometric results (Chapter 7) could be directly combined to shed light on the whole production process of ceramic objects throughout the Copper Age for the sites analysed (Chapter 8) and discussed in relation to broader cultural processes (Chapter 9).

Integrated typological and technological analyses of the different phases of the ceramic productions made it possible to highlight technological innovations as well as strong manufacturing traditions never previously fully characterised for Copper Age Southern Italy, such as the introduction of grog temper and moulds, the abandonment of calcareous clays etc. It was also possible to track the shift in production processes and aesthetics from Neolithic to Early Copper Age ceramics, previously recognised only macroscopically, from a technological perspective, and to suggest possible functional and social explanations. Important technological innovations could be recognised and relatively dated, including: the introduction (or re-introduction) of grog in Campania in the first half of the 4th millennium BC; the use, from *c.* 3650 onwards, of moulds for the production of complex forms; advances in the control of the firing process, with the possible introduction of kilns, from the Late Copper Age onwards; and the introduction of new tools (comb decoration), decorative styles and paste recipes in the last centuries of the 3rd millennium BC, as a result of long distance contacts and reworking of external models. In the last case, it was also noted that even in the cases of clearly external vessel types, the production was always local, with no long-distance import of ceramic objects. The analysis of the distribution of types and morphologies over the *long durée* highlighted important changes in the use of specific ceramic objects, also suggesting shifts in daily activities and habits, such as the disappearance in the 3rd millennium BC of the different types of hanging jars and the rarity of pouring vessels.

The suite of typological, macroscopic and archaeometric analyses applied allowed the clarification of the main features of potting traditions that archaeologists have previously ascribed to different cultural entities and human groups (see Chapter 2). A key aspect of the research was to test the extent to which traditional typological identifications of different cultures (or *facies*) corresponded to changes in ceramic technology.

Classic typological distinctions were revealed to be valid only in those cases with more established and homogeneous ceramic productions (Gaudo and Laterza), but were less reliable for periods when broadly circulating, inter-regional styles dominated (Early Copper Age and part of the Final Copper Age). The evidence relating to cremation burials (Taurasi) was also found to be problematic. The unpublished site of Sala Consilina provided the first typological and archaeometric characterisation of a ceramic assemblage connected to cremation burials. From a technological point of view, it can be clearly distinguished from Early Copper Age products, but it displays strong typological similarities. The typological variability of ceramics connected to cremations from different sites highlights the need to further study of this complex practice, not necessarily linked to distinct cultural traditions.

Clear pottery traditions could be recognised for ‘Gaudo’ and ‘Laterza’ contexts. These distinct technocomplexes display a degree of technological continuity but strong differences in typology, aesthetics, time investment, purpose, variability of ceramic objects and permeability to external influences. Their attribution to culturally or chronologically different human groups cannot yet be confirmed , but it is clear that important socio-economic changes were occurring in Southern Italy during the 3rd millennium BC, resulting in radical changes in the production and purpose, and symbolic and material value, of ceramic objects. The shift from a ‘ritual’ (Gaudo) to a ‘functional’ (Laterza) demand for ceramic production (Chapter 9.2), theorised for the first time for these contexts, exemplifies the cultural processes ongoing in this period, which are recognised and further refined through the ceramic record: the mobility of people and long distance flow of stylistic and technological knowledge and skills; the onset of large settlements and shifts in investment from funerary to domestic productions; the diversification of agricultural practices and food processing (visible in intra type variability and the emergence of new technical objects); the ideological shift from collective to single burials; and the growing impact of ‘foreign’ influences.

Several lines of research remain open: the genetic, chronological and cultural relationships between human groups characterised by different material cultures and ritual practices; the directions and intensities of the flows of peoples, objects and information; and the characteristics and implications of cremation ritual practices. As exemplified by the case studies presented, Copper Age contexts in Southern Italy are characterised by a surprisingly rich archaeological record, which carries significant interpretive potential. To move beyond old paradigms and interpretations, the reformulation of traditional approaches, the more intensive use of radiocarbon dating and the extensive application of modern scientific methods (e.g., archaeometry, stable isotope and aDNA analyses) will be essential tools to refine further the broad historical reconstruction presented here.

References

AA.VV. (1993), Archeometria Della Ceramica. Problemi Di Metodo - A*tti 8 Simposio Internazionale Della Ceramica Rimini, 1-12 Novembre 1992*. Bologna: Centro Ceramico.

Acquafredda, P., Cinquepalmi, A., Laviano, R. and Muntoni, I. M. (2006), Indagine Archeometrica Su Fornelli, Intonaci e Ceramiche Dell'età Del Bronzo Da Monopoli - Piazza Palmieri (Bari), in: *Archeometria del costruito. L'edificato storico: materiali, strutture e rischio sismico*. Bari: Edipuglia, pp. 21–31.

Albero-Santacreu, D. (2011), *Caracterización Tecnológica, Social y Adaptación Funcional de Cerámicas Prehistóricas En El Oeste y Sureste de Mallorca (1700-50 BC). Aproximación Sincrónica y Diacrónica a Partir Del Estudio Arqueométrico de Pastas*. Departamento de Prehistoria y Arqueología, Facultad de Filosofía y Letras, PhD thesis.

Albore Livadie, C. (1990), *Archeologia a Piano Di Sorrento. Ricerche Di Preistoria e Di Protostoria Nella Penisola Sorrentina*. Napoli: Centre Jean Bérard.

Albore Livadie, C. (1999), Territorio e Insediamento Nell'agro Nolano Durante Il Bronzo Antico: Nota Preliminare, in: Albore Livadie, C. (Ed.), *L'eruzione delle "Pomici di Avellino" e la facies di Palma Campania (Bronzo Antico). Atti del Seminario Internazionale (Ravello, 15-17.07.1994)*. Bari: Edipuglia, pp. 203–245.

Albore Livadie, C. (2014), La Pianura Campana. Prima Della Città, in: Rescigno, C. and Sirano, F. (Eds.), *Immaginando città. Racconti di fondazioni mitiche, forma e funzioni delle città campane*. Salerno: Soprintendenza per beni archeologici di Salerno, Avellino, Benevento e Caserta - Università degli Studi di Salerno Dipartimento di Scienzedel Patrimonio culturale, pp. 12–18.

Albore Livadie, C. (2020), Su Alcuni Reperti Metallici Del Bronzo Antico Della Campania, in: Albore Livadie, C. and Vecchio, G. (Eds.), *Nola – Croce del Papa. Un villaggio sepolto dall'eruzione vesuviana delle Pomici di Avellino*. Napoli: Centre Jean Bérard, pp. 226–242.

Albore Livadie, C. and Gangemi, G. (1988), Sepolture Eneolitiche da Casalbore, Loc. S. Maria Dei Bossi (Avellino), in: *L'età del Rame in Europa, Viareggio 15/18 ottobre 1987, Rassegna di Archeologia 7*: 572–573.

Albore Livadie, C., Fedele, F., Albarella, U., De Matteis, F., Esposito, E. and Federico, R. (1987), Ricerche Sull'insediamento Tardo-Neolitico Di Mulino Sant'Antonio (Avella). *Rivista di scienze preistoriche*, 41(1–2): 65–103.

Albore Livadie, C., Arcuri, F. and Napoli, G. (2011), Vecchi Scavi, Nuove Conferme: Riesame Della Necropoli Di Facies Laterza Presso Il Tempio Di Cerere (Paestum, Salerno), in: *Atti della XLIII Riunione Scientifica dell'Istituto Italiano di Preistoria e Protostoria - L'età del Rame in Italia (Bologna, 26-29 novembre 2008)*, pp. 329–334.

Amato, V. (2011), Geoarcheologia Di Pontecagnano e Dell'Agro Picentino, in: Pellegrino, C. and Rossi, A. (Eds.), *Pontecagnano I.1. Città e campagna nell'Agro Picentino (Gli scavi dell'autostrada 2001-2006)*. Salerno: Soprintendenza per beni archeologici di Salerno, Avellino, Benevento e Caserta - Università degli Studi di Salerno Dipartimento di Scienze del Patrimonio culturale, pp. 235–249.

Amato, V., Aucelli, P., Patrizio, C., D'Argenio, B., Da Prato, S., Ferraro, L., Pappone, G., Petrosino, P., Rosskopf, C. M. and Russo Ermolli, E. (2012), Holocene Environmental Evolution of the Costal Sector in Front of the Poseidonia-Paestum Archaeological Area (Sele Plain, Southern Italy). *Rendiconti Lincei*, 23(1): 45–59.

Amicone, S., Quinn, P. S., Marić, M., Mirković-Marić, N. and Radivojević, M. (2019), *Tracing Pottery-Making Recipes in the Prehistoric Balkans 6th–4th Millennia BC*. Oxford: Archaeopress.

Amicone, S., Gori, M., Podrug, E., Recchia, G., Šuta, I. and Tomas, H. (2019), Characterising Cetina Pottery Technology. Petrographic Analyses from Poljakuše and Vučevica Tumuli in Central Dalmatia, poster at the *15th European Meeting on Ancient Ceramics, 16-18 September 2019, Barcelona*.

Amicone, S., Freund, K.P., Mancini, P., Oriano, R. D. and Berthold, C. (2020), New Insights into Early Iron Age Connections between Sardinia and Etruria: Archaeometric Analyses of Ceramics from Tavolara. *Journal of Archaeological Science: Reports*, 33(June): 102452.

Amicone, S., Radivojević, M., Sean, P. and Berthold, C. (2020), Pyrotechnological Connections? Re-Investigating the Link between Pottery Firing Technology and the Origins of Metallurgy in the Vinča Culture, Serbia. *Journal of Archaeological Science,* 188: 105123.

Amicone, S., Raj, A., Deepthi, R., Mirković-marić, N., Pantović, I. and Kuzmanović-cvetković, J. (2020), Beneath the Surface : Exploring Variability in Pottery Paste Recipes within Vinča Culture. *Quaternary International*, 560–561: 86–101.

Amicucci, L., Barchi, M. R., Montone, P. and Rubiliani, N. (2008), The Vallo Di Diano and Auletta Extensional Basins in the Southern Apennines (Italy): A Simple Model for a Complex Setting. *Terra Nova*, 20(6): 475–482.

Anastasia, A., Forte, V. and Lemorini, C. (2020), Pesi e Fuseruole: La Tessitura Nelle Comunità Eneolitiche Del Territorio Di Roma, in: Carboni, G. and Anzidei, A. P. (Eds.), *Roma prima del mito*. Roma: Archaeopress, pp. 597–608.

Anthony, D. (1990), Migration in Archaeology: The Baby and the Bathwater. *American Anthropologist*, 92: 895–914.

Anthony, D. (2007), *The Horse, the Wheel, and Language: How Bronze-Age Riders from the Eur-Asian Steppes Shaped the Modern World*. Princeton: Princeton University Press.

Anzidei, A.P. and Carboni, G. (2011), Il Gaudo a Sud Del Tevere: Abitati e Necropoli Dall'area Romana, in: *Atti della XLIII Riunione Scientifica dell'Istituto Italiano di Preistoria e di Protostoria - L'età del Rame in Italia, Bologna, 26-29 novembre 2008*. Firenze: Istituto Italiano di Preistoria e Protostoria, pp. 209–221.

Anzidei, A. P. and Carboni, G. (2020), *Roma Prima Del Mito*. Oxford: Archaeopress.

Anzidei, A. P., Carboni, G., Castagna, M. A., Celant, A., Cianca, M., Egidi, R., Favorito, S., Funiciello, R., Giordano, G., Malvone, M.a and Tagliacozzo, A. (2007), L'Abitato Eneolitico Di Osteria Del Curato-via Cinquefrondi : Nuovi Dati Sulle Facies Archeologiche Di Laterza e Ortucchio Nel Territorio Di Roma, in: *Atti della XL riunione scientifica- Strategie di insediamento fra Lazio e Campania in età preistorica e protostorica (Roma, Napoli, Pompei, 30 novembre-3 dicembre 2005).* Firenze: Istituto Italiano di Preistoria e Protostoria, pp. 477–508.

Anzidei, A. P., Carboni, G., Egidi, R. and Malvone, M. (2007), Rinaldone a Sud Del Tevere: Nuove Necropoli e Materiali Da Contesti Di Abitato Nel Comprensorio Delle via Tuscolana Nell'area Sud-Est Di Roma, in: *Atti della XL riunione scientifica- Strategie di insediamento fra Lazio e Campania in età preistorica e protostorica (Roma, Napoli, Pompei, 30 novembre-3 dicembre 2005)*. Firenze: Istituto Italiano di Preistoria e Protostoria, pp. 461–476.

Appadurai, A. (1986), *The Social Life of Things: Commodities in Cultural Perspective*. Cambridge and New York: Cambridge University Press.

Aprile, G., Ingravallo, E. and Tiberi, I. (2018), *I Tumuli Della Necropoli Di Salve: Architetture e Rituali Nell'Ideologia Funeraria Dell'Età Del Rame*. Bari: Edipuglia.

Aras, A. (2004), The Change of Phase Composition in Kaolinite- and Illite-Rich Clay-Based Ceramic Bodies. *Applied Clay Science*, 24(3–4): 257–269.

Arcà, A. (1999), Incisioni Topografiche e Paesaggi Agricoli Nell'arte Rupestre Della Valcamonica e Del Monte Bego. *Notizie archeologiche bergomensi*, 7: 207–233.

Arcuri, F. and Albore Livadie, C. (1988), Paestum (Salerno): Le Tombe Eneolitiche Presso Il Tempio Di Cerere, in: *L'età del Rame in Europa, Viareggio 15/18 ottobre 1987, Rassegna di Archeologia*, 7: 568–569.

Arcuri, F., Albore Livadie, C., Di Maio, G., Esposito, E., Napoli, G., Scala, S. and Soriano, E. (2016), Influssi Balcanici e Genesi Del Bronzo Antico in Italia Meridionale : La Koinè Cetina e La Facies Di Palma Campania. *Rivista di scienze preistoriche*, 65: 77–95.

Ard, V. (2013), Ceramic Traditions and Cultural Identities: West-Central France during the Late Neolithic II Period (c.3400-2900 Cal. BC). *Oxford Journal of Archaeology*, 32(4): 367–389.

Arnold, D. E. (1972), Native Pottery Making in Quinua, Peru. *Anthropos*, 67(January): 858–872.

Arnold, D. (1985), *Ceramic Theory and Cultural Process*. Cambridge: Cambridge University Press.

Arnold, D. E. (1993), *Ecology and Ceramic Production in an Andean Community*. Cambridge: Cambridge University Press.

Arnold, D. E. (2000), Working without a Net: Recent Trends in Ceramic Ethnoarchaeology. *Journal of Archaeological Research*, 8(2): 105–133.

Arnold, D. (2005), Linking Society with the Compositional Analysis of Pottery: A Model from Comparative Ethnography, in: Livingstone, A., Bosquet, D., and Martineau, R. (Eds.), *Pottery Manufacturing Processes: Reconstitution and Interpretation* (BAR International Series 1349). Oxford: Archaeopress, pp. 15–21.

Arnold, D. E. (2011), Ceramic Theory and Cultural Process after 25 Years. *Ethnoarchaeology*, 3(1): 63–98.

Arnold, D. E., Neff, H. and Bishop, R. L. (1991), Compositional Analysis and 'Sources' of Pottery: An Ethnoarcheological Approach. *American Anthropologist*, 93(1): 70–90.

Arthur, J. (2003), Ethnoarchaeology, Pottery, and Technology: Bridging Ethnographic and Archaeological Approaches. *Reviews in Anthropology*, 32(4): 359–378.

Artioli, G. (2010), Overview of the Analytical Techniques, in: Artioli, G. (Ed.), *Scientific Methods and Cultural Heritage: An introduction to the application of materials science to archaeometry and conservation science*. Oxford: Oxford University Press, pp. 583–605.

Artioli, G., Angelini, I., Nimis, P., Addis, A. and Villa, I. M. (2014), Prehistoric Copper Metallurgy in the Italian Eastern Alps: Recent Results. *Historical Metallurgy*, 47(1): 51–59.

Ascione, A., Ciarcia, S., Di Donato, V., Mazzoli, S. and Vitale, S. (2012), The Pliocene-Quaternary Wedge-Top Basins of Southern Italy: An Expression of Propagating Lateral Slab Tear beneath the Apennines. *Basin Research*, 24(4): 456–474.

Ashmore, P. J. (2003), Terminology, Time and Space: Labels, Radiocarbon Chronologies and a 'Neolithic' of Small Worlds, in: Armit, I., Murphy, E., Nelis, E., and Simpson, D. (Eds.), *Neolithic settlement in Ireland and Western Britain*. Oxford: Oxbow Books, pp. 40–46.

Atzeni, E. (2004), *Laconi : Il Museo Delle Statue Menhir*. Sassari: Carlo Delfino.

Aurino, P. (2004), Rappresentazioni Antropomorfe e Motivi Figurati Nella Cultura Del Gaudo, in: *Atti del Sesto Incontro di Studi sulla Preistoria e Protostoria in Etruria*. Milano: Centro Studi Preistoria e Archeologia pp. 83–87.

Aurino, P. (2011), L'occupazione Del Territorio Fra Neolitico e Bronzo Recente, in: Pellegrino, C. and Rossi, A. (Eds.), *Pontecagnano I.1. Città e campagna nell'Agro Picentino (Gli scavi dell'autostrada 2001-2006)*. Salerno: Soprintendenza per beni archeologici di Salerno, Avellino, Benevento e Caserta - Università degli Studi di Salerno Dipartimento di Scienze del Patrimonio culturale, pp. 37–52.

Aurino, P. (2013), Al Tempo Del Gaudo: Riflessioni Sull'età Del Rame in Campania, in, Cocchi Genick, D. (Ed.), *Cronologia Assoluta e Relativa dell'età del Rame in Italia*, *Atti dell'Incontro di Studi Universita di Verona, 25 June 2013*. Verona: Quiedit, pp. 157–171.

Aurino, P. (2015), La Necropoli Eneolitica Del Gaudo (Paestum) Tra Scoperta e Riscoperte, in: Guidi, A. (Ed.), *150 anni di preistoria e protostoria in Italia*. Firenze: Istituto Italiano di Preistoria e Protostoria, pp. 437–444.

Aurino, P. (2016), Gli Oggetti Di Ornamento Nelle Necropoli Del Gaudo Tra Funzione e Diffusione, in: *Atti del XII incontro di studi di Preistoria e Protostoria in Etruria.* Milano: Centro Studi Preistoria e Archeologia pp. 189-201.

Aurino, P. (2019), Percorsi Di Acqua e Di Terra: Interazioni e Scambi Nella Preistoria Pestana, in: Zuchtriegel, G., Carter, P., and Oddo, M. E. (Eds.), *Poseidonia città d'acqua. Archeologia e cambiamenti climatici*. Paestum: Pandemos, pp. 65–74.

Aurino, P. and De Falco, M. (2021), Le Forme Del Culto: Strategie Produttive e Scelte Rituali Nella Ceramica Eneolitica Di Paestum, in: *Dialoghi sull'Archeologia della Magna Grecia e del Mediterraneo, Paestum 15-17 Settembre 2019, vol. IV.3.* Paestum: Pandemos, pp. 693–706.

Aurino, P. and De Falco, M. (2022), Mind the Gap : Bell Beaker Presence in Copper Age Campania , Southern Italy, in: Abegg, C., Carloni, D., Cousseau, F., Derenne, E., and Ryan-Despraz, J. S. (Eds.), *Bell Beaker Culture in all its forms. Proceedings of the 22nd Meeting of 'Archéologie et Gobelets' 2021 (Geneva, Switzerland).* Oxford: Archaeopress, pp. 211–224.

Aurino, P., De Falco, M., Mancusi, V. and Moretti, M. (2017), Prima Di Poseidonia: La Vita e La Morte Sotto i Templi, in: *Dialoghi sull'Archeologia della Magna Grecia e del Mediterraneo.* Paestum: Pandemos, pp. 151–165.

Aurino, P., Cavazzuti, C., Cecconi, V., De Falco, M., Gigante, M., Lugli, F., Moretti, M., Savella, D. and Sperduti, A. (2021), La Fine Dell'età Del Rame e l'inizio Dell'età Del Bronzo Nella Piana Campana: La Necropoli Di Gaudello Tra Articolazioni Interne e Influenze Esterne, in: *X Incontro Annuale di Preistoria e Protostoria – 10th Annual Meeting of Prehistory and Protohistory*. Firenze: Istituto Italiano di Preistoria e Protostoria.

Aurisicchio, C. and Medeghini, L. (2020), Caratterizzazione Chimica e Mineralogica Delle Ceramiche Campaniformi "Originali" Dal Territorio Di Roma, in: Anzidei, A. P. and Carboni, G. (Eds.), *Roma prima del mito*. Oxford: Archaeopress, pp. 661–662.

Bacci, G.M., Caramuta, J. and Martinelli, M.C. (2003), L'insediamento Neo-Eneolitico Di Camaro (ME), in: *Atti della XXXV Riunione Scientifica dell'Istituto Italiano di Preistoria e di Protostoria: Le comunità della Preistoria italiana. Studi e ricerche sul Neolitico e le Età dei metalli, Lipari, 2-7 giugno 2000*. Firenze: Istituto Italiano di Preistoria e Protostoria, pp. 839–842.

Bacci Spigo, G.M. (1993), Un Idoletto a Violino Di Tipo Egeo Da Camaro Presso Messina. *Kokalos*, XXXIX–XL: 171–179.

Bagolini, B. and Cremonesi, G. (1988), La Distribuzione Della Ceramica a Squame, in: *L'età del Rame in Europa, Viareggio 15/18 ottobre 1987, Rassegna di archeologia*, 7: 634–635.

Bailo Modesti, G. (2006), Interpretare Il Gaudo, 447–53, in: *Atti del VII incontro sulla Preistoria e Protostoria in Etruria*. Milano: Centro Studi Preistoria e Archeologia.

Bailo Modesti, G. and Aurino, P. (2004), L'enigma Della Semplicità: Motivi e Schemi Decorativi Nella Facies Del Gaudo, in: *Atti del Sesto incontro di Studi Preistoria e Protostoria in Etruria', vol. I*. Milano: Centro Studi Preistoria e Archeologia, pp. 67–81.

Bailo Modesti, G. and Salerno, A. (1995), Il Gaudo Di Eboli. *Origini,* XIX: 327–393.

Bailo Modesti, G. and Salerno, A. (1998), *Pontecagnano II.5 La Necropoli Eneolitica. L'età Del Rame in Campania Nei Villaggi Dei Morti* (AION - Quaderni di Archeologia e Storia Antica 11). Napoli: Istituto Universitario Orientale.

Bailo Modesti, G., Salerno, A. and Talamo, P. (1999), L'Eneolitico in Campania: Criteri per Una Definizione Tipologica e Terminologica Del Repertorio Vascolare, in: Cocchi Genick, D. (Ed.), *Criteri di nomenclatura e di terminologia inerente alle forme vascolari del Neolitico/Eneolitico e del Bronzo/Ferro. Atti del Congresso di Lido di Camaiore, 26-29 marzo 1998. Volume I.* Firenze: Octavo, pp. 207–215.

Bajeot, J. and Roux, V. (2019), The Lower Egyptian Culture: New Perspectives through the Lens of Ceramic Technology. *Archeo-Nil*, 29: 157–178.

Balfet, H. (1984), Methods of Formation and Shape of Pottery, in: Van der Leeuw, S. E. (Ed.), *The many dimensions of pottery: ceramics in archaeology and anthropology.* Amsterdam: Institute for Pre- and Proto-history, University of Amsterdam, pp. 171–197.

Banning, E. (2005), *The Archaeologist's Laboratory: The Analysis of Archaeological Data*. *Interdisciplinary Contributions to Archaeology*. New York: Kluwer Academic.

Barber, R.L.N. (1987), *The Cyclades in the Bronze Age*. London: Duckworth.

Barberi, F., Innocenti, F., Lirer, L., Munno, R., Pescatore, T.S. and Santacroce, R. (1978), The Campanian Ignimbrite: A Major Prehistoric Eruption in the Neapolitan Area (Italy). *Bulletin of Volcanology*, 41(1): 1–22.

Barfield, L. (1995), The Context of Statue-Menhirs, in: Casini, S., Marinis, R. De, and Pedrotti, A. (Eds.), *Statue-stele e Massi Incisi nell'Europa dell'Età del Rame*. Bergamo: Notizie Archeologiche Bergomensi, Civico Museo Archeologico, pp. 11–36.

Bartelheim, M. and Krauß, R. (2012), Sense and Non-Sense of the Term 'Chalcolithic', in: Allen, M. J., Gardiner, J., and Sheridan, A. (Eds.), *Is there a British Chalcolithic? People, place and polity in the later 3rd millennium*. Oxford: Prehistoric society and Oxbow Books, pp. 85–114.

Bazzanella, M., Mayr, A., Moser, L. and Rast-Eichter, A. (2003), *Textiles: Intrecci e Tessuti Dalla Preistoria Europea. Catalogo Della Mostra Tenutasi a Riva Del Garda Dal 24 Maggio Al 19 Ottobre 2003*. Milano: Esperia.

Bernabò Brea, L. (1968), Considerazioni Sull'Eneolitico e Sulla Prima Età Del Bronzo Della Sicilia e Della Magna Grecia. *Kokalos*, 14–15: 20–58.

Bernabò Brea, L. (1985), *Gli Eoli e l'inizio Dell'età Del Bronzo Nelle Isole Eolie e Nell'Italia Meridionale*. Napoli: Istituto Universitario Orientale.

Berrocal, M. Cruz, Sanjuán, L. G. and Gilman, A. (2013), *The Prehistory of Iberia: Debating Early Social Stratification and the State*. New York: Routledge.

Bettelli, M., Levi, S. T., Jones, R. E. and Vagnetti, L. (2006), Le Ceramiche Micenee in Area Medio-Tirrenica: Nuove Prospettive, in: *Studi di protostoria in onore di Renato Peroni*. Firenze: Torrossa, pp. 399–406.

Bianco Peroni, V. (1994), *Il Pugnali Nell'Italia Continentale.* Prahistorischen Bronzefunde VI (10). Stuttgart: Franz Steiner Verlag.

Biancofiore, F. (1967), La Necropoli Eneolitica Di Laterza. Origini e Sviluppo Dei Gruppi Protoappenninici in Apulia. *Origini,* 1: 195–300.

Bietti Sestieri, A. M. (1982), Implicazioni Del Concetto Di Territorio in Situazioni Culturali Complesse: Le Isole Eolie Nell'età Del Bronzo in Economia e Organizzazione Del Territorio Nelle Società Protostoriche. *Dialoghi di Archeologia Roma*, 4(2): 39–60.

Binder, D., Lardeaux, J. M., Dubar, M., Durrenmath, G., Muntoni, I. M., Jacomet, S., Monge, G. and Lepère, C. (2018), South-Eastern Italian Transfers towards the Alps during the 5th Millennium BCE: Evidence of "Serra-d'Alto" Ware within Square-Mouthed Pottery Deposits at the Lare 2 Cave (Saint-Benoit, Alpes-de-Haute-Provence, France). *Journal of Archaeological Science: Reports*, 21(February): 222–237.

Binford, L. R. (1962), Archaeology as Anthropology. *American Antiquity*, 28(2): 217–225.

Binford, L. R. (1965), Archaeological Systematics and the Study of Culture Process. *American Antiquity*, 31(2Part1): 203–210.

Binford, L. R. (1978), *Nunamiut Ethnoarchaeology*. New York: Academic Press Inc.

Binford, Lewis R. (1983), *In Pursuit of the Past: Decoding the Archaeological Record*. London: Thames and Hudson.

Biro, K. T., Szilagyi, V. and Kreiter, A. (2007), *Vessels: Inside and Outside. Proceedings of the conference EMAC '07. 9th European Meeting on Ancient Ceramics. 24-27 October 2007 Budapest, Hungary*. Budapest: Hungarian National Museum.

Blackman, M.J., Stein, G.J. and Vandiver, P.B. (1993), The Standardization Hypothesis and Ceramic Mass Production: Technological, Compositional, and Metric Indexes of Craft Specialization at Tell Leilan, Syria. *American Antiquity*, 58(1): 60–80.

Blockley, S. P., Ramsey, E., Bronk, C., and Pyle, D M (2008), Improved Age Modelling and High-Precision Age Estimates of Late Quaternary Tephras, for Accurate Palaeoclimate Reconstruction. *Journal of Volcanology and Geothermal Research*, 177(1): 251–262.

Boenzi, G. (2022), L'insediamento Eneolitico Di Carinaro: Polo Calzaturiero: I Saggi Di Scavo Nell'area SE. *Rivista di scienze preistoriche*, LXXII: 1–20.

Bökönyi, S. (1974), The Vertebrate Fauna. *Wissenschaftliche Mitteilungen des Bosnisch-Herzegowinischen Landesmuseums*, 4a: 55–154.

Bonardi, G., Ciarcia, S., Di Nocera, S., Matano, F., Sgrosso, I. and Torre, M. (2009), Main Kinematic Units Map of the Southern Apennines. Explanatory Notes. *Bollettino della Societa Geologica Italiana*, 128(1): 47-60.

Boozer, A. L. (2015), The Tyranny of Typologies, in: Chapman, R. and Wylie, A. (Eds.), *Material Evidence. Learning from archaeological practice*. Oxon: Routledge, pp. 92-110.

Borgna, E. and Levi, S.T. (2015), The Italo-Mycenean Connection. Some Considerations on the Technological Transfer in the Field of Pottery Production, in: Gauss, W., Klebinder–Gauss, G., and von Rüden, C. (Eds.), *The Transmission of Technical Knowledge in the Production of Ancient Mediterranean Pottery*. Wien: ¨Osterreichisches Arch¨aologisches Institut, pp. 115–138.

Borrello, M. A. and van Willingen, S. (2014), Le Chasséen Du Midi de La France et l'Italie. Caractères Céramique, Distribution Spatiale et Donées Chronologiques, in: *Genti del territorio Varesino dalle origini al Medioevo*. Varese: Centro di Studi preistorici e archeologici di Varese, pp. 171–197.

Bortolini, E. (2016), Typology and Classification, in: Hunt, A. (Ed.), *The Oxford Handbook of Archaeological Ceramic Analysis*. Oxford: University Press, pp. 650–670.

Bourdieu, P. (1977), *Outline of a Theory of practice*. Cambridge: Cambridge University Press.

Bourdieu, P. (1990), *The Logic of Practice*. Stanford, CA: Stanford University Press.

Boyd, R. and Richerson, P. (1985), *Culture and the Evolutionary Process*. Chicago: University of Chicago Press.

Braekmans, D. and Degryse, P. (2016), Petrography. Optical Microscopy, in: Hunt, A. (Ed.), *Oxford Handbook of Archaeological Ceramic Analysis*. Oxford: University Press, pp. 233–265.

Braithwaite, M. (1984), Ritual and Prestige in the Prehistory of Wessex c. 2,200– 1,400 BC: A New Dimension to the Archaeological Evidence, in: Miller, D. and Tilley, C. (Eds.), *Ideology, power, and prehistory*. Cambridge: Cambridge University Press, pp. 93–110.

Braun, D. (1983), Pots as Tools, in: Moore, J. A. and Keene, A. S. (Eds.), *Archaeological hammers and theories*. New York: Academic Press, pp. 107–134.

Brinson, J.G.S. (1945), *The Pre-Hellenic Necropolis at Gaudo*. Typescript kept at the Superintendency Library in Naples.

Brocchini, D., Principe, C., Castradori, D., Laurenzi, M. A. and Gorla, L. (2001), Quaternary Evolution of the Southern Sector of the Campanian Plain and Early Somma-Vesuvius Activity : Insights from the Trecase 1 Well. *Mineralogy and Petrology*, 73: 67–91.

Brodà, Y., Cannavò, V., Govi, E., Levi, S. T., Marchetti Dori, S. and Pellacani, G. (2009), Bronze Age Terramare Pottery from Northern Italy - Exercises in Experimental Reproduction, in: Biró, K. T., Szilágyi, V., and Kreiter, A. (Eds.), *Vessels: inside and outside. Proceedings of the Conference EMAC '07, 9th European Meeting on Ancient Ceramics, Budapest*. Budapest: Hungarian National Museum, pp. 103–110.

Brodie, N. (1997), New Perspectives on the Bell Beaker Culture. *Oxford Journal of Archaeology*, 16: 297–314.

Brodie, N. (2001), Technological Frontiers and the Emergence of the Beaker Culture, in: Nicolis, F. (Ed.), *Bell Beakers Today: Pottery, people, culture and symbols in prehistoric Europe. International Colloquium Riva del Garda (Trento, Italy), 11-16 May 1999*. Trento: Provincia Autonoma di Trento Servizio Beni Culturali Ufficio Beni Archeologici, pp. 487–496.

Broodbank, C. (2013), *The Making of the Middle Sea: A History of the Mediterranean from the Beginning to the Emergence of the Classical World.* Oxford: Oxford University Presse.

Brouwer, P. (2010), *Theory of XRF*. Almelo: PANalytical BV, The Netherlands.

Brysbaert, Ann (2007), Cross-Craft and Cross-Cultural Interactions during the Aegean and Eastern Mediterranean Late Bronze Age. In Antoniadou S. and Pace A. (eds.) *Mediterranean Crossroads*: 325–359.

Budden, S. A. (2008), Skill amongst the Sherds: Understanding the Role of Skill in the Early to Late Middle Bronze Age in Hungary. *Breaking the Mould: Challenging the Past through Pottery, Prehistoric Ceramics Research Group, Occasional Paper*, 6: 1–17.

Budden, S. and Sofaer, J. (2009), Non-Discursive Knowledge and the Construction of Identity Potters, Potting and Performance at the Bronze Age Tell of Százhalombatta, Hungary. *Cambridge Archaeological Journal*, 19 (2): 203–220.

Burragato, F., Grubessi, O. and Lazzarini, L. (1994), *1st European Workshop on Archaeological Ceramics*. Roma: Università degli Studi di Roma 'La Sapienza'.

Buxeda I Garrigós, J., Cau Ontiveros, M. A. and Kilikoglou, V. (2003), Chemical Variability in Clays and Pottery from a Traditional Cooking Pot Production Village: Testing Assumptions in Pereruela. *Archaeometry*, 45(1): 1–17.

Caldana, I., Faresin, E., Maritan, L. and Vidale, M. (2019), Did the Bronze Age Potters of the Terramare Culture Use a Hand-Powered Did the Bronze Age Potters of the Terramare Culture Use a Hand-Powered Wheel? *Rivista di Scienze Preistoriche*, (January): 1–25.

Calvo, M. (1999), Reflexiones En Torno Al Concepto de Útil, Forma, Función y Su Relación Con Los Análisis Funcionales. *Pyrenae,* 30: 17–38.

Canino, G., Manunza, M.R., Melis, M.G. and Usai, E. (1999), L'Eneolitico in Sardegna, in: Cocchi Genick, D. (Ed.), *Criteri di nomenclatura e di terminologia inerente alle forme vascolari del Neolitico/Eneolitico e del Bronzo/Ferro. Atti del Congresso di Lido di Camaiore, 26-29 marzo 1998. Volume I.* Firenze: Octavo, pp. 241–258.

Cannavò, V., Cardarelli, A., Lugli, S., Vezzalini, G. and Levi, S. T. (2017), Fabrics and Archaeological Facies in Northern Italy: An Integrated Approach to Technological and Stylistic Choices in Bronze Age Pottery Production. *Journal of Archaeological Science: Reports*, 16: 521–531.

Cannavò, V., Di Renzoni, A., Levi, S. T. and Brunelli, D. (2019), Protohistoric Italian ceramics: towards a general fabrics classification and interpretation. *Origini*, XLIII: 209–234.

Capel, J., Navarrete, M. S., Huertas, F. and Linares, J. (1982), Algunos Aspectos Del Proceso de Manufacturación de Cerámicas Neolíticas. Estudio Del Contenido En Desgrasantes Mediante Lupa Binocular. *Cuadernos de Prehistoria de la Universidad de Granada*, 7: 73–109.

Capelli, C. and Mannoni, T. (1996), Proposte per Una Scheda Descrittiva Delle Sezioni Sottili e per Una Classifica- Zione Minero-Petrografica Delle Ceramiche. *Archeologia Medievale*, XXIII: 689–697.

Capelli, C. and Mannoni, T. (1998), Proposte per Una Classificazione Degli Impastri Ceramici Mediante Gruppi Minero-Petrografici Dello Scheletro, Correlabili Alla Geologia Delle Aree Produttive, in: D'Amico, C., and Albore Livadie, C. (Eds.), *Le Scienze della Terra e l'Archeometria, Quarta Giornata*. Napoli: Napoli, Istituto Universitario Suor Orsola Benincasa - CUEN, pp. 123–125.

Capriglione, C., de Bonis, A., de Tommaso, G., Guarino, V., Iuliano, M., Marino, D., Morra, V. and Pacciarelli, M. (2012), Grandi Dolii Protostorici d'impasto Dalla Calabria Centromeridionale. Contributo Allo Studio Cronotipologico, Tecnologico e Funzionale. *Rivista di scienze preistoriche*, LXII: 6514.

Carancini, G. L. (1975), *Die Nadeln in Italien. Gli Spilloni in Italia Continentale*. München: Prähistorische Bronzefunde, Abteilung XIII-Band 2.

Carancini, G. L. (2012), Aspetti Dell'iconografia Delle Statue-Stele e Dei Massi Incisi in Europa Tra Eneolítico Ed Antica Età Del Bronzo - Confronti e Convergenze Con Altre Fonti Archeologiche Nell'ambito Del Bacino Del Mediterráneo. *Preistoria Alpina*, 46(2): 255–265.

Carancini, G. L. and Guerzoni, R. P. (1987), Gli Scavi Nella Grotta Pavolella Presso Cassano Allo Jonio (CS), in: *Atti della XXVI Riunione scientifica dell'Istituto Italiano di Preistoria e Protostoria*. Firenze: Istituto Italiano di Preistoria e Protostoria, pp. 782–792.

Cardarelli, A. (1992), Le Età Dei Metalli Nell'Italia Settentrionale, in: Guidi, A. and Pipemo, M. (Eds.), *Italia Preistorica*. Bari: Laterza, pp. 366–419.

Cardarelli, A. (2009), The Collapse oF the Terramare Culture and Growth of New Economic and Social Systems during the Late Bronze Age in Italy. *Scienze dell'antichità. Storia archeologia antropologia*, 15: 449–520.

Cardarelli, A., Damiani, I., Gennaro, F. di, Iaia, C. and Pacciarelli, M. (1999), Forme Del Vasellame Ceramico in Italia Peninsulare Dal Bronzo Medio Al Principio Dell'età Del Ferro: Criteri e Proposte Di Nomenclatura, in: Cocchi Genick, D. (Ed.), *Criteri di nomenclatura e di terminologia inerente alle forme vascolari del*

Neolitico/Eneolitico e del Bronzo/Ferro. Atti del Congresso di Lido di Camaiore, 26-29 marzo 1998. Volume II. Firenze: Octavo, pp. 181–308.

Carloni, D. (2017), Le piastre di cottura dell'età del bronzo. Aspetti archeometrici e tecno-funzionali, in: Larocca, F. (Ed.), *Tra Pietra e Acqua Archeologia delle Grotte di Pertosa-Auletta Studi e ricerche 2004-2016*. Pertosa: Fondazione MiDa, pp. 70–85.

Carloni, D., Larocca, F., Tiziana, L. S. And Cannavò, V. (2017), Technological And Functional Identification Of Cooking Slabs: Evidence From The Bronze Age Pile Dwelling Settlement Of Grotta Di Pertosa (Salerno, Southern Italy), in: Pereira, T., Terradas, X., and Bicho, N. (Eds.), *The Exploitation of Raw Materials in Prehistory: Sourcing, Processing and Distribution*. Cambridge: Cambridge Scholars Publishing, pp. 477–491.

Casini, S. (1994), *Carta Archeologica Della Lombardia. 4, La Provincia Di Lecco*. Modena: F.C. Panini.

Cassano, S. M., Muntoni, I. M. and Conati Barbaro, C. (1995), *Dall'argilla Al Vaso. Fabbricazione Della Ceramica in Una Comunità Neolitica Di 7000 Anni Fa*. Roma: Argos.

Cassano, S. M., Marconi, N. and Muntoni, I. M. (1999), Appendice - Applicazione Del Metodo Delle Envelopes Allo Studio Del Complesso Ceramico Di Masseria Candelaro: Premesse Teoriche e Primi Risultati Analitici, in: Cocchi Genick, D. (Ed.), *Criteri di nomenclatura e di terminologia inerente alle forme vascolari. Atti del Congresso di Lido di Camaiore, 26-29 marzo 1998. Volume I.* Firenze: Octavo, pp. 115–124.

Cataldo, L. (1996), La Tomba Di Casal Sabini e i Rinvenimenti Funerari Tra Eneolitico Ed Età Del Bronzo Nel Territorio Di Altamura (Bari): Le Facies Culturali Indigene e i Contatti Transadriatici e Con Il Mediterraneo Orientale. *Origini*, 20: 109–164.

Cavalli-Sforza, L. L. and Feldman, M. W. (1981), *Cultural Transmission and Evolution: A Quantitative Approach*. Princeton: Princeton University Press.

Cavanagh, W., Mee, C. and Renard, J. (2016), Early Bronze Age Chronology of Mainland Greece: A Review with New Dates from the Excavations at Kouphovouno. *Annual of the British School at Athens*, 111: 35–49.

Cavazzuti, C. (2020), Cosa Possono Fare ADNA e Isotopi per La Protostoria Italiana?, in: Dankers, J., Cavazzuti, C. and Cattani, M. (Eds), *Facies e Culture Nell'età Del Bronzo Italiana?* Brepols: Artes Institut historique belge de Rome, XI. Turnhout, pp. 295–314.

Cazzella, A. (1972), Considerazioni Su Alcuni Aspetti Eneolitici Dell'Italia Meridionale e Della Sicilia. *Origini*, VI: 171–298.

Cazzella, A. (1992), Sviluppi Culturali Eneolitici Nella Penisola Italiana, in: Cazzella, A. and Moscoloni, M. (Eds.), *Neolitico ed Eneolitico*. Roma: Popoli e Civiltà dell'Italia Antica 11, pp. 349–643.

Cazzella, A. (1999), Terminologia e Tipologia: Denominare Che Cosa?, in: Cocchi Genick, D. (Ed.), *Criteri di nomenclatura e di terminologia inerente alle forme vascolari. Atti del Congresso di Lido di Camaiore, 26-29 marzo 1998. Volume I.* Firenze: Octavo, pp. 13–20.

Cazzella, A. (2003), Conelle Di Arcevia Nel Panorama Culturale Della Preistoria Del Mediterraneo Centro-Orientale e Della Penisola Balcanica Tra Quarto e Terzo Millennio, in: Cazzella, A., Moscoloni, M., and Recchia, G. (Eds.), *Conelle di Arcevia II. Tecnologia e contatti culturali*. Roma: Casa Editrice Università degli Studi di Roma 'La Sapienza', pp. 541–568.

Cazzella, A. and Guidi, A. (2011), Il Concetto Di Eneolitico in Italia, in: *Atti della XLIII Riunione Scientifica dell'Istituto Italiano di Preistoria e Protostoria - L'età del Rame in Italia, Bologna, 26-29 novembre 2008*. Firenze: Istituto Italiano di Preistoria e Protostoria, pp. 25–32.

Cazzella, A. and Moscoloni, M. (1985), Dislivelli Culturali Nel Mediterraneo Centro-Orientale Fra Terzo e Secondo Millennio a.C., in: Liverani, M., Palmieri, A., and Peroni, R. (Eds.), *Studi di Paletnologia in onore di S. M. Puglisi*. Roma: Università di Roma "La Sapienza", pp. 531–545.

Cazzella, A. and Moscoloni, M. (1999), *Conelle Di Arceaia. Un Insediamento Eneolitico Nelle Marche*. Roma: Gangemi.

Cazzella, A. and Recchia, G. (2021), *All'origine Delle Disuguaglianze. Dall'affermazione Dell'economia Produttiva Alle Prime Forme Di Stratificazione in Italia e Nelle Isole Adiacenti (6000-1000 a.C.)*. Ragusa: Ediz. Storia e Studi Sociali.

Cazzella, A., Cultraro, M. and Recchia, G. (2011), Relazioni Tra l'Italia Centro-Meridionale, La Sicilia e l'area Egeo-Balcanica Durante l'Eneolitico, in: *Atti della XLIII Riunione Scientifica dell'Istituto Italiano di Preistoria e Protostoria - L'età del Rame in Italia, Bologna, 26-29 novembre 2008*. Firenze: Istituto Italiano di preistoria e protostoria, pp. 26–29.

Cazzella, A., Pace, A. and Recchia, G. (2007), Cultural Contacts and Mobility between the South Central Mediterranean and the Aegean during the Second Half of the 3rd Millennium BC, in: Antoniadou, S. and Pace, A. (Eds.), *Mediterranean Crossroads*. Athens: Pieridies Foundation, pp. 243–260.

Chapman, J. and Gaydarska, B. (2007), *Parts and Wholes. Fragmentation in Prehistoric Context*. Oxford: Oxbow Books.

Chapman, R. (1982), Autonomy, Ranking and Resources in Iberian Prehistory, in: Renfrew, C. and Shennan, S. (Eds.), *Ranking, Resource and Exchange*. Cambridge: Cambridge University Press, pp. 46–51.

Chapman, R. (1990), *Emerging Complexity: The Later Prehistory of South-East Spain, Iberia and the West Mediterranean.* Cambridge and New York: Cambridge University Press.

Chapman, R. (1999), The Archaeology of the Iberians: Archaeological Analysis of a Historical Process. *American Antiquity*, 64.4: 715-715.

Chapman, R. (2003), *Archaeologies of Complexity*. London: Routledge.

Chiarenza, N. and Rossi, G. (2011), Ugelli Fittili e Produzione Artigianale Della Grotta Pollera (Finale Ligure, Savona) Nell'ambito Dei Contatti Con l'area Francese, in: *Atti della XLIII Riunione Scientifica dell'Istituto Italiano di Preistoria e Protostoria - L'età del Rame in Italia (Bologna, 26-29 novembre 2008)*. Firenze: Istituto Italiano di Preistoria e Protostoria, pp. 483–488.

Chierici, G. (1884), I Sepolcri Di Remedello Nel Bresciano e i Pelasgi in Italia. *Bullettino di Paletnologia Italiana*, 10: 133–164.

Childe, V. G. (1925), The Dawn of European Civilization, , in: Paul, K. (Ed.), *Trench, 6th ed*. London: Trubner & Co.

Childe, V.G. (1930), *The Bronze Age*. Cambridge: Cambridge University Press.

Childe, V. G. (1936), *Man Makes Himself*. London: Watt.

Childe, V. G. (1942), *What Happened in History*. Harmondsworth: Penguin.

Chimenti, F., De Candia, R., De Silvio, A., *et al.* (1999), Le Facies Serra d'Alto e Diana-Bellavista in Italia Meridionale, in: Cocchi Genick, D. (Ed.), *Criteri di nomenclatura e di terminologia inerente alle forme vascolari del Neolitico/Eneolitico e del Bronzo/Ferro. Atti del Congresso di Lido di Camaiore, 26-29 marzo 1998. Volume I.* Firenze: Octavo, pp. 125–137.

Christakis, K. S. (1999), Pithoi and Food Storage in Neopalatial Crete: A Domestic Perspective. *World Archaeology*, 31(1): 1–20.

Cianfanelli, A., De Angelis, F., Lelli, R., *et al.* (2015), Valutazione Delle Abitudini Alimentari Di Popolazioni Eneolitiche Dell'Italia Centro-Meridionale, in: *Atti della L Riunione Scientifica dell'Istituto Italiano di Preistoria e Protostoria*.

Cinque, A., Romano, P., Budillon, F. and D'Argenio, B. (2009), *Note Illustrative Della Carta Geologica D'Italia Alla Scala 1:50.000 - Foce Sele. Foglio 486*. Roma: ISPRA, Servizio Geologico d'Italia, System Cart, LAC, SELCA.

Cioni, R., Santacroce, R. and Sbrana, A. (1999), Pyroclastic Deposits as a Guide for Reconstructing the Multi-Stage Evolution of the Somma-Vesuvius Caldera. *Bulletin of Volcanology*, 60: 207–222.

Çilingiroğlu, Ç. (2005), The Concept of 'Neolithic Package': Considering Its Meaning and Applicability. *Documenta Praehistorica*, XXXII: 1–13.

Clarke, D. (1968), *Analytical Archaeology*. London: Methuen & Co Ltd.

Cocchi Genick, D. (1996), *Manuale Di Preistoria, III: L'età Del Rame*. Firenze: Octavo.

Cocchi Genick, D. (1998), *L'antica Età Del Bronzo Nell'Italia Centrale*. Firenze: Octavo.

Cocchi Genick, D. (2004), Considerazioni Sull'ideologia Religiosa Nell'Eneolitico Italiano. *Bullettino di Paletnologia Italiana*, 95: 83–126.

Cocchi Genick, D. (2005), Considerazioni Sull'uso Del Termine "Facies" e Sulla Definizione Delle Facies Archeologiche. *Rivista di scienze preistoriche,* 55: 5–27.

Cocchi Genick, D. (2008), *La Tipologia in Funzione Della Ricostruzione Storica. Le Forme Vascolari Dell'età Del Rame Dell'Italia Centrale*. Verona: QuiEdit.

Cocchi Genick, D. (2009), *Preistoria*. Verona: QuiEdit.

Cocchi Genick, D. (2011), Problematiche e Prospettive Della Ricerca Sull'età Del Rame in Italia in Ricordo Di Gianni Bailo Modesti, in: *Atti della XLIII Riunione Scientifica dell'Istituto Italiano di Preistoria e Protostoria - L'età del Rame in Italia (Bologna, 26-29 novembre 2008)*. Firenze: Istituto Italiano di Preistoria e Protostoria, pp. 13–24.

Cocchi Genick, D. (2012), *Le Potenzialità Informative Delle Ceramiche Nell'analisi Storica. Le Forme Vascolari Dell'età Del Rame Dell'Italia Settentrionale*. Verona: QuiEdit.

Cocchi Genick, D. (2013), *Cronologia Assoluta e Relativa Dell'età Del Rame in Italia, Atti Dell'Incontro Di Studi, Università Di Verona, 25 Giugno 2013*. Verona: QuiEdit.

Colini, G.A. (1899), Il Sepolcreto Di Remedello Sotto Nel Bresciano e Il Periodo Eneolitico in Italia. *Bullettino di Paletnologia Italiana,* XXIV: 1–27.

Conticelli, S., D'Antonio, M., Pinarelli, L. and Civetta, L. (2002), Source Contamination and Mantle Heterogenity in the Genesis of Italian Potassic and Ultrapotassic Volcanic Rocks: Sr-Nd-Pb Isotope Data from Roman Province and Southern Tuscany. *Mineralogical Petrology*, 74: 189–222.

Conticelli, S., Melluso, L., Perini, G., Avanzinelli, R. and Boari, E. (2004), Petrologic, Geochemical, and Isotopic Characteristics of Potassic and Ultrapotassic Magmatism in Central- Southern Italy: Inferences on Its Genesis and on the Nature of Mantle Sources. *Periodico di Mineralogia*, 73: 136–164.

Cornaggia Castiglioni, O. (1971), *La Cultura Di Remedello. Problematica Ed Ergologia Di Una Facies Dell'eneolitico Padano*. Milano: Memorie SISN.

Costin, C. L. (1991), Craft Specialization: Issues in Defining, Documenting, and Explaining the Organization of Production, 1–56, in: Schiffer, M. B. (Ed.), *Archaeological Method and Theory vol. 3*. Tucson: The University of Arizona Press.

Costin, C.L. (2005), Craft Production, in: Maschner, D. G. and Chippindale, C. (Eds.), *The Handbook of Archaeological Methods*. Lanham: Altamira Press, pp. 85–93.

Costin, C. L. (2020), What Is a Workshop?, in: Hodgkinson, A. K. and Tvetmarken, C. L. (Eds.), *Approaches to the Analysis of Production Activity at Archaeological Sites*. Oxford: Archaeopress, pp. 177–197.

Costin, C. L. and Hagstrum, M. B. (1995), Standardization, Labor Investment, Skill, and the Organization of Ceramic Production in Late Prehispanic Highland Peru. *American Antiquity*, 60(4): 619–639.

Craig, O. E., Chapman, J., Figler, A., Patay, P., Taylor, G. and Collins, M. J. (2003), Milk Jugs' and Other Myths of the Copper Age of Central Europe. *European Journal of Archaeology*, 6(3): 251–265.

Cremonesi, G. (1984), Osservazioni Su Alcuni Aspetti Dell'Eneolitico Del Versante Adriatico, in: *Atti del III convegno nazionale sulla Preistoria, Protostoria, Storia della Daunia*. San Severo, pp. 131–147.

Cremonesi, G. and Tozzi, C. (1987), Il Neolitico Dell'Abruzzo, in: *Atti della XVI Riunione Scientifica dell'Istituto Italiano di Preistoria e Protostoria - Dai ciclopi agli ecisti : società e territorio nella Sicilia preistorica e protostorica, (San Cipirello, PA, 16-19 novembre 2006)*. Firenze: Istituto Italiano di Preistoria e Protostoria, pp. 239–251.

Cresswell, R. (1976), Techniques et Culture : Les Bases d'un Programme de Travail. *Techniques & Culture*, 1: 7–59.

Cresswell, R. (1983), Transfert de Techniques et Chaînes Opératoires. *Techniques et Culture*, 2: 143–163.

Cresswell, R. (1996), *Prométhée Ou Pandore ? Propos de Technologie Culturelle*. Paris: Éditions Kimé.

Crown, P.L. (2014), The Archaeology of Crafts Learning: Becoming a Potter in the Puebloan Southwest. *Annual Review of Anthropology*, 39: 335–343.

Cruz, M. D. (1996), Ceramic Production in the Banda Area (West-Central Ghana): An Ethnoarchaeo- Logical Approach. *Nyame Akuma*, 45: 30–39.

Cultraro, M. (2001), Aspetti Dell'Eneolitico Dell'Italia Centrale Nel Quadro Dei Rapporti Con La Penisola Balcanica e l'Egeo, in: *Atti della XXXIV Riunione Scientifica dell'Istituto Italiano di Preistoria e Protostoria - Preistoria E Protostoria Della Toscana (Firenze 29 Settembre -2 Ottobre 1999).* Firenze: Istituto Italiano di Preistoria e Protostoria, pp. 215–233.

Cultraro, M. (2006), La Cultura Di Rinaldone Nel Quadro Delle Relazioni Con Il Mondo Egeo-Balcanico: Un Aggiornamento, in: *Atti della XXXIX Riunione Scientifica dell'Istituto Italiano di Preistoria e Protostoria - Materie prime e scambi nella preistoria italiana (Firenze, 25-27 novembre 2004*). Firenze: Istituto Italiano di Preistoria e Protostoria, pp. 405–420.

Cultrone, G., Rodriguez-Navarro, C., Sebastian, E., Cazalla, O. And De La Torre, M. J. (2001), Carbonate and Silicate Phase Reactions during Ceramic Firing. *European Journal of Mineralogy*, (May 2000): 671–684.

Cunliffe, B. and Keay, S. (1995), *Social Complexity and the Development of Towns in Iberia, From the Copper Age to the Second Century AD*. Oxford: Proceedings of the British Academy.

Cuomo di Caprio, N. (1985), *La Ceramica in Archeologia. Antiche Tecniche Di Lavorazione e Moderni Metodi Di Indagine*. Palermo: L'Erma di Bretschneider.

Cuomo di Caprio, N. (2010), *Ceramica in Archeologia 2*. Palermo: L'Erma di Bretschneider.

Cuomo di Caprio, N. and Vaughan, S.J. (1993), An Experimental Study in Distinguishing Grog (Chamotte) from Argillaceous Inclusions in Ceramic Thin Sections. *Archeomaterials*, 7: 21–40.

Curtis, N. G. W. and Wilkin, N. C. A. (2012), The Regionality of Beakers and Bodies in the Chalcolithic of North-East Scotland, in: Allen, M. J., Gardiner, J., and Sheridan, A. (Eds.), *Is there a British Chalcolithic? People, place and polity in the later 3rd millennium BC. Prehist. Soc. Research Paper 4*. Oxford: Oxbow books, pp. 237–256.

D'Agostino, B. (1974), Pontecagnano, in: Bailo Modesti, G., D'Agostino, B., and Gastaldi, P. (Eds.), *Seconda mostra della Preistoria e Protostoria del Salernitano.* Salerno: Laveglia, pp. 87–108.

D'Agostino, B. (1981), L'Eneolitico, in: D'Agostino, B. (Ed.), *Storia del Vallo di Diano*. Salerno: Laveglia, pp. 23–38.

Dal Sasso, G., Maritan, L., Salvatori, S., Mazzoli, C. and Artioli, G. (2014), Discriminating Pottery Production by Image Analysis: A Case Study of Mesolithic and Neolithic Pottery from Al Khiday (Khartoum, Sudan). *Journal of Archaeological Science*, 46(1): 125–143.

Damiani, I. (2010), *L'età Del Bronzo Recente Nell'Italia Centro-Meridionale*. Firenze: All'Insegna del Giglio.

Danckers, J., Cavazzuti, C. and M. Cattani (2019), *Facies e Culture Nell'età Del Bronzo Italiana?* Brepols: Artes Institut historique belge de Rome), XI. Turnhout.

David-Elbiali, M. (2000), *La Suisse Occidentale Au IIe Millénaire Av. J.-C.: Chronologie, Culture, Intégration Européenne*. Lausanne: Cahiers d'Archéologie Romande.

David, N. and Kramer, C. (2001), *Ethnoarchaeology in Action*. Cambridge: Cambridge University Press.

Day, P. M., Kiriatzi, E., Tsolakidou, A. and Kilikoglou, V. (1999), Group Therapy in Crete: A Comparison between Analyses by NAA and Thin Section Petrography of Early Minoan Pottery. *Journal of Archaeological Science*, 26(8): 1025–1036.

de Angelis, A. M. (1956), Osservazioni Su Sezioni Sottili Di Ceramiche Di Lagozza e Golasecca e Su Al-Cune Argille Locali. *Sibrium*, III: 158–160.

de Angelis, A. M., Mariani, E., Peco, G. and Storti, C. (1960), Osservazioni Tecnologiche Su Campioni Di Ceramica Micenea: Contributo Alle Conoscenze Dell'industria Vascolare Micenea. *Rivista di Antropologia*, 1960: 17–58.

De Bonis, A. (2011), *Caratterizzazione Mineralogico-Petrografica e Fisico-Meccanica Di Argille Campane Quali Materie Prime per Produzioni Ceramiche d'interesse Archaeologico*. Università degli studi di Napoli 'Federico II', Dipartimento di Scienze della Terra, dell'Ambiente e delle Risorse, PhD thesis.

De Bonis, A. (2018), Ceramic production in the plain of the sele river . The preliminary results of the archaeometric analyses. *FACEM (version 06/12/2018)*: 1–15.

De Bonis, A. and Gassner, V. (2018), Ceramic Production in the Plain of Paestum. *FACEM (version 06/12/2018)*: 1–8.

De Bonis, A., Grifa, C., Cultrone, G., De Vita, P., Langella, A. and Morra, V. (2013), Raw Materials for Archaeological Pottery from the Campania Region of Italy: A Petrophysical Characterization. *Geoarchaeology*, 28(5): 478–503.

De Bonis, A., Cultrone, G., Grifa, C., Langella, A., Leone, A. P., Mercurio, M. and Morra, V. (2017), Different Shades of Red: The Complexity of Mineralogical and Physico-Chemical Factors Influencing the Colour of Ceramics. *Ceramics International*, 43(11): 8065–8074.

De Falco, M. (2012), *La Cultura Di Laterza in Campania: Nuove Evidenze Dallo Scavo Dell'Agorà Di Paestum.* Università degli Studi di Napoli 'L'Orientale', Dipartimento Asia, Africa e Mediterraneo. Unpublished Bachelor's Thesis.

De Falco, M. (2016), *L'uomo Che Imprime l'argilla. Il Villaggio a Ceramiche Impresse Di Grottaminarda (Avellino) Nel Quadro Del Neolitico Antico Dell'Italia Meridionale.* Università degli Studi di Napoli 'L'Orientale', Dipartimento Asia, Africa e Mediterraneo. Unpublished Master's Thesis.

de Groot, B. G. (2021), Material Methods; Considering Ceramic Raw Materials and the Spread of the Potter's Wheel in Early Iron Age Southern Iberia. I*nterdisciplinaria Archaeologica Natural Sciences In Archaeology* XII(2): 331–342.

de Groot, B. G., Badreshany, K., Torres-Martınez, J. F. and Fernandez-Gotz, M. (2023), Capturing Technological Crossovers between Clay Crafts: An Archaeometric Perspective on the Emergence of Workshop Production in Late Iron Age Northern Spain. *PLoS ONE* 18(5): e0283343.

de Marinis, R. C. (2009), L'immagine Del Guerriero e i Segni Del Potere Nell'età Del Rame e Del Bronzo Dell'Italia Settentrionale Alla Luce Della Documentazione Funeraria. *Aoste: Bulletin d'études préhistoriques et archéologiques alpines. Les manifestations du pouvoir dans les Alpes, de la Préhistoire au Moyen-Age: XII Colloque International sur les Alpes dans l'Antiquité, Yenne (Savoia), 2-4 ottobre 2009.*, 21: 127–136.

de Marinis, R. C. (2013), La Necropoli Di Remedello Sotto e l'età Del Rame Nella Pianura Padana a Nord Del Po, in, de Marinis, R. C. (Ed.), *L'età del Rame: la Pianura Padana e le Alpi al tempo di Otzi. Catalogo della mostra*. Brescia: Compagnia della Stampa Massetti Rodella editori, pp. 301–351.

de Marinis, R. C. (2020), Cultura Archeologica, Facies Archeologica, Gruppo Culturale e Civiltà Nella Letteratura Pre- e Protostorica Italiana, in: Dankers, J., Cavazzuti, C. and Cattani, M. (Eds), *Facies e Culture Nell'età Del Bronzo Italiana?* Brepols: Artes Institut historique belge de Rome), XI. Turnhout, pp. 27–38.

De Rosa, B. and Piccioli, C. (2006), Caratterizzazione Tecnico-Scientifica Della Ceramica Preistorica: Facies Del Gaudo, in: *La ceramica in italia quando l'Italia non c'era. Atti della 8° giornata di Archeometria della Ceramica (Vietri sul Mare, 27-28 Aprile 2004)*. Bari: Edipuglia, pp. 99–106.

De Vita, S., Orsi, G., Civetta, L., *et al.* (1999), The Agnano-Monte Spina Eruption (4100 Years BP) in the Restless Campi Flegrei Caldera (Italy). *Journal of Volcanology and Geothermal Research*, 91(2–4): 269–301.

De Vivo, B., Rolandi, G., Gans, P.B., Calvert, A., Bohrson, W.A., Spera, F.J. and Belkin, H.E. (2001), New Constraints on the Pyroclastic Eruptive History of the Campanian Volcanic Plain (Italy). *Mineralogy and Petrology*, 73: 47–65.

Debandi, F., Cattani, M. and Peinetti, A. (2019), Focolari E Piastre Di Cottura Nell'abitato Dell'età Del Bronzo Di Mursia (Pantelleria Tp). *Ipotesi di Preistoria*, 12: 111–142.

Degryse, P. and Braekmans, D. (2014), *Elemental and Isotopic Analysis of Ancient Ceramics and Glass*. Amsterdam: Elsevier Ltd.

Deino, A. L, Orsi, G., De Vita, S. and Piochi, M. (2004), The Age of the Neapolitan Yellow Tuff Caldera-Forming Eruption (Campi Flegrei Caldera - Italy) Assessed by Ar / 39 Ar Dating Method. *Journal of Volcanology and Geothermal Research*, 133: 157–170.

Del Fattore, F. R., Filloramo, R., Genchi, F. and Curci, A. (2017), Elementi in Comune Ed Aspetti Locali. Ceramiche a Solcature Nel Quadro Delle Evidenze Dell' Italia Centro-Meridionale. *Studi di Preistoria e Protostoria - 4 - Preistoria e Protostoria della Puglia*. Firenze: Istituto Italiano di Preistoria e Protostoria, pp. 409-416.

Derenne, E., Ard, V. and Besse, M. (2020), Pottery Technology as a Revealer of Cultural and Symbolic Shifts: Funerary and Ritual Practices in the Sion 'Petit-Chasseur' Megalithic Necropolis (3100–1600 BC, Western Switzerland). *Journal of Anthropological Archaeology*, 58(March): 101170.

Derenne, E., Carloni, D. and Besse, M. (2022), Pottery Chaînes Opératoires as a Tool to Approach the Integration of the Bell Beaker Phenomenon : The ' Petit-Chasseur ' Necropolis as a Case Study, in: Abegg, C., Carloni, D., Cousseau, F., Derenne, E., and Ryan-Despraz, J. (Eds.), *Bell Beaker Culture in all its forms. Proceedings of the 22nd Meeting of 'Archéologie et Gobelets' 2021 (Geneva, Switzerland)*. Oxford: Archaeopress, pp. 49–63.

Di Girolamo, P. (1970), Differenziazione Gravitativa e Curve Isochimiche Nella “Ignimbrite Campana”. *Rendiconti della Societa Italiana di Mineralogia e Petrologia*, 26: 3–44.

Di Renzo, V., Di Vito, M. A., Arienzo, I., Carandente, A., Civetta, L., D’Antonio, M., Giordano, F., Orsi, G. and Tonarini, S. (2007), Magmatic History of Somma-Vesuvius on the Basis of New Geochemical and Isotopic Data from a Deep Borehole (Camaldoli Della Torre). *Journal of Petrology*, 48(4): 753–784.

Di Pierro, M. and Moresi, M. (1985), Compositional Characteristics of «Argille Varicolori» from Outcrops of Bisaccia and Calitri, Avellino Province, Southern Italy, in: Pozzuoli, A. (Ed.), *Proc. Clays and Clay Minerals, 1st Ital.-Spanish Congr., Seiano di Vico Equense and Amalfi*, pp. 217–230.

Di Vito, M.A., Isaia, R., Orsi, G., Southon, J., de Vita, S., D’Antonio, M., Pappalardo, L. and Piochi, M. (1999), Volcanism and Deformation since 12,000 Years at the Campi Flegrei Caldera (Italy). *Journal of Volcanology and Geothermal Research*, 91: 221–246.

Di Vito, M. A., Sulpizio, R., Zanchetta, G. and D’Orazio, M. (2008), The Late Pleistocene Pyroclastic Deposits of the Campanian Plain: New Insights into the Explosive Activity of Neapolitan Volcanoes. *Journal of Volcanology and Geothermal Research*, 177(1): 19–48.

Di Vito, M. A., Castaldo, N., de Vita, S., Bishop, J. and Vecchio, G. (2013), Human Colonization and Volcanic Activity in the Eastern Campania Plain (Italy) between the Eneolithic and Late Roman Periods. *Quaternary International*, 303: 132–141.

Di Vito, M. A., Aurino, P., Boenzi, G., Laforgia, E. and Rucco, I. (2021), Human Communities Living in the Central Campania Plain during Eruptions of Vesuvius and Campi Flegrei. *Annals of Geophysics*, 64(5): 1–16.

Diallo, B.M., Vanhaelen, M.H. and Gosselain, O.P. (1995), Plant Constituents Involved in Coating Practices among Traditional African Potters. *Experientia*, 51: 95–97.

Díaz-del-Río, P. and García Sanjuan, L. (2006), *Social Inequality in Iberian Late Prehistory (BAR International Series 1525)*. Oxford: Archaeopress.

Dietler, M. and Herbich, I. (1998), Habitus, Techniques, Style: An Integrated Approach to the Social Understanding of Material Culture and Boundaries, in: Stark, M. (Ed.), *The Archaeology of Social Boundaries*. Washington, D.C.: Smithsonian Institution Press, pp. 232–263.

Dobres, M. A. (2000), *Technology and Social Agency: Outlining a Practice Framework for Archaeology*. Oxford: Blackwell.

Dobres, M. A. and Hoffman, C. R. (1994), Social Agency and the Dynamics of Prehistoric Technology. *Journal of Archaeological Method and Theory*, 1(3): 211–258.

Dobres, M. A. and Robb, J. (2000), *Agency in Archaeology*. London: Routledge.

Dolfini, A. (2006), La Necropoli Di Rinaldone e Il Problema Delle Sepolture Primarie in Italia Centrale Tra IV e III Millennio a.C. *Preistoria e Protostoria in Etruria. Atti del VII Incontro di Studi: 77-96.* Milano: Centro Studi di Preistoria e Archeologia, pp. 77–96.

Dolfini, A. (2014), Early Metallurgy in the Central Mediterranean, in: Roberts, B. W. and Thornton, C. P. (Eds.), *Archaeometallurgy in Global Perspective: Methods and Syntheses*. New York: Springer, pp. 473–506.

Dolfini, A. (2015), Neolithic and Copper Age Mortuary Practices in the Italian Peninsula: Change of Meaning or Change of Medium? In J.R. Brandt, H. Ingvaldsen and M. Prusac (Eds.) *Death and Changing Rituals: Function and Meaning in Ancient Funerary Practices*. Oxford: Oxbow Books, pp. 17-44.

Dolfini, A. (2019), From the Neolithic to the Bronze Age in Central Italy: Settlement, Burial, and Social Change at the Dawn of Metal Production. *Journal of Archaeological Research*, 28: 503–556.

Dolfini, A. (2022), Warrior Graves Reconsidered: Metal, Power and Identity in Copper Age Italy. *World Archaeology*, 53(5): 809-833.

Dolfini, A., Angelini, I. and Artioli, G. (2020), Copper to Tuscany – Coals to Newcastle? The Dynamics of Metalwork Exchange in Early Italy. *PLoS ONE*, 15(1): e0227259.

Donato, G. (1969), *Scienze Sussidiarie Dell'archeologia*. Roma: CNR - Consiglio Nazionale Ricerche.

Dornan, J. L. (2002), Agency and Archaeology: Past, Present, and Future Directions. *Journal of Archaeological Method and Theory*, 9(4): 303–329.

Dubois, J., Murat, M., Amroune, A., Carbonneau, X. and Gardon, R. (1995), High-Temperature Transformation in Kaolinite: The Role of the Crystallinity and of the Firing Atmosphere. *Applied Clay Science*, 10(3): 187–198.

Duday, H., Cipriani, A. M. and Pearce, J. (2009), *The Archaeology of the Dead: Lectures in Archaeothanatology*. Oxford: Oxbow books.

Duistermaat, K. (2016), *The organization of pottery production: Toward a Relational Approach*. Oxford: Oxford University Press.

Echallier, J. C. (1984), *Éléments de Technologie Céramique et d'analyse Des Terres Cuites Archéologiques.* Lambesc: Association pour la diffusion de l'archéologie méridionale.

Eckert, S. L. (2008), *Pottery and Practice: The Expression of Identity at Pottery Mound and Hummingbird Pueblo*. Albuquerque: UNM Press.

Emami, M., Sakali, Y., Pritzel, C. and Trettin, R. (2016), Deep inside the Ceramic Texture: A Microscopic–Chemical Approach to the Phase Transition via Partial-Sintering Processes in Ancient Ceramic Matrices. *Journal of Microscopy and Ultrastructure*, 4(1): 11.

Eramo, G. (2020), Ceramic Technology: How to Recognize Clay Processing. *Archaeological and Anthropological Sciences*, 12(8).

Eramo, G. and Mangone, A. (2019), Archaeometry of Ceramic Materials. *Physical Sciences Reviews*, 4(11): 1–16.

Ermrich, M. and Opper, D. (2011), *X-Ray Powder Diffraction: XRD for the Analyst*. Amsterdam: Panalytical.

Evans, J. and Recchia, G. (2003), Pottery Function: Trapped Residues in Bronze Age Pottery from Coppa Nevigata (Southern Italy). *Scienze dell'Antichità*, 11: 187–201.

Fabbri, B. (1995), *The Cultural Ceramic Heritage, European Ceramic Society Fourth Conference*, Vol. 14. Faenza: Gruppo Editoriale Faenza Editrice.

Fedele, F. (1995), Centro Cultuale Calcolitico Dell'Anvoia a Ossimo (Valcamonica): Scavi 1988–1995, in: S.Casini, Marinis, R. De, and Pedrotti, A. (Eds.), *Statue-stele e Massi Incisi nell'Europa dell'Età del Rame*. Bergamo: Notizie Archeologiche Bergomensi, Civico Museo Archeologico, pp. 251–257.

Fedele, F. G., Giaccio, B., Isaia, R. and Orsi, G. (2003), The Campanian Ignimbrite Eruption, Heinrich Event 4, and Paleolithic Change in Europe: A High-Resolution Investigation. *Geophysical Monograph-American Geophysical Union*, 139: 301–328.

Fernandes, D. M., Mittnik, A., Olalde, I., *et al.* (2020), The Spread of Steppe and Iranian-Related Ancestry in the Islands of the Western Mediterranean. *Nature Ecology and Evolution*, 4(3): 334–345.

Ferrara, B., Guarino, V., De Bonis, A., Morra, V., Grifa, C. and Langella, A. (2014), The Sanctuary of Hera at the Mouth of the Sele River: Archaeometric Analyses for the Reconstruction of Black Glaze Ware

Production at Paestum, in: Greco, G. and Cicala, L. (Eds.), *Archeometry. Comparing experiences.Quaderni del Centro Studi Magna Grecia 19*. Pozzuoli: Naus, pp. 165–189.

Finlay, A. J., McComish, J. M., Ottley, C. J., Bates, C. R. and Selby, D. (2012), Trace Element Fingerprinting of Ceramic Building Material from Carpow and York Roman Fortresses Manufactured by the VI Legion. *Journal of Archaeological Science*, 39(7): 2385–2391.

Finné, M., Holmgren, K., Sundqvist, H. S., Weiberg, E. and Lindblom, M. (2011), Climate in the Eastern Mediterranean, and Adjacent Regions, during the Past 6000 Years - A Review. *Journal of Archaeological Science*, 38(12): 3153–3173.

Fitzpatrick, A. P. (2011), *The Amesbury Archer and Boscombe Bowmen: Bell Beaker Burials on Boscombe Down, the Amesbury, Wiltshire*. Salisbury: Wessex Archaeology, Wessex Archaeological Reports 27.

Flannery, K. V. (1967), Culture History vs. Culture Process: A Debate in American Archaeology. *Scientific American.*, 217(2): 119–127.

Forenbaher, S. (2018), Ljubljana i Cetina: Lončarski Stilovi 3. Tisućljeća Prije Krista Na Prostoru Istočnoga Jadrana Ljubljana and Cetina: Pottery Styles of the Third Millennium BC in the Eastern Adriatic. *Prilozi Instituta za arheologiju u Zagrebu*, 35: 113–159.

Forte, V. (2012), Investigating Pottery Technological Patterns Through Macrowear Analysis: The Chalcolithic Village Of Maccarese-Fiumicino (Italy), in Marreiros J., Bichoand N. Gibaja Bao J. (Eds.), *International Conference on Use-Wear Analysis, Use-Wear 2012*. Cambridge: Cambridge scholar publishing, pp. 619–629.

Forte, V. (2014), Tecnologia e Funzione Nella Produzione Ceramica Eneolitica Del Territorio Di Roma: Casi Studio, Problemi e Potenzialità Della Ricerca. Università La Sapienza di Roma. PhD thesis.

Forte, V. (2019), Skilled People or Specialists? Knowledge and Expertise in Copper Age Vessels from Central Italy. *Journal of Anthropological Archaeology*, 55 (September 2018): 101072.

Forte, V. (2020), *Scelte Tecnologiche, Expertise e Aspetti Sociali Della Produzione*. Oxford: Archaeopress.

Forte, V. and Medeghini, L. (2017), A Preliminary Study of Ceramic Pastes in the Copper Age Pottery Production of the Rome Area. *Archaeological and Anthropological Sciences*, 9(2): 209–222.

Forte, V., Tarquini, O., Botticelli, M. and Medeghini, L. (2020), The Technology of Copper Age Funerary Pottery from Central Italy: An Integrated Study of Compositional Analyses and Manufacturing Traces. *Archaeometry,* 62: 712– 730.

Fowler, C (2017), Relational Typologies, Assemblage Theory and Early Bronze Age Burials. *Cambridge Archaeological Journal*, 27(1): 95–109.

Fowler, C. and Wilkin, N. (2016), Early Bronze Age Mortuary Practices in North-East England and South-East Scotland: Using Relational Typologies to Trace Social Networks, in: Crellin, R., Fowler, C., and Tipping, R. (Eds.), *Prehistory without Borders: The prehistoric archaeology of the Tyne–Forth region*. Oxford: Oxbow Books, pp. 112–135.

Fowler, S. J., Spera, F. J, Bohrson, W. A, Belkin, H. E. and Vivo, B. D. E. (2007), Phase Equilibria Constraints on the Chemical and Physical Evolution of the Campanian Ignimbrite. *Journal Of Petrology*, 48(3): 459–493.

Fragnoli, P. (2021), *Re-Assessing the Notion(s) of Craft Standardization through Diversity Statistics: A Pilot Study on Late Chalcolithic Pottery from Arslantepe in Eastern Anatolia*. PLoS ONE 16(1): e0245660.

Freestone, I. C. and Middleton, A. P. (1987), Mineralogical Applications of the Analytical SEM in Archaeology. *Mineralogical Magazine*, 51(359): 21–31.

Freestone, I. C., Johns, C. and Potter, T. (1982), *Current Research in Ceramics: Thin-Section Studies*. London: British Museum Research Laboratory.

Frieman, C. J., Brück, J., Rebay-Salisbury, K., Bergerbrant, S., Montón Subías, S., Sofaer, J., Knüel, C. J., Vandkilde, H., Giles, M. and Treherne, P. (2017), Aging Well: Treherne's 'Warrior's Beauty' Two Decades Later. *European Journal of Archaeology*, 20(1): 36–73.

Froh, J. (2004), Archaeological Ceramics Studied by Scanning Electron Microscopy. *Hyperfine Interactions*, 154(1–4): 159–176.

Fugazzola Delpino, M.A. and Pellegrini, E. (1998), Presenze Campaniformi Nell'Italia Centro-Meridionale, 155-160, in: Nicolis, F. and Mottes, E. (Eds.), *Simbolo ed enigma. Il bicchiere campaniforme e l'Italia nella preistoria europea del III millennio a.C.* Trento: Provincia Autonoma di Trento Servizio Beni Culturali Ufficio Beni Archeologici.

Fugazzola Delpino, M.A. and Pellegrini, E. (1999), Il Complesso Cultuale 'Campaniforme' Di Fosso Conicchio (Viterbo). *Bullettino di Paletnologia Italiana*, 90(VIII): 61-159.

Fugazzola Delpino, M.A., Salerno, A., Tagliacozzo, A. and Tiné, V. (2003), Una Comunità Della Facies Di Laterza Nella Pianura Campana: L'area "Forum" Di Gricignano - US Navy (CE), in: *Atti della XXXV Riunione Scientifica dell'Istituto Italiano di Preistoria e Protostoria - Le comunità della Preistoria italiana. Studi e ricerche sul Neolitico e le Età dei metalli (Lipari, 2-7 giugno 2000)*. Firenze: Istituto Italiano di Preistoria e Protostoria, pp. 199–214.

Fugazzola, M.A., Salerno, A. and Tiné, V. (2007), Villaggi e Necropoli Dell'area "Centro Commerciale" Di Gricignano d'Aversa, US Navy (CE), in: *Atti della XL Riunione Scientifica dell'Istituto Italiano di Preistoria e Protostoria - Strategie di insediamento fra Lazio meridionale e alla Campania centro-settentrionale in età preistorica e protostorica (Roma, 30 novembre-3 dicembre 2005)*. Firenze: Istituto Italiano di Preistoria e Protostoria, pp. 521–537.

Furholt, M. (2014), Upending a 'Totality': Re-Evaluating Corded Ware Variability in Late Neolithic Europe. *Proceedings of the Prehistoric Society*, 80(January): 67–86.

Furholt, M. (2017), Massive Migrations? The Impact of Recent a DNA Studies on Our View of Third Millennium Europe. *European Journal of Archaeology*, 21(2): 159–178.

Furholt, M. (2020), Social Worlds and Communities of Practice: A Polythetic Culture Model for 3rd Millennium BC Europe in the Light of Current Migration Debates. *Préhistoires méditerranéennes*, (8): 1-24.

Gallay, A. (1992), A Propos de La Céramique Actuelle Du Delta Intérieur Du Niger (Mali): Approche Ethnoarchéologique et Règles Transculturelles, in: Gallay, A., Audouze, F., and Roux, V. (Eds.), *Ethnoarchéologie: Justification, Problèmes, Limites*. Juan-les-Pins: APDCA, pp. 67–90.

Gallay, A. (2001), L'énigme Campaniforme, in: Nicolis, F. (Ed.), *Bell beakers today: pottery, people, culture, symbols in prehistoric Europe*. Trento: Ufficio Beni Archeologici - Servizio Beni Culturali - Provincia Autonoma, pp. 41–58.

Gangemi, G. (1988), Un Insediamento Di Tipo Laterza a Castel Baronia (Avellino), in: *L'età del Rame in Europa, Viareggio 15/18 ottobre 1987, Rassegna di Archeologia*, 7: 570–571.

Gelbert, A. (2005), Reconnaissance Des Techniques et Des Méthodes de Façonnage Par l'analyse Des Macrotraces: Étude Ethnoarchéologique Dans La Vallée Du Sénégal, in: Smith, A. L., Bosquet, D., and Martineau, R. (Eds.), *Section 2, Archaeometry; Symposium 2.1, Pottery Manufacturing Processes: Reconstitution and Interpretation*. Oxford: Archaeopress, pp. 67–78.

Geniola, A., and Sanseverino, R. (2014), Elementi funerari nell'area centro-meridionale del sito di Santa Barbara (Polignano a Mare, BA). *Rivista di Studi Liguri*, 37–39: 283–288.

Giampaola, D. and Boenzi, G. (2013), Interazione Tra Attività Vulcanica e Vita Dell'uomo: Evidenze Archeologiche Nell'area Urbana Di Napoli. *Miscellanea INGV*, 18: 38–44.

Giampaola, D., Laforgia, E. and Boenzi, G. (2007), Ambiente e Insediamento Tra Neolitico Ed Età Del Bronzo, in: *Atti XL Riunione Scientifica dell'Istituto Italiano di Preistoria e Protostoria*. Firenze: Istituto Italiano di Preistoria e Protostoria, pp. 924-927

Giano, S. I., Gioia, D. and Schiattarella, M. (2014), Morphotectonic Evolution of Connected Intermontane Basins from the Southern Apennines, Italy: The Legacy of the Pre-Existing Structurally Controlled Landscape. *Rendiconti Lincei*, 25(2): 241–252.

Giardino, C. (1998), *I Metalli Nel Mondo Antico: Introduzione All'archeometallurgia*. Roma: Laterza.

Giardino, C. (2000), The Beginning of Metallurgy in Tyrrhenian South-Central Italy. The Eneolithic Facies of Gaudo, in: Ridgeway, D. (Ed.), *Ancient Italy in its Mediterranean setting. Studies in Honour of Zeller Macnamara*. London: Accordia Research Institute, University of London, pp. 49–65.

Gimbutas, M. (1991), *The Civilization of the Goddess: The World of Old Europe*. San Francisco: Harper and Row.

Gliozzo, E. (2020a), Ceramics Investigation: Research Questions and Sampling Criteria. *Archaeological and Anthropological Sciences*, 12(8): 1-19.

Gliozzo, E. (2020b), Ceramic Technology. How to Reconstruct the Firing Process. *Archaeological and Anthropological Sciences*, 12(11): 1–35.

Gliozzo, E., Kirkman, I. W., Pantos, E. and Turbanti Memmi, I. (2004), Black Gloss Pottery: Production Sites and Technology in Northern Etruria, Part II: Gloss Technology. *Archaeometry*, 46(2): 227–246.

Gliozzo, E., Vivacqua, P. and Memmi, I.T. (2008), Integrating Archaeology, Archaeometry and Geology: Local Production Technology and Imports at Paola (Cosenza, Southern Italy). *Journal of Archaeological Science*, 35(4): 1074–1089.

Gomart, L., Weiner, A., Gabriele, M., Durrenmath, G., Sorin, S., Angeli, L., Colombo, M., Fabbri, C., Maggi, R., Panelli, C., Pisani, D. F., Radi, G., Tozzi, C. and Binder, D. (2017), Spiralled Patchwork in Pottery Manufacture and the Introduction of Farming to Southern Europe. *Antiquity*, 91(360): 1501–1514.

González-Ruibal, A. (2014), Archaeological Revolution(S). *Current Swedish Archaeology*, 22(Barrett): 41–45.

Gori, M. (2020), Κατὰ Γῆν Καὶ Κατὰ Θάλασσαν. Cetina Communities on the Move across the Central Mediterranean and the Balkans in the 3rd Millennium BC, in: Maran, J., Băjenaru R., Ailincăi S. C., Popescu A. D., and Hansen S. (Eds.), *Objects, Ideas and Travelers Contacts between the Balkans, the Aegean and Western Anatolia during the Bronze and Early Iron Age*. Bonn: Verlag Dr. Rudolf Habelt GmbH, pp. 65-84.

Gori, M., Recchia, G. and Tomas, H. (2018), The Cetina Phenomenon across the Adriatic during the 2nd Half of the 3rd Millennium BC: New Data and Research Perspectives, in: *38° convegno nazionale sulla Preistoria - Protostoria - Storia della Daunia*. San Severo, pp. 197–216.

Gosden, C. and Marshall, Y. (1999), The Cultural Biography of Objects. *World Archaeology*, 31(2): 169–178.

Gosselain, O. P. (1992), Bonfire of the Enquiries. Pottery Firing Temperatures in Archaeology: What For? *Journal of Archaeological Science*, 19(3): 243–259.

Gosselain, O. P. (1998), Social and Technical Identity in a Clay Crystal Ball. *The Archaeology of Social Boundaries*: 78–107.

Gosselain, O. P. (2000), Materializing Identities: An African Perspective. *Journal of Archaeological Method and Theory*, 7(3): 187–217.

Gosselain, O. P. (2002), *Poteries Du Cameroun Meridional. Styles, Techniques et Raports a l'identité*. Paris: CNRS éditions.

Gosselain, O. P. (2008), Thoughts and Adjusments in the Potter's Backyard, in: *Breaking the Mould: Challenging the Past through Pottery. Prehistoric Ceramics Research Group, Occasional Paper, 6.* Oxford: British Archaeological Reports, International Serie, pp. 67–79.

Gosselain, O. P. (2011), Fine If I Do, Fine If I Don't. Dynamics of Technical Knowledge in Sub-Saharan Africa Chapter, in: Roberts, B. W. and Linden, M. Vander (Eds.), *Investigating Archaeological Cultures*. New York: Springer, pp. 211–227.

Gosselain, O. P. (2016), Commentary: On Fluxes, Connections and Their Archaeological Manifestations. *Human Mobility and Technological Transfer in the Prehistoric Mediterranean*. Cambridge: Cambridge University Press, pp. 193–205.

Gosselain, O. P. (2018), Pottery Chaînes Opératoires as Historical Documents, in Spear, T. (ed.). *The Oxford Encyclopedia of African Historiography: Methods and Sources.* Oxford: Oxford University Press.

Gosselain, O. P. and Livingstone Smith, A. (2005), The Source. Clay Selection and Processing Practices in Sub-Saharan Africa. *Pottery Manufacturing Processes: Reconstruction and Interpretation*, 1349(August): 33–47.

Gosselain, O. P., Livingstone Smith, A., Wallaert, H., Ewe, G. W. and Vander Linden, M. (1996), Preliminary Results of Fieldwork Done by the « Ceramic and Society Project » in Cameroon, December 1995-March 1996. *Nyame Akuma*, 46: 11–17.

Grasso, M. (2001), The Apenninic-Maghrebian Orogen in Southern Italy, Sicily and Adjacent Areas, in: Vai, G. B. and Martini, P. I. (Eds.), *Anatomy of an Orogen. The Ap- ennines and adjacent Mediterranean basins*. Dordrecht: Kluwer, pp. 255–286.

Graziosi, P. (1947), I Resti Scheletrici Umani Della Necropoli Preistorica Di Paestum. *Rivista di scienze preistoriche*, 2(4): 291–320.

Greenfield, H. J. (2010), The Secondary Products Revolution: The Past, the Present and the Future. *World Archaeology*, 42(1): 29–54.

Guerzoni, R. P. (2004), La Facies Di Piano Conte Nella Grotta Pavolella: La Sequenza Cronologica Sulla Base Della Ceramica Vascolare, in: *Atti della XXXVII riunione scientifica IIPP, Preistoria e Protostoria della Calabria*. Firenze: Istituto Italiano di Preistoria e Protostoria, 235–249.

Guglielmino, R., Levi, S. T. and Jones, R. E. (2010), Relations between the Aegean and Apulia in the Late Bronze Age: The Evidence from an Archaeometric Study of the Pottery at Roca (Lecce). *Rivista di Scienze Preistoriche*, LX: 257–282.

Guidi, A. (1992), Le Età Dei Metalli Nell'Italia Centrale e in Sardegna, in: Guidi, A. and Piperno, M. (Eds.), *Italia preistorica*. Roma: Laterza, pp. 420–470.

Guidi, A. (2020), Tipi e Culture Nell' Archeologia Preistorica Italiana: Un Binomio Inscindibile?, Dankers, J., Cavazzuti, C. and Cattani, M. (Eds), *Facies e Culture Nell'età Del Bronzo Italiana?* Brepols: Artes Institut historique belge de Rome), XI. Turnhout, pp. 41–52.

Guilaine, J. (1980), *La France d'avant La France: Du Neolithique a l'age Du Fer*. Paris: Hachette.

Guilaine, J. (2007), *Le Chalcolithique et La Construction Des Inégalités. Tome 1, Le Continent Européen*. Paris: Errance.

Haak, W., Lazaridis, I., Patterson, N. *et al.* (2015), Massive Migration from the Steppe Was a Source for Indo-European Languages in Europe. *Nature*, 522(7555): 207–211.

Hakenbeck, S. (2008), Migration in Archaeology: Are We Nearly There Yet? *Archaeological review from Cambridge*, 23(2): 9–26.

Hall, M. (2016), X-Ray Fluorescence-Energy Dispersive (ED-XRF) and Wavelength Dispersive (WD-XRF) Spectrometry, in: Hunt, A. (Ed.), *Oxford Handbook of Archaeological Ceramic Analysis*. Oxford: Oxford University Press, pp. 342–362.

Hally, D. (1986), The Identification of Vessel Function: A Case Study from Northern Georgia. *American Antiquity*, 51: 267–295.

Hamilakis, Y. (1998), Eating the Dead: Mortuary Feasting and the Politics of Memory in the Aegean Bronze Age Societies, in Branigan, K., *Cemetery and society in the Aegean Bronze Age*. Sheffield: Sheffield University Press, pp. 115–132.

Hamon, G., Querre, G. and Aubert, J.G. (2005), Techniques de Fabrication de Ceramiques Du Neolithique Moyen I En Armorique (France), in: Livingstone-Smith, A., Bosquet, D., and Martineau, R. (Eds.), *Pottery manufacturing processes: Reconstitution and interpretation (British Archaeological Reports Internatinal Series 1349).* Oxford: Archaeopress, pp. 115–126.

Harris, O. J. T. and Cipolla, C. N. (2017), *Archaeological theory in the new millennium: introducing current perspectives.* New York: Routledge.

Harrison, R. and Heyd, V. (2007), The Transformation of Europe in the Third Millennium BC: The Example of 'Le Petit-Chasseur I + III' (Sion, Valais, Switzerland). *Prahistorische Zeitschrift*, 82(2): 129–214.

Heggarty, P. (2014) Prehistory by Bayesian Phylogenetics? The State of the Art on Indo-European Origins. *Antiquity*, 88: 566–577.

Heimann, R. B. (2016), X-Ray Powder Diffraction (XRPD), in: Hunt, A. (Ed.), *The Oxford Handbook of Archaeological Ceramic Analysis*. Oxford: Oxford University Press, pp. 327-341.

Heimann, R. B. and Franklin, U. M. (1979), Archaeo-Thermometry: The Assessment of Firing Temperatures of Ancient Ceramics. *Journal of the International Institute of Conservation-Canadian Group*, 4(2): 23–45.

Hein, A. and Kilikoglou, V. (2017), Compositional Variability of Archaeological Ceramics in the Eastern Mediterranean and Implications for the Design of Provenance Studies. *Journal of Archaeological Science: Reports*, 16: 564–572.

Hein, A. and Kilikoglou, V. (2020), Ceramic Raw Materials: How to Recognize Them and Locate the Supply Basins—Chemistry. *Archaeological and Anthropological Sciences*, 12(8).

Hein, A., Tsolakidou, A., Iliopoulos, I., Mommsen, H., Buxeda i Garrigós, J., Montana, G. and Kilikoglou, V. (2002), Standardisation of Elemental Analytical Techniques Applied to Provenance Studies of Archaeological Ceramics: An Inter Laboratory Calibration Study. *Analyst*, 127(4): 542–553.

Hein, A., Day, P. M., Quinn, P. S. and Kilikoglou, V. (2004), The Geochemical Diversity of Neogene Clay Deposits in Crete and Its Implications for Provenance Studies of Minoan Pottery. *Archaeometry*, 46(3): 357–384.

Hein, A., Müller, N. S., Day, P. M. and Kilikoglou, V. (2008), Thermal Conductivity of Archaeological Ceramics: The Effect of Inclusions, Porosity and Firing Temperature. *Thermochimica Acta*, 480(1–2): 35–42.

Herbert, J. M. and Smith, M. S. (2010), Identifying Grog in Archaeological Pottery. *First Annual Conference, Reconstructive/Experimental Archaeology*, 1(March): 1–17.

Heyd V. (2007a), When the West Meets the East: The Eastern Periphery of the Bell Beaker Phenomenon and Its Relation with the Aegean Early Bronze Age, in: Galanaki, I., Galanakis, I., Tomas, H., and Laffineur, R. (Eds.), *Between the Aegean and Baltic Seas: periphery across bord*. Liège, Belgique : Universitè de Liège, Histoire de l'art et archéologie de la Grèce antique; Austin, TX : University of Texas at Austin, Program in Aegean Scripts and Prehistory, pp. 91–107.

Heyd, V. (2007b), Families, Prestige Goods, Warriors & Complex Societies: Beaker Groups of the 3rd Millennium Cal BC along the Upper & Middle Danube. *Proceedings of the Prehistoric Society*, 73: 327–379.

Heyd, V. (2012), Growth and Expansion: Social, Economic and Ideological Structures in the European Chalcolithic, 96–112, in: Allen, M. J.; Gardiner, J. and Sheridan, A. (Eds.), *Is there a British Chalcolithic?: people, place and polity in the later 3rd millennium, Proceedings of the British Chalcolithic conference, April 2008 in Bournemouth*. London & Oxford: The Prehistoric Society & Oxbow Books.

Heyd, V. (2013), L'Europa Nell'Età Del Rame: La 'Calcolitizzazione' Di Un Continente, in de Marinis, R.C. (Ed.), *L'età del Rame: La Pianura Padana e le Alpi al tempo di Ötzi*. Brescia: Compagnia della Stampa Massetti Rodella editori, pp. 23–38.

Heyd, V. and Walker, K. (2015), The First Metalwork and Expressions of Social Power, in: Fowler, C., Harding, J., and Hofmann, D. (Eds.), *The Oxford Handbook of Neolithic Europe*. Oxford: Oxford University Press, pp. 672–691.

Higham, T., Chapman, J. and Slachev, V. (2007), New Perspectives on the Varna Cemetery (Bulgaria) – AMS Dates and Social Implications. *Antiquity*, 81: 640–654.

Ho, J. W. I. and Quinn, P. S. (2021), Intentional Clay-Mixing in the Production of Traditional and Ancient Ceramics and Its Identification in Thin Section. *Journal of Archaeological Science: Reports*, 37(March): 102945.

Hoard, R.J., O'Brien, M. J., Khorasgany, M. G. and Gopalaratnam, V. S. (1995), A Materials-Science Approach to Understanding Limestone-Tempered Pottery from the Midwestern United States. *Journal of Archaeological Science*, 22(6): 823–832.

Hodder, I. (1982a), *The Present Past: An Introduction to Anthropology for Archeologists*. Barnsley: Pen and Sword.

Hodder, I. (1982b), *Symbolic and Structural Archaeology*. Cambridge: Cambridge University Press.

Hodder, I, (1986), *Reading the Past*. Cambridge: Cambridge University Press.

Hodder, I. (2012), *Entangled. An Archaeology of the Relationships between People and Things*. Oxford: Wiley-Blackwell.

Holloway, R. R. (1969), Excavations at Buccino: 1968. *American Journal of Archaeology*, 73(2): 199–201.

Holloway, R. R. (1970), Excavations at Buccino: 1969. *American Journal of Archaeology*, 74(2): 145–148.

Holloway, R. R. (1973), Buccino, in: Bailo Modesti, G., D'Agostino, B., and Gastaldi, P. (Eds.), *Seconda mostra del Salernitano*. Salerno: Pietro Laveglia Editore, pp. 43–50.

Holloway, R. R. (1974), The Sanctuary at San Mauro, Buccino. *American Journal of Archaeology*, 78(1): 25–32.

Holmqvist, E. (2016), Handheld Portable Energy-Dispersive X-Ray Fluorescence Spectrometry (PXRF), in: Hunt, A. (Ed.), *Oxford Handbook of Archaeological Ceramic Analysis*. Oxford: Oxford University Press, pp. 363–381.

Horden, P. and Purcell, N. (2000), *The Corrupting Sea: A Study of Mediterranean History*. Oxford: Wiley-Blackwell.

Hoskins, J. (2006), Agency, Biography and Objects, in Tilley, C., Keane, W., Küchler, S., Rowlands, M., and Spyer, P. (2006). *Handbook of material culture*. New York: SAGE Publications Ltd, pp. 74–84.

Hunt, A. (2016), Introduction to the Oxford Handbook of Archaeological Ceramic Analysis, in, Hunt, A. (Ed.), *The Oxford Handbook of Archaeological Ceramic Analysis.* Oxford: Oxford University Press, pp. 2–6.

Huntley, D. L. (2008), *Ancestral Zuni Glaze-Decorated Pottery: Viewing Pueblo IV Regional Organization through Ceramic Production and Exchange*. Tucson: University of Arizona Press.

Iaia, C. and Dolfini, A. (2021), A New Seriation and Chronology for Early Italian Metalwork, 4500-2100 BC. A New Seriation and Chronology for Early Italian Metalwork, 4500-2100 BC. *Rivista di Scienze Preistoriche*, LXXI: 1–43.

Ingold, T. (1993) The temporality of the landscape, *World Archaeology*, 25, 2: 152-174

Ingravallo, E. (2002), *Grotta Cappuccini (Galatone) Tra Eneolitico e Primo Bronzo*. Galatina: Congedo.

Ingravallo, E., Tiberi, I. and Lo Noce, N. (2010), L'orizzonte Culturale Del III Millennio a.C.: Il Tumulo 7 Di Salve (Lecce). *Origini*, XXXII: 203–258.

Ionescu, C. and Hoeck, V. (2020), Ceramic Technology. How to Investigate Surface Finishing. *Archaeological and Anthropological Sciences*, 12(9).

Ippolito, F., D'Argenio, B., Pescatore, T. and Scandone, P. (1975), Structural-Stratigraphic Units and Tectonic Framework of Southern Apennines, in: Squyres, C. H. (Ed.), *Geology of Italy. Petrol Expl Soc Libya*. Tripoli: The Earth Sciences Society Of The Libyan Arab Republic, pp. 317–328.

Ivanova, M. (2017), The 'Green Revolution' in Prehistory: Late Neolithic Agricultural Innovations as a Technological System, in: Stockhammer, P. W. and Maran, J. (Eds.), *Appropriating Innovations. Entangled Knowledge in Eurasia, 5000-1500 BC*. Oxford: Oxbow Books, pp. 40–49.

Jeanjean, A. (1885), L'hommes et Les Animaux Dans Les Cavernes Des Basses Cévannes, in: *Mémoires de l'Académie de Nimes*. Nimes: Imprimerie Clavel-Ballivet et Cie, pp. 135–228.

Jeunesse, C. (2015), The Dogma of the Iberian Origin of the Bell Beaker: Attempting Its Deconstruction. *Journal of Neolithic Archaeology*, 16: 158–166.

Joyce, R. (2012) From Place to Place: Provenience, Provenance, and Archaeology, in G. Feigenbaum and I. Reist (Eds.), *Provenance: An Alternate History of Art*. Los Angeles, Getty Research Institute, pp. 48-60.

Jones, R. E., Vagnetti, L. Levi, S. T., Williams, J., Jenkins, D. and De Guio, A. (2002), Mycenaean Pottery from Northern Italy. Archaeological and Archaeometric Studies. *Studi Micenei ed Egeo-Anatolici*, XLIV/2: 221–261.

Jones, R. E., Levi, S. T. and Bettelli, M. (2005), Mycenaeans Pottery in the Central Mediterranean: Imports, Imitations and Derivatives, in: Laffineur, R. and Greco, E. (Eds.), *EMPORIA. Aegeans in Central and Eastern Mediterranean, Proceedings of the 10th International Aegean Conference*. Liège and Austin: Université de Liège, Histoire de l'art et archéologie de la Grèce antique ; University of Texas at Austin, Program in Aegean Scripts and Prehistory, pp. 539–545.

Jones, R. E., Levi, S. T., Bettelli, M. and Vagnetti, L. (2014), *Italo-Mycenaean Pottery: The Archaeological and Archaeometric Dimensions, Incunabula Graeca CIII*. Roma: CNR - Consiglio Nazionale Ricerche.

Karner, D. B., Juvigne, E., Brancaccio, L., Cinque, A., Russo Ermolli, E., Santangelo, N., Bernasconi, S. and Lirer, L. (1999), A Potential Early Middle Pleistocene Tephrostratotype for the Mediterranean Basin: The Vallo Di Diano, Campania, Italy. *Global and Planetary Change*, 21(1–3): 1–15.

Keller, J., Ryan, W. B. F., Ninkovich, D. and Altherr, R. (1978), Explosive Volcanic Activity in the Mediterranean over the Past 200,000 Yr as Recorded in Deep-Sea Sediments. *Geological Society of America Bulletin*, 89(4): 591–604.

Kienlin, T. L. and Zimmermann, A. (2012), *Beyond Elites. Alternatives to Hierarchical Systems in Modelling Social Formations.* Bonn: Habelt.

Kilikoglou, V., Vekinis, G., Maniatis, Y. and Day, P. M. (1998), Mechanical Performance of Quartz-Tempered Ceramics: Part I, Strength and Toughness. *Archaeometry*, 40(2): 261–279.

Kintigh, K. W., Altschul, J. H., Beaudry, M. C., *et al.* (2014), Grand Challenges for Archaeology. *Proceedings of the National Academy of Sciences of the United States of America*, 111(3): 879–880.

Klein, C. and Philpotts, A. (2017), *Earth Materials: Introduction to Mineralogy and Petrology 2nd Edition*. Cambridge: Cambridge University Press.

Klimscha, F. (2017), Transforming Technical Know-How in Time and Space. Using the Digital Atlas of Innovations to Understand the Innovation Process of Animal Traction and the Wheel. *ETopoi. Journal for Ancient Studies*, 6: 16–63.

Kohl, P.L. (2007), *The Making of Bronze Age Eurasia*. Cambridge: Cambridge University Press.

Kohring, S. and Wynne-Jones, S. (2007), *Socialising Complexity. Structure, Integration and Power in the Past*. Oxford: Oxbow Press.

Kolb, C. C. (1988), *Ceramic Ecology Revisited: The Technology and Socioeconomics of Pottery* (BAR International Series S436). Oxford: Archaeopress.

Kossinna, G. (1910), Der Ursprung Der Urfinnen Und Urindogermanen Und Ihre Ausbreitung Nach Osten. *Mannus*, 1–2: 225–245.

Krauß, R., Schmid, C., Kirschenheuter, D., Abele, J., Slavchev, V. and Weninger, B. (2017), Chronology and Development of the Chalcolithic Necropolis of Varna I. *Documenta Praehistorica*, 44: 282–305.

Kristiansen, K. (1989), Prehistoric Migrations: The Case of the Single Grave and Corded Ware Culture. *Journal of Danish Archaeology*, 8: 211–225.

Kristiansen, K. (1999), The Emergence of Warrior Aristocracies in Later European Prehistory and Their Long-Term History, in: Carman, J. and Harding, A. (Eds.), *Ancient Warfare. Archaeological Perspectives*. Stroud: Sutton Publishing, pp. 175–189.

Kristiansen, K. (2014), The Decline of the Neolithic and the Rise of Bronze Age Society, in Fowler, C., Harding, J., and Hofmann, D. (Eds), *The Oxford Handbook of Neolithic Europe*. Oxford: Oxford University Press, pp. 1–19.

Kristiansen, K. and Earle, T. (2015), Neolithic Versus Bronze Age Social Formations: A Political Economy Approach, in Kristiansen, K., Šmejda, L., & Turek, J. (Eds.), *Paradigm Found: Archaeological Theory – Present, Past and Future. Essays in Honour of Evžen Neustupný*. Oxford: Oxbow Books, pp. 234–247.

Kristiansen, K. and Larsson, T. B. (2005), *The Rise of Bronze Age Society: Travels, Transmissions and Transformations*. Cambridge: Cambridge University Press.

Kristiansen, K., Allentoft, M. E., Frei, K. M., *et al.* (2017), Re-Theorising Mobility and the Formation of Culture and Language among the Corded Ware Culture in Europe. *Antiquity*, 91(356): 334–347.

Kruts, V.A., Korvin-Piotrovskiy, A.G. and Rizhov, S.N. (2001), *Talianki – Settlement-Giant of the Tripolian Culture. Investigations in 2001*. Kiev: Institute of Archaeology of NASU.

Kuhn, T. (1962), *The Structure of Scientific Revolutions*. Chicago: University of Chicago Press.

Kuijpers, M. H.G. (2018), The Bronze Age, a World of Specialists? Metalworking from the Perspective of Skill and Material Specialization. *European Journal of Archaeology*, 21(4): 550–571.

Kulbicki, G. (1958), High-Temperature Phases in Montmorillonites, in: Swineford, A. (Ed.), *Clays and Clay Minerals*. Washington, D.C.: National Academy of Sciences/National Research Council, pp. 144–158.

La Marca, C. (2021), Lo Sfruttamento Del Territorio Nel Neolitico Recente: Un'ipotesi Interpretativa Delle Strutture Di Casale Di Valleranello (Roma), in: *Preistoria del cibo L'alimentazione nella preistoria e nella protostoria*. Firenze: Istituto Italiano di Preistoria e Protostoria, pp. 867–872.

La Marca, C., Eramo, G., Muntoni, I. M. and Conati Barbaro, C. (2017), Early Neolithic Potters of the Italian Middle Adriatic Region. *Archeologické rozhledy*, LXIX: 227–245.

La Torre, A., Mannino, G. and Zurzolo, A. (2020), Fine Pottery Chaîne Opératoire from the Bronze Age Site of via Ordiere, Solarolo (RA, IT): Experiments on the Relationship between Surface Treatments and Function. *EXARC Journal*, 1: 1–7.

Laforgia, E. and Boenzi, G. (2011), Nuovi Dati Sull'Eneolitico Della Piana Campana Dagli Scavi A.V. in Provincia Di Napoli, in: *Atti della XLIII Riunione Scientifica - L'età del Rame in Italia (Bologna, 26-29 novembre 2008*. Firenze: Istituto Italiano di Preistoria e Protostoria, pp. 249–255.

Laforgia, E., Boenzi, G. and Signorelli, C. (2007), Caivano (Napoli). Nuovi Dati Sull'Eneolitico Dagli Scavi A.V. La Necropoli Del Gaudo, in: *Atti della XL Riunione Scientifica dell'Istituto Italiano di Preistoria e Protostoria - Strategie di insediamento fra Lazio meridionale e alla Campania centro-settentrionale in età preistorica e protostorica (Roma, 30 novembre-3 dicembre 2005)*. Firenze: Istituto Italiano di Preistoria e Protostoria, pp. 615–618.

Laforgia, E., Boenzi, G., Amato, L., Bishop, J., Fattore, L., Stanzione, M. and Di Vito, M. A. (2013), L'impatto Delle Eruzioni Vulcaniche Nelle Aree a Nord Di Napoli: Casi Da Scavi Recenti. *Bollettino dell'Istituto Nazionale di Geologia e Vulcanologia*, 18: 110–114.

Langella, M., Andaloro, E., Bocci, M., Boscaino, M., Coppa, A., Curci, A., De Francesco, A. M., Senatore, M. R., Rampa, R. and Vargiu, R. (2008), Foglianise (Benevento), Loc. S. Maria a' Peccerella: Un Insediamento Di Tipo Laterza. *Rivista di scienze preistoriche,* 58: 165–90.

Lanos, P., Lefèvre, J-C., Oberlin, C., Albore Livadie, C. and Dufresne, P. (2020), Chronologie de l'éruption et Des Cultures Archéologiques Associées Par Le Logiciel de Statistique Bayésienne ChronoModel, in: Albore Livadie, C. and Vecchio, G. (Eds.), *Nola –Croce del Papa. Un villaggio sepolto dall'eruzione vesuviana delle Pomici di Avellino*. Napoli: Centre Jean Bérard, pp. 71–83.

Laplace, G. (1975), La Typologie Analytique et Structurale: Base Rationelle d'étude Des Industries Lithiques et Osseues, in: *Banques de donnés archéologiques, Colloques Nationaux de la Recherce Scientifique, 932 (Marseille, 12-14 juin 1972)*, pp. 92–143.

Latour, B. and Lemonnier., P. (1994), *De La Préhistoire Aux Missiles Balistiques. L'intelligence Sociale Des Techniques.* Paris: La Découverte.

Lave, J. and Wenger, E. (1991), *Situated Learning. Legitimate Peripheral Participation*. New York: Cambridge University Press.

Laviano, R. and Muntoni, I. M. (2006), Provenance and Technology of Apulian Neolithic Pottery. *Geological Society Special Publication*, 257(January 2006): 49–62.

Laviano, R. and Muntoni, I. M. (2008), La Ceramica Neolitica in Puglia (Italia): Stato Dell 'Arte e Prospettive Della Ricerca Archeometrica, in: Hernàndez A.A., Campione A., Otranto G. (Eds), *Italia e Argentina. Itinerari di ricerca dall'antichità all'epoca della globalizzazione*. Bari: Cacucci Editore, pp. 49-67.

Laviano, R. and Muntoni, I. M. (2011), La Ceramica Neolitica in Puglia (Italia): Stato Dell'arte e Prospettive Della Ricerca Archeometrica, in: Hernàndez, A. A., Campione, A., and Otranto, G. (Eds.), *Italia e Argentina. Itinerari di ricerca dall'antichità all'epoca della globalizzazione, Sodilatas-Studi Italo-Argentini Università degli studi di Bari 5*. Bari: Cacucci Editore, pp. 49–67.

Laviosa Zambotti, P. (1943), *Le Più Antiche Culture Agricole Europee*. Milano: Principato.

Lechtman, H. (1977), Style in Technology. Some Early Thoughts, in: Lechtman, H. and Merrill, R. S. (Eds.), *Material Culture. Style, Organization, and Dynamics of Technology. 1975 Proceedings of the American Ethnological Society*. St Paul/New York: West Publishing Co, pp. 3–20.

Lechtman, H. (1984), Andean Value Systems and the Development of Prehistoric Metallurgy. *Technology and Culture*, 25: 1–36.

Leclerc, J. (1990), La Notion de Sépulture. *Bulletins et Mémoires de la Société d'Anthropologie de Paris*, 2(3): 13–18.

LeCron, M. (1994), Symbolism: The Foundation of Culture, in: Ingold, T. (Ed.), *The Companion Encyclopedia of Anthropology*. London: Routledge, pp. 366–395.

Lemercier, O. (2018), Think and Act. Local Data and Global Perspectives in Bell Beaker Archaeology. *Journal of Neolithic Archaeology*, (December 2018): 77–96.

Lemercier, O. (2020), The Bell Beaker Question: From Historical-Cultural Approaches to ADNA Analyses, in: *Demography and Migration: Population trajectories from the Neolithic to the Iron Age: Proceedings of the XVIII UISPP World Congress (4-9 June 2018, Paris, France)*. Vol. 5, pp. 116-140.

Lemonnier, P. (1986), The Study of Material Culture Today: Toward an Anthropology of Technical Systems. *Journal of Anthropological Archaeology*, 5: 147– 186.

Lemonnier, P. (1992), *Elements for an Anthropology of Technology*. Ann Arbor: Museum of Anthropology, University of Michigan.

Lemonnier, P. (1993), *Technological Choices: Transformation in Material Cultures Since the Neolithic*. London and New York: Routledge.

Leonardi, G. and Pennello, G. (1991), *Il Disegno Archeologico Della Ceramica*. Torino: E.D.T.

Leonini, V. and Sarti, L. (2008a), Bell Beaker Pottery in Central Italy. *Bell Beaker in everyday life : proceedings of the 10th meeting «Archéologie et Gobelets» (Florence - Siena - Villamora sul Clisi, May 12-15, 2006)*: 119–128.

Leonini, V. and Sarti, L.(2008b), Bell Beaker Pottery in the Florentine Area. *Bell Beaker in everyday life : proceedings of the 10th meeting «Archéologie et Gobelets» (Florence - Siena - Villamora sul Clisi, May 12-15, 2006)*: 87–102.

Lepère, C. (2014), Experimental and Traceological Approach for a Technical Interpretation of Ceramic Polished Surfaces. *Journal of Archaeological Science*, 46(1): 144–155.

Leroi-Gourhan, A. (1964), *Le Geste et La Parole, Tome 1: Technique et Langage*. Paris: Albin Michel.

Leroi-Gourhan, A. (1965), *Le Geste et La Parole. 2. La Mémoire et Les Rythmes*. Paris: Albin Michel.

Levi, S. T. (1999), *Produzione e Circolazione Della Ceramica Nella Sibaritide Protostorica. I. Impasto e Dolii*. Edizioni all'Insegna del Giglio.

Levi, S.T. (2010), *Dal Coccio Al Vasaio. Manifattura, Tecnologia e Classificazione Della Ceramica*. Bologna: Zanichelli.

Levi, S. T. and Muntoni, I. M. (2014), L'archeometria Della Ceramica in Italia: Storia Degli Studi, Risultati e Prospettive Della Ricerca, in: *150 anni di preistoria e protostoria in Italia*. Firenze: Istituto Italiano di Preistoria e Protostoria, pp. 535–542.

Levi, S. T. and Vanzetti, A. (2009), Definizione e Identificazione Rapida Delle Classi Ceramiche Preistoriche e Protostoriche, in: *Le classi ceramiche. Situazione degli studi - Atti della 10a Giornata di Archeometria della Ceramica (Roma, 5-7 aprile 2006)*. Bari: Edipuglia, pp. 9–15.

Levi, S.T., Sonnino, M. and Jones, Richard. E. (2006), Eppur Si Muove…Problematiche e Risultati Delle Indagini Sulla Circolazione Della Ceramica Dell'età Del Bronzo in Italia, in: *Atti della XXXIX Riunione Scientifica dell'Istituto Italiano di Preistoria e Protostoria - Materie prime e scambi nella preistoria italiana (Firenze, 25-27 novembre 2004*). *vol. 2*. Firenze: Istituto Italiano di Preistoria e Protostoria, pp. 1093–1111.

Levi, S. T., Cannavò, V. and Brunelli, D. (2019), *Atlas of Ceramic Fabrics 2: Italy: Southern Tyrrhenian. Neolithic - Bronze Age*. Oxford: Archaeopress.

Levi, S. T., Cannavò, V., Martinelli, M. C., Bettelli, M., Brunelli, D., Di Renzoni, A. and Williams, J. L. (2020), Tradition and Innovation: Pre and Protohistoric Pottery at Lipari in a Wider Environmental and Cultural Perspective. *Rivista di scienze preistoriche*, LXX: 5–28.

Lichardus, J. (1991), *Die Kupferzeit Als Historische Epoche*. Bonn: Habelt.

Lillios, K. T. (1999), Objects of Memory: The Ethnography and Archaeology of Heirlooms. *Journal of Archaeological Method and Theory*, 6(3): 235–262.

Lillios, K. T. (2008), Engaging Memories of European Prehistory, in: Jones, A. (Ed.), *Prehistoric Europe: Theory and Practice*. Oxford: Wiley-Blackwell, pp. 228–254.

Lillios, K. T. (2015), Practice, Process, and Social Change in Third Millennium BC Europe: A View from the Sizandro Valley, Portugal. *European Journal of Archaeology*, 18(2): 245–258.

Lippi, B. and Mallegni, F. (2011), Il Popolo Del Gaudo (Paestum): Biologia Di Un Gruppo Umano Dell'Eneolitico Campano, in: *Atti della XLIII Riunione Scientifica dell'Istituto Italiano di Preistoria e Protostoria - L'età del Rame in Italia (Bologna, 26-29 novembre 2008)*. Firenze: Istituto Italiano di Preistoria e Protostoria, pp. 396–400.

Lirer, F., Sprovieri, M., Ferraro, L., *et al.* (2013), Integrated Stratigraphy for the Late Quaternary in the Eastern Tyrrhenian Sea. *Quaternary International*, 292: 71–85.

Livingstone Smith, A. (2000), Processing Clay for Pottery in Northern Cameroon: Social and Technical Requirements. *Archaeometry*, 42: 21–42.

Longacre, W. A. (1991), *Ceramic Ethnoarchaeology*. Tucson: University of Arizona Press.

Longacre, W.A. (1999), Standardization and Specialization: What's the Link., in: Skibo, J. M. and Feinman, G. (Eds.), *Pottery People: A Dynamic Interaction*. Salt Lake City: University of Utah Press, pp. 44–58.

Longacre, W. A. and Skibo, J. M. (1994), *Kalinga Ethnoarchaeology: Expanding Archaeological Method and Theory*. Washington, DC: Smithsonian Institution Press.

Longhi, C. (2010), La Ceramica Della Necropoli Dell'età Del Rame Di Remedello Sotto, Brescia. *Rivista di scienze preistoriche*, LX(60): 145–165.

López-Montalvo, E., Roldán, C., Badal, E., Murcia-Mascarós, S. and Villaverde, V. (2017), Identification of Plant Cells in Black Pigments of Prehistoric Spanish Levantine Rock Art by Means of a Multi-Analytical Approach. A New Method for Social Identity Materialization Using Chaîne Opératoire. *PLoS ONE*, 12(2).

Maggetti, M. (1982), Phase Analysis and Its Significance for Technology and Origin. *Archaeological ceramics*, (March): 121–133.

Maggetti, M. (2001), Chemical Analyses of Ancient Ceramics: What For? *Chimia*, 55(11): 923–930.

Maggetti, M. and Rossmainith, M. (1981), Archaeothermometry of Kaolinitic Clays. *Revue d'Archéométrie*, 1(1): 185–194.

Maggetti, M., Neururer, C. and Ramseyer, D. (2011), Temperature Evolution inside a Pot during Experimental Surface (Bonfire) Firing. *Applied Clay Science*, 53(3): 500–508.

Mallegni, F. (1975), Studio Antropologico Dei Calvari Della Necropoli Del Gaudo, in: *Atti della XVII Riunione Scientifica dell'Istituto Italiano di Preistoria e Protostoria in Campania*. Firenze: Istituto Italiano di Preistoria e Protostoria, pp. 199–209.

Mallegni, F. (1979), Gli Inumati Eneolitici Della Necropoli Del Gaudo (Paestum), Nota Preliminare. *Quaderni di Scienze atropologiche*, 2: 5–18.

Mallory, J. (1989), *In Search Ofthe Indo-Europeans*. London: Thames and Hudson.

Malone, C. (1985), Pots, Prestige and Ritual in Neolithic Southern Italy, in: Malone, C. and Stoddart, S. (Eds.), *Papers in Italian Archaeology IV: The Cambridge Conference, Part II: Prehistory, vol. 244.* Oxford: British Archaeological Reports, pp. 118–151.

Malone, C. (2003), The Italian Neolithic : A Synthesis. *Journal of World Prehistory*, 17(3): 235–312.

Mancusi, V.G. (2015), Traces of Use and Raw Materials: Use, Reuse and Recycling of Chipped Lithic Artifacts from the Archaeological Investigations Carried out by the Variant Trafficking Naples-Cancello at Acerra - Excavations 2014, in: *Proceedings 1st International Conference on Metrology for Archaeology Benevento, Italy, October 22 - 23, 2015,* pp. 578–583.

Mancusi, V. G. and Bonifacio, G. (2020), Tra facies e culture: il caso della necropoli del bronzo antico in località Gaudello ad Acerra (NA), in: Dankers, J., Cavazzuti, C. and Cattani, M. (Eds), *Facies e Culture Nell'età Del Bronzo Italiana?* Brepols: Artes Institut historique belge de Rome), XI. Turnhout: 37–52.

Manem, S. (2020), Modeling the Evolution of Ceramic Traditions Through a Phylogenetic Analysis of the Chaînes Opératoires: The European Bronze Age as a Case Study. *Journal of Archaeological Method and Theory*, 27: 992–1039.

Manfredini, A. (2002), *Le Dune, Il Lago, Il Mare. Una Comunità Di Villaggio Dell'età Delrame a Maccarese*. Firenze: Istituto Italiano di Preistoria e Protostoria.

Manfredini, A., Conati Barbaro, C., Lemorini, C. and Muntoni, I. M. (2003), Il Laboratorio Del Museo Delle Origini Dell'Università "La Sapienza" Di Roma: Didattica e Ricerca in Alcuni Esempi Di Archeologia Sperimentale, in: Bellintani, P. and Moser, L. (Eds.), *Archeologie sperimentali. Metodologie ed esperienze fra verifica, riproduzione, comunicazione e simulazione*. Trento: Provincia autonoma di Trento, pp. 241–251.

Manfredini, A., Carboni, G., Conati Barbaro, C., Silvestrini, M., Fiorentino, G. and Corridi, C. (2005), La Frequentazione Eneolitica Di Maddalena Di Muccia (Macerata), in: *Atti della XXXVIII Riunione Scientifica dell'Istituto Italiano di Preistoria e Protostoria - Preistoria e Protostoria delle Marche (Portonovo, 1-5 ottobre 2003)* Firenze: Istituto Italiano di Preistoria e Protostoria, pp. 433-444.

Manfredini, A., Fugazzola Delpino, M., Sarti, L., Silvestrini, M., Martini, F., Conati Barbaro, C. and Muntoni, I. (2009), Adriatico e Tirreno a Confronto: Analisi Dell'occupazione Territoriale Tra Il Neolitico Finale e l'età Del Rame in Alcune Aree Campione Dell'Italia Centrale. *Rivista di scienze preistoriche*, (59): 115–180.

Maniatis, Y. (2002), Archaeometry in the Third Millennium: An Integrated Tool for the Decoding, Preservation and Dissemination of the Cultural Heritage, in: *Archaeometry in Europe in the Third Millenium, (Roma, 29-30 Marzo 2001)*. Roma: Accademia Nazionale Dei Lincei, pp. 61–86.

Maniatis, Y. and Tite, M. S. (1981), Technological Examination of Neolithic-Bronze Age Pottery from Central and Southeast Europe and from the Near East. *Journal of Archaeological Science*, 8(1): 59–76.

Mannoni, T. (1994), *Archeometria - Geoarcheologia Dei Manufatti, Venticinque Anni Di Archeologia Globale 5*. Genova: All'Insegna del Giglio.

Marciniak, A. (2011), The Secondary Products Revolution: Empirical Evidence and Its Current Zooarchaeological Critique. *Journal of World Prehistory*, 24(2): 117–130.

Mariani, E., Peco, G. and Storti, C. (1956), Osservazioni Tecnologiche Sulla Ceramica Della Lagozza. *Sibrium*, III: 143–157.

Maritan, L. (2004), Archaeometric Study of Etruscan-Padan Type Pottery from the Veneto Region: Petrographic, Mineralogical and Geochemical-Physical Characterisation. *European Journal of Mineralogy*, 16(2): 297–307.

Maritan, L. (2020), Ceramic Abandonment. How to Recognise Post-Depositional Transformations. *Archaeological and Anthropological Sciences*, 12(8).

Maritan, L., Nodari, L., Mazzoli, C., Milano, A. and Russo, U. (2006), Influence of Firing Conditions on Ceramic Products: Experimental Study on Clay Rich in Organic Matter. *Applied Clay Science*, 31(1–2): 1–15.

Martineau, R. (2005), Identification of the" Beater and Anvil" Technique in Neolithic Contexts: Experimental Approach, , in: Livingstone-Smith, A., Bosquet, D., and Martineau, R. (Eds.), *Pottery Manufacturing Processes: Reconstitution and Interpretation: Actes Du XIVème Congrès UISPP, Université de Liège, Belgique, 2-8 Septembre 2001 (British Archaeological Reports: International Series 1329)*. Oxford: Archaeopress.

Martini, F., Pallecchi, P. and Sarti, L. (1996), *La Ceramica Preistorica in Toscana. Artigiani e Materie Prime Dal Neolitico All'Età Del Bronzo*. Montelupo Fiorentino: Garlatti e Razzai.

Martinón-Torres, M. and Rehren, T., (2014), Technical Ceramics, in: Roberts, B. W. and Thornton, C. P. (Eds.), *Archaeometallurgy in Global Perspective: Methods and Syntheses*. New York: Springer, pp. 107–131.

Marton, T., Kreiter, A., Füzesi, A., *et al.* (2020), Transforming Traditions of Material Culture. Spatial and Temporal Patterns in Pottery Style, Production and Use During the Second Half of the 6th Millennium Cal BC in South-Eastern Transdanubia and Beyond. *Hungarian Archaeology*, 9(1): 1–11.

Marzocchella, A. (1980), Le Tombe Eneolitiche Di Napoli Materdei. *Rivista di Scienze Preistoriche*, (35): 147–163.

Marzocchella, A. (1998), Tutela Archeologica e Preistoria Nella Pianura Campana, in: Guzzo, P. and Peroni, R. (Eds.), *Archeologia e Vulcanologia in Campania, Napoli*. Napoli: Arte Tipografica, pp. 97–133.

Matson, F. R. (1965), *Ceramics and Man*. Chicago: Viking Fund publications in anthropology.

Matson, F. R. (1995), Ceramic Ecology. *American Journal of Archaeology*, 99: 108– 111.

Mauss, M. (1947), *Manuel d'ethnographie*. Paris: Payot.

Mayor, A. (2010), Ceramic Traditions and Ethnicity in the Niger Bend, West Africa. *Ethnoarchaeology*, 2: 5–48.

Mazzieri, P. and Bernabo Brea, M. (2012), Stilemi Decorativi e Significati Simbolici Nella Decorazione Vascolare VBQ. *Preistoria Alpina*, 46(1): 195–202.

Mesoudi, A. (2016), Cultural Evolution: A Review of Theory, Findings and Controversies. *Evolutionary Biology*, 43(4): 481–497.

Mesoudi, A. and O'Brien., J.M. (2008), The Learning and Transmission of Hierarchical Cultural Recipes. *Biological Theory*, 3: 63–72.

Mezzena, F. (1997), La Valle d'Aosta Nel Neolitico e Nell'Eneolitico, in: *Atti della XXXI Riunuone Scientifica dell'Istituto Italiano di Preistoria e Protostoria - La Valle d'Aosta nel quadro della preistoria e protostoria dell'arco alpino occidentale (Courmayeur 2-5 giugno 1994)*. Firenze: Istituto Italiano di Preistoria e Protostoria, pp. 17–138.

Mezzena, F. (1998), *Dei Di Pietra. La Grande Statuaria Antropomorfa Nell'Europa Del III Millennio a. C. Museo Archaeologico Di Aosta. Regione Autonoma Valle d'Aosta*. Milano: Skira editore.

Michelaki, K., Braun, G. V. and Hancock, R. G. V. 2015. Local Clay Sources as Histories of Human-Landscape Interactions: a Ceramic Taskscape Perspective. *Journal of Archaeological Method and Theory*, 22: 783–827.

Middleton, A.P. and Freestone, I. C. (1991), *Recent Developments in Ceramic Petrology*. London: British Museum Research Laboratory.

Miller, D. (1994), Artefacts and the Meaning of Things, in: Ingold, T. (Ed.), *Companion Encyclopedia of Anthropology*. London: Routledge, pp. 396–419.

Miller, D. and Tilley, C. (1984), *Ideology, Power and Prehistory*. Cambridge: Cambridge University Press.

Millson, D. (2016), Breaking Boundaries Past and Present: The Development of Neolithic and Early Bronze Age Pottery in the Tyne–Forth Area within a Western European Context, in: Crellin, R., Fowler, C., and Tipping, R. (Eds.), *Prehistory without Borders: The prehistoric archaeology of the Tyne–Forth region*. Oxford: Oxbow Books, pp. 95–111.

Miloglav, I. (2020), Drills and Holes – Pottery Repairing as Evidence of the Social Meaning of an Object. *Quaternary International*, 569–570: 120–127.

Mittnik, A., Cavazzuti, C., Coppa, A., *et al.* (2022), The Transformation Of The Genomic Landscape In Copper And Bronze Age Campania, conference presentation at the *28th EAA Annual Meeting in Budapest, Hungary, 31 August - 3 September 2022*.

Modesto, R., Muntoni, I. M. and Eramo, G. (2021), Provenienza E Tecnologia Delle Ceramiche Dell'età Del Bronzo Di Trinitapoli (Bt): Prima Ipotesi Sulle Dinamiche Sociali Di Frequentazione Degli Ipogei, in: *I convegno Beni Culturali In Puglia Dialoghi multidisciplinari per la ricerca, la tutela e la valorizzazione. Bari, 16-17 settembre 2020*, pp. 149–156.

Moffa, C. (2007), Materie Prime, Tecnologie e Impiego Degli Impasti Di Fango in Contesti Pre-Protostorici Della Penisola Italiana - Esempi Archeologici, Confronti Etnografici, Analisi Archeometriche, in: *Materiali Argillosi Non Vascolari: un'Occasione in più per l'Archeologia – Atti della 9a Giornata di Archeometria della Ceramica (Pordenone 18-19 aprile 2005)*. Pordenone: Lithostampa, pp. 19–26.

Molera, J., Pradell, T. and Vendrell-Saz, M. (1998), The Colours of Ca-Rich Ceramic Pastes: Origin and Characterization. *Applied Clay Science*, 13(3): 187–202.

Molina González, F. Cámara Serrano, J. A. (2010), Los Millares y Su Dominio Sobre El Valle Del Andarax. *PH: Boletín del Instituto Andaluz del Patrimonio Histórico*, 73: 60–65.

Montana, G. (2020), Ceramic Raw Materials: How to Recognize Them and Locate the Supply Basins—Mineralogy, Petrography. *Archaeological and Anthropological Sciences*, 12(8): 175.

Montelius, O. (1908), The Chronology of the British Bronze Age. *Archaeologia*, 67: 97–162.

Moore, D.M. and Reynolds, R.C. (1997), *X-Ray Diffraction and the Identification and Analysis of Clay Minerals, 2nd Ed*. Oxford: Oxford University Press.

Müller, J. (2015), Eight Million Neolithic Europeans: Social Demography and Social Archaeology On The Scope Of Change – From The Near East To Scandinavia, in: Kristiansen, K., Šmejda, L. and Turek, J. (Eds.), *Paradigm Found: Archaeological Theory – Present, Past and Future. Essays in Honour of Evžen Neustupný*, pp. 200–214.

Müller, J., Arponen, V. P. J., Hofmann, R. and Ohlrau, R. (2015), The Appearance of Social Inequalities: Cases of Neolithic and Chalcolithic Societies. *Origini*, 2(38): 65–85.

Muntoni, I. M. (2002), Le Analisi Archeometriche Di Ceramiche Neolitiche in Italia: Storia Degli Studi, Strategie Di Campionamento, Tecniche Analitiche e Obiettivi Delle Ricerche. *Origini*, XXIV: 165–234.

Muntoni, I. M. (2003), *Modellare l'argilla. Vasai Del Neolitico Antico e Medio Delle Murge Pugliesi*. Firenze: Istituto Italiano di Preistoria e Protostoria.

Muntoni, I. M. (2004), Metodologie e Obiettivi Delle Ricerche Negli Studi Archeometrici Delle Ceramiche Neolitiche in Italia, in: Berti, F., Fabbri, B., Gualtieri, S., and Guarnieri, C. (Eds.), *Metodologia di ricerca e obiettivi degli studi: lo stato dell'arte - Atti della VI Giornata di Archeometria della Ceramica*. Roma: CNR - Consiglio Nazionale Ricerche, pp. 9–16.

Muntoni, I. M., Aurino, P., Moretti, M., Eramo, G. and Laviano, R. (2015), The Neolithic Site at the Temple of Ceres at Paestum: Archaeometric Analyses of the Serra d'Alto Ceramics, in: *Metrology. 1st International Conference on Metrology for Archaeology Benevento, Italy, October 22-23, 2015,* pp. 131–134.

Muntoni, I. M, Torre, M. and Eramo, G. (2018), Setting the Technological Patterns in the Neolithic Pottery Production of Central Apulia, in: *4th International Conference in Metrology for Archaeology, 24- 25 Ottobre, Cassino (FR)*, pp. 131-134.

Murillo-Barroso, Leonardo García Sanjuán Mercedes (2013), Social Complexity in Copper Age Southern Iberia (ca. 3200–2200 Cal B.C.) Reviewing the 'State' Hypothesis at Valencina de La Concepción (Seville, Spain), in: Cruz Berrocal, M., García Sanjuán, L., and Gilman A., *The Prehistory of Iberia: Debating Early Social Stratification and the State*. New York: Routledge, pp. 119–140.

Nava, M. L., Giampaola, D., Laforgia, E. and Boenzi, G. (2007), Tra Il Clanis e Il Sebeto: Nuovi Dati Sull'occupazione Della Piana Campana Tra Il Neolitico e l'età Del Bronzo, in: *Atti della XL Riunione Scientifica dell'Istituto Italiano di Preistoria e Protostoria - Strategie di insediamento fra Lazio meridionale e alla Campania centro-settentrionale in età preistorica e protostorica (Roma, 30 novembre-3 dicembre 2005)*. Firenze: Istituto Italiano di Preistoria e Protostoria, pp. 101–126.

Needham, S. (2005), Transforming Beaker Culture in North-West Europe: Processes of Fusion and Fission. *Proceedings of the Prehistoric Society*, 71: 171–217.

Neff, H., Bishop, R. L. and Sayre, E. V. (1988), A Simulation Approach to the Problem of Tempering in Compositional Studies of Archaeological Ceramics. *Journal of Archaeological Science*, 15(2): 159–172.

Negroni Catacchio, N. (2011), Rituali Funerari e Aspetti Simbolici Della 'cultura' Di Rinaldone. *Atti della XLIII Riunione Scientifica - L'età del Rame in Italia (Bologna, 26-29 novembre 2008)*. Firenze: Istituto Italiano di Preistoria e Protostoria, pp. 289–296.

Negroni Catacchio, N. and Miari, M. (1999), La Facies Di Rinaldone, in: Cocchi Genick, D. (Ed.), *Criteri di nomenclatura e di terminologia inerente alle forme vascolari del Neolitico/Eneolitico e del Bronzo/Ferro. Atti del Congresso di Lido di Camaiore, 26-29 marzo 1998. Volume I.* Firenze: Octavo, pp. 189–197.

Neupert, M. A. (2007), Contingency Theory and the Organizational Behavior of Traditional Pottery Production, 138–162, in: Skibo, J. M., Graves, M. W., and Stark, M. T. (Eds.), *Archaeological Anthropology: Perspectives on Method and Theory*. Tuscon: University of Arizona Press.

Nicklin, K. (1971), Stability and Innovation in Pottery Manufacture. *World archaeology*, 3: 16–48.

Nicolis, F. and Mottes, E. (1998), *Simbolo Ed Enigma. Il Bicchiere Campaniforme e l'Italia Nella Preistoria Europea Dell III Millennio a.C.* Trento: Provincia autonoma di Trento.

Nicosia, C., Necco, A. and Vanzetti A. (2007), Le Arature Preistoriche Di Gricignano / US Navy (Caserta): Micromorfologia Del Suolo Dagli Scavi Della Soprintendenza Speciale Al Museo Nazionale Preistorico Etnografico "Luigi Pigorini ", in: *Atti della XL Riunione Scientifica dell'Istituto Italiano di Preistoria e Protostoria - Strategie di insediamento fra Lazio meridionale e alla Campania centro-settentrionale in età* *preistorica e protostorica (Roma, 30 novembre-3 dicembre 2005)*. Firenze: Istituto Italiano di Preistoria e Protostoria, pp. 574–578.

Nilsson, M. and Robinson, M. (2005), Remains Of Prehistoric Habitation Beneath Pompeii V 1,13. *Opuscula Romana* 30: 97-103.

Nodari, L., Maritan, L., Mazzoli, C. and Russo, U. (2004), Sandwich Structures in the Etruscan-Padan Type Pottery. *Applied Clay Science*, 27(1–2): 119–128.

Nodari, L., Marcuz, E., Maritan, L., Mazzoli, C. and Russo, U. (2007), Hematite Nucleation and Growth in the Firing of Carbonate-Rich Clay for Pottery Production. *Journal of the European Ceramic Society*, 27(16): 4665–4673.

O'Brien, M. J., Holland, T. J., Hoard, R. J. and Fox, G. L. (1994), Evolutionary Implications of Design and Performance Characteristics of Prehistoric Pottery. *Journal of Archaeological Method and Theory*, 3(1): 259–304.

Olalde, I., Brace, S., Allentoft, M. E., *et al.* (2018), The Beaker Phenomenon and the Genomic Transformation of Northwest Europe. *Nature*, 555(7695): 190–196.

Onorato, G. O. (1960), *La Ricerca Archeologica in Irpinia*. Avellino: Amministrazione provinciale di Avellino.

Orfanou, V., Amicone, S., Sava, V., O'Neill, B., Brown, L. E. F., Bruyère, C. and Molloy, B. P. C. (2022), Forging a New World Order? Interdisciplinary Perspectives on the Management of Metalworking and Ideological Change in the Late Bronze Age Carpathian Basin. J*ournal of Archaeological Method and Theory*.

Orsi, G., Di Vito, M. A., Selva, J. and Marzocchi, W.(2009), Long-Term Forecast of Eruption Style and Size at Campi Flegrei Caldera (Italy). *Earth and Planetary Science Letters*, 287(1–2): 265–276.

Orton, C. and Hughes, M. (2013), *Pottery in Archaeology, Second Edition*. Cambridge: Cambridge University Press.

Pacciarelli, M. (2011), L'eneolitico della Calabria tirrenica: nuovi dati sull'articolazione cronoculturale. *Origini*, XXXIII(V): 249–302.

Pacciarelli, M. and Talamo, P. (2011), Sull'articolazione Dell'età Del Rame Nell'Italia Meridionale Tirrenica, in: *Atti della XLIII Riunione Scientifica - L'età del Rame in Italia (Bologna, 26-29 novembre 2008), - L'età del Rame in Italia (Bologna, 26-29 novembre 2008),* vol. 1. Firenze: Istituto Italiano di Preistoria e Protostoria, pp. 87–94.

Palermo Rossetti, A. and Talamo, P. (2011), Torre Le Nocelle (AV) - Loc . Felette, Scavi 2007: Primi Dati Sulla Necropoli Di Tipo Laterza, in: *Atti della XLIII Riunione Scientifica dell'Istituto Italiano di Preistoria e Protostoria - L'età del Rame in Italia (Bologna, 26-29 novembre 2008)*. Firenze: Istituto Italiano di Preistoria e Protostoria, pp. 757–760.

Palmisano, A., Bevan, A., Kabelindde, A., Roberts, N. and Shennan, S. (2021), Long-Term Demographic Trends in Prehistoric Italy: Climate Impacts and Regionalised Socio-Ecological Trajectories. *Journal of World Prehistory* 34: 381–432

Papac, L., Ernée, M., Dobeš, M., *et al.* (2021), Dynamic Changes in Genomic and Social Structures in Third Millennium BCE Central Europe. *Science Advances*, 7(35).

Papageorgiou, I. (2020), Ceramic Investigation: How to Perform Statistical Analyses. *Archaeological and Anthropological Sciences*, 12(9).

Passariello, I., Talamo, P., D'Onofrio, A., Barta, P., Lubritto, C. and Terrasi, F. (2010), Contribution of Radiocarbon Dating to the Chronology of Eneolithic in Campania (Italy). *Geochronometria*, 35(1): 25–33.

Passariello, I., Marzioli, F., Capano, M., D'Onofrio, A. and Terrasi, F. (2020), Le Datazioni Assolute Dell'eruzione, in: Livadie, C. A. and Vecchio, G. (Eds.), *Nola Croce del Papa. Un villaggio sepolto dall'eruzione vesuviana delle Pomici di Avellino*. Napoli: Centre Jean Bérard, pp. 63–69.

Peacock, D. P. (1981), Archaeology, Ethnology and Ceramic Production, in: Howard, H. and Morris, E. B. (Eds.), *Production and Distribution: A Ceramic Viewpoint* (BAR International Series 120). Oxford: Archaeopress, pp. 187–194.

Pearce, M. (2015), The Spread of Early Copper Mining and Metallurgy in Europe: An Assessment of the Diffusionist Model, in: Hauptmann, A., Modarressi-Tehrani, D., and Prange, M. (Eds.), *Archaeometallurgy in Europe III: Proceedings of the 3rd International Conference. Deutsches Bergbau-Museum Bochum, June 29 – July 1, 2011 (Der Anschnitt 26).* Bochum: Deutsches Bergbau-Museum, pp. 45–54.

Pearce, M. (2019), The 'Copper Age'—A History of the Concept. *Journal of World Prehistory*, 32(3): 229–250.

Peccerillo, A. (2005), *Plio-Quaternary Volcanism in Italy: Petrology, Geochemistry, Geodynamics*. Heidelberg: Springer Berlin.

Peinetti, A. (2014), Terra Cruda e Terra Cotta. Architettura Domestica e Attività Artigianali, in Venturino Gambari, M. (Ed), *La memoria del passato. Castello di Annone tra archeologia e storia*. Alessandria: LineLab, pp. 275–319.

Pellegrino, C. and Rossi, A. (2011), *Pontecagnano I. 1. Città e Campagna Nell'Agro Picentino (Gli Scavi Dell'autostrada 2001-2006)*. Fisciano: Dipartimento di Scienze del Patrimonio Culturale. Università di Salerno.

Pellegrino, C. and Serritella, A. (2013), Fratte e Pontecagnano: Produzione e Circolazione Di Ceramiche Nel Golfo Di Salerno Tra Ine IV e III Sec. a.C., in: Olcese, G. (Ed.), *Ricerche archeologiche, archeometriche e informatiche per la ricostruzione dell'economia e dei commerci nel bacino occidentale del Mediterraneo (metà IV sec. a.C. - I sec. d.C.)*. Roma: Quasar, pp. 209–220.

Peroni, R. (1956), Per Una Distinzione in Fasi Delle Necropoli Del Secondo Periodo Siculo a Pantalica. *Bullettino di Paletnologia Italiana*, LXV: 387–432.

Peroni, R. (1959), *Per Una Definizione Dell'aspetto Culturale" Subappenninico" Come Fase Cronologica a Sè Stante*. Roma: Memorie/Accademia Nazionale dei Lincei, Classe di Scienze Morali, Storiche e Filologiche, 8(IX).

Peroni, R. (1971), *L'età Del Bronzo Nella Penisola Italiana, I. L'antica Età Del Bronzo*. Firenze: Accademia toscana di scienze e lettere «La Colombaria». Serie Studi, vol. 19.

Peroni, R. (1994), *Introduzione Alla Protostoria Italiana*. Bari: Laterza.

Peroni, R. (1995), La Strategia Metodologica, in: Cocchi Genick, D., Damiani, I., Macchiarola, I., Peroni, R., and Keller, R. P. (Eds.), *Aspetti culturali della media età del bronzo nell1talia centro-meridionale*. Firenze: Octavo, pp. 7–19.

Peroni, R. (1998), Classificazione Tipologica, Seriazione Cronologica, Distribuzione Geografica. *Aquileia Nostra*, LXIX: 10–28.

Pessina, A. (1991), Nuovi Dati Sull'insediamento Neolitico Di Paterno, in: *Atti del convegno di archeologia. Il Fucino e le aree limitrofe nell'antichità. Avezzano, 10-11 novembre 1989: Archeoclub d'Italia - Sezione della Marsica*, pp. 122–133.

Pessina, A. and Tiné, V. (2008), *Archeologia Del Neolitico: L'Italia Tra VI e IIV Millennio AC*. Roma: Carocci.

Petitti, P., Bondioli, L., Conti, A. M., Macchiarelli, R., Persiani, C. and Salvadei, L. (2002), La Tomba 23 Della Necropoli Della Selvicciola (Ischia Di Castro - VT): Analisi Archeologica e Aspetti Tafonomici e Antropologici, in: *Preistoria e Protostoria in Etruria, Atti del V incontro di Studi*. Milano: Centro Studi Preistoria e Archeologia, pp. 523–537.

Pétrequin, A.-M. and Pétrequin, P. (1999), La Poterie En Nouvelle-Guinée : Savoir-Faire et Transmission Des Techniques. *Journal de la Société des océanistes*, 108(1): 71–101.

Pétrequin, P., Cassen, S., Errera, M., Klassen, L., Sheridan, A. and Pétrequin, A. M. (2012), *Jade: Grandes Haches Alpines Du Néolithique Européen, Ve et IVe Millénaires Av. J.-C. Vol. 1-2*. Besançon: Presses Universitaires de Frenche-Comté.

Pétrequin, P., Gauthier, E. and Pétrequin, A. M. (2017), *Jade: Objets-Signes et Interprétations Sociales Des Jades Alpins Dans l'Europe Néolithique. Vol. 3-4.* Besançon: Presses Universitaires de Franche-Comté.

Petrone, P. P. and Bernardi, L. (1998), Analisi Dei Processi Tafonomici e Delle Pratiche Funerarie, in: *Pontecagnano II.5 La necropoli eneolitica. L'età del Rame in Campania nei villaggi dei morti*, Napoli: Istituto Universitario Orientale - AION Quaderni di Archeologia e Storia Antica 11, pp. 201-206.

Pfaffenberger, B. (1988), Fetishised Objects and Humanised Nature: Toward an Anthropology of Technology. *Man*, 23: 236–252.

Pfaffenberger, B. (1992), Social Anthropology of Technology. *Annual Review of Anthropology*, 21: 491–516.

Piaget, J. (1972), Development and Learning, in: Stendler Lavatelli, C. and Stendler, F. (Eds.), *Reading in child behavior and development*. San Diego: Harcourt, Brace & World, pp. 38–46.

Piggott, S. (1954), *The Neolithic Cultures of the British Isles*. Cambridge: Cambridge University Press.

Ponting, M. (2004), The Scanning Electron Microscope and the Archaeologist. *Physics Education*, 39(2): 166–170.

Pool, C. A. (2000), Why a Kiln? Firing Technology in the Sierra de Los Tuxtlas, Veracruz (Mexico). *Archaeometry*, 42: 61–76.

Porter, J.W. (1964), Comment on Weaver's "Technological Analysis of Lower Mississippi Ceramic Materials". *American Antiquity*, 29: 520–521.

Prehistoric Ceramics Research Group (PCRG) (1997), The Study of Later Prehistoric Pottery: General Policies and Guidelines for Analysis and Publication. *Prehistoric Ceramics Research Group Occasional Papers*, 1–2.

Prescott, C. (2013), Recurrent Themes: Indo-Europeans in Norwegian Archaeology, in: Bergerbrant, S. and Sabatini, S. (Eds.), *Counterpoint: essays in Archaeology and Heritage Studies in Honour of Professor Kristian Kristiansen*. Oxford: British Archaeological Report, pp. 607–612.

Prieto-Martínez, M. P. (2012), Perceiving Changes in the Third Millennium BC in Europe through Pottery, in Prescott, C. and Glorstad, H., *Becoming European: The transformation of third millennium northern and western Europe.* Oxford: Oxbow Books, pp. 30–47.

Prieto-Martínez, M. P. (2019), Decorative Patterns and Stylistic Cycles of the Prehistoric Pottery of Northwestern Iberia. *Treballs d'Arqueologia*, 23(December 2019): 63.

Puglisi, S. M. (1959), *La Civiltà Appenninica*. Firenze: Sansoni.

Von Pulsky, F. (1884), *Die Kupferzeit in Ungarn*. Budapest.

Pyle, D. M., Ricketts, G. D., Margari, V., Van Andel, T. H., Sinitsyn, A. A., Praslov, N. D. and Lisitsyn, S. (2006), Wide Dispersal and Deposition of Distal Tephra during the Pleistocene 'Campanian Ignimbrite /Y5' Eruption, Italy. *Quaternary Science Reviews*, 25: 2713–2728.

Quinn, P. S. (2010), *Interpreting Silent Artefacts: Petrographic Approaches to Archaeological Ceramics*. Oxford: Archaeopress Publishing Ltd.

Quinn, P. S. (2013), *Ceramic Petrography: The Interpretation of Archaeological Pottery & Related Artefacts in Thin Section*. Oxford: Archaeopress.

Quinn, P. S. (2022), *Thin Section Petrography, Geochemistry and Scanning Electron Microscopy of Archaeological Ceramics*. Oxford: Archaeopress.

Quinn, P. S. and Benzonelli, A. (2018), XRD and Materials Analysis, in: Varela, S. L. L. (Ed.), *The Encyclopedia of Archaeological Sciences*. Hoboken: Wiley Blackwell, pp. 1–5.

Radić, D., Lugović, B. and Marjanac, L. (2008), Neapolitan Yellow Tuff (NYT) from the Pleistocene Sediments in Vela Spila on the Island of Korčula: A Valuable Chronostratigraphic Marker of the Transition from the Palaeolithic to the Mesolithic. *Opusc. archaeologica*, 31: 7–26.

Radmilli, A. M. (1963), *La Preistoria d'Italia Alla Luce Delle Ultime Scoperte*. Firenze: Istituto geografico militare.

Ratti, M. (1994), *Antenati Di Pietra*. Genova: SAGEP.

Recchia, G. (1997), L'analisi Degli Aspetti Funzionali Dei Contenitori Ceramici: Un'ipotesi Di Percorso Applicata All'età Del Bronzo Dell'Italia Meridionale. *Origini*, XXI: 207–306.

Recchia, G. (2010), Interrelazioni Culturali e Scambi Con l'area Egeo-Balcanica Durante l'età Del Bronzo, in Todisco, L. (ed.), *La Puglia centrale dall'età del Bronzo all' alto Medioevo*. Roma: Giorgio Bretschneider Editore, pp. 103-111.

Recchia, G. (2020), Reaching across the Adriatic: Northern and Western Interactions of the Cetina Phenomenon (25th –20th Centuries BC). *Godišnjak/Jahrbuch*, 49: 5–28.

Recchia, G. and Cazzella, A. (2017), Permeable Boundaries in the Late 3rd Millennium BC Central Mediterranean: Contacts and Mobility between the Balkans, Greece, Southern Italy and Malta, in: Vlachopoulos, A., Lolos, Y., Laffineur, R., and Fotidias, M. (Eds.), *Hesperos - The Aegean Seen from the West, Proceedings of the 16th International Aegean Conference, Aegaeum 41*. Leuven: Peeters, pp. 93–103.

Reedy, C. L. (2008), *Thin-Section Petrography of Stone and Ceramic Cultural Materials*. London: Archetype.

Renfrew, C. (1971), Sitagroi, Radiocarbon and the Prehistory of South-East Europe. *Antiquity*, XLV: 275 – 282.

Renfrew, C. (1973), *The Explanation of Culture Change*. London: Duckworth.

Renfrew, R. (1986), Varna and the Emergence of Wealth in Prehistoric Europe, in: Appadurai, A. (Ed.), *The Social Life of Things: Commodities in Cultural Perspective.* Cambridge and New York: Cambridge University Press, pp 141–168.

Renfrew, C. and Whitehouse, R. (1974), The Copper Age of Peninsular Italy and the Aegean. *Annual of the British School at Athens*, 69: 343–390.

Rice, P. M. (1976), Rethinking the Ware Concept. *American Antiquity*, 41(4): 538–543.

Rice, P. M. (1987), Pottery Analysis: A Sourcebook. Chicago: University of Chicago Press.

Rice, P. M. (1996), Recent Ceramic Analysis : 2. Composition, Production, and Theory. *Journal of Archaeological Research*, 4(3): 165-202.

Rice, P. M. (2015), *Pottery Analysis a Sourcebook. Second Edition*. Chicago: The University of Chicago Press.

Robb, J. (1994), Burial and Social Reproduction in the Peninsular Italian Neolithic. *Journal of Mediterranean Archaeology*, 7: 29–75.

Robb, J. (2007), *The Early Mediterranean Village*. Cambridge: Cambridge University Press.

Robb, J. (2008) Tradition and agency: human body representations in later prehistoric Europe. *World Archaeology*, 40:3, 332-353.

Robb, J. (2009), People of Stone: Stelae, Personhood, and Society in Prehistoric Europe. *Journal of Archaeological Method and Theory*, 16(3): 162–183.

Robb, J. and Michelaki, K. (2012), In Small Things Remembered: Pottery Decoration in Neolithic Southern Italy, in: Jessen, M., Johannsen, N., and Jensen, H. J. (Eds.), *Excavating the Mind: Cross-Sections Through Culture, Cognition and Materiality*. Aarhus: University of Aarhus Press, pp. 161-181.

Robb, J. and Pauketat, T. R. (2013), From Moments to Millennia: Theorizing Scale and Change in Human History, in: Robb, J. and Pauketat, T. R. (Ed.), *Big Histories, Human Lives: Tackling Problems of Scale in Archaeology*. Santa Fe: School of Advanced Research, pp. 3–33.

Roberts, B. W. (1998), Migration, Craft Expertise and Metallurgy, *Archaeological Review from Cambridge,* 23: 27-45.

Roberts, B. W. (2008), The Bronze Age, in: Atkins, L., Atkins, R., and Leitch, V. (Eds.), *The Handbook of British Archaeology*. Edinburgh: Constable and Robinson, pp. 60–91.

Roberts, B. W. and Vander Linden, M. (2011), Investigating Archaeological Cultures, in: Roberts, B. W. and Vander Linden, M. (Eds), *Investigating Archaeological Cultures. Material Culture, Variability, and Transmission.* New York: Springer, pp. 1–22.

Roberts, B. W. and Frieman, C. J. (2012), Drawing Boundaries and Building Models: Investigating the Concept of the 'Chalcolithic Frontier' in Northwest Europe. *Is there a British Chalcolithic: people, place and polity in the later 3rd millennium*, (December 2014): 27–39.

Roberts, B. W. and Thornton, C. P. (2014), *Archaeometallurgy in Global Perspective: Methods and Syntheses*. New York: Springer.

Roberts, B. W., Thornton, C. P. and Pigott, V. C. (2009), Development of Metallurgy in Eurasia. *Antiquity*, 83: 1012–1022.

Ross, D. J.K. and Bustin, M. R. (2009), The Importance of Shale Composition and Pore Structure upon Gas Storage Potential of Shale Gas Reservoirs. *Marine and Petroleum Geology*, 26(6): 916–927. http://dx.doi.org/10.1016/j.marpetgeo.2008.06.004

Roux, V. (2003), A Dynamic Systems Framework for Studying Technological Change. *Journal of Archaeological Method and Theory*, 10(1): 1–30.

Roux, V. (2010), Lecture Anthropologique Des Assemblages Céramiques. Fondements et Mise En Œuvre de l'analyse Technologique. *Les Nouvelles de l'Archéologie*, 119: 4–9.

Roux, V. (2019), *Ceramics and Society*. New York: Springer.

Roux, V., Bril, B., Cauliez, J., *et al.* (2017), Persisting Technological Boundaries: Social Interactions, Cognitive Correlations and Polarization. *Journal of Anthropological Archaeology*, 48(October): 320–335.

Roux, V., Courty, M.-A., Dollfus, G. and Lovell, J. L. (2011), A Techno-Petrographic Approach for Defi Ning Cultural Phases and Communities: Explaining the Variability of Abu Hamid (Jordan Valley) Early 5th Millennium Cal BC Ceramic Assemblage, in: Lovell, J. and Rowan, Y. (Eds.), *Culture, Chronology and the Chalcolithic*. Oxford: Oxbow books, pp. 114–132.

Russo Ermolli, E. and Cheddadi, R. (1997), Climatic Reconstruction during the Middle Pleistocene: A Pollen Record from Vallo Di Diano (Southern Italy). *Geobios*, 30(6): 735–744.

Russo Ermolli, E., Di Pasquale, L. and Di Pasquale, G. (2011), Le Analisi Polliniche, in: Pellegrino, C. and Rossi, A. (Eds.), *Pontecagnano I.1. Città e campagna nell'Agro Picentino (Gli scavi dell'autostrada 2001-2006)*. Salerno: Soprintendenza per beni archeologici di Salerno, Avellino, Benevento e Caserta - Università degli Studi di Salerno Dipartimento di Scienzedel Patrimonio culturale, pp. 250–254.

Russo, F., Casciello, E., Cesarano, *et al.* (2010), *Note Illustrative Della Carta Geologica D'italia Alla Scala 1:50.000 - Salerno Foglio 467*. Roma: ISPRA, Servizio Geologico d'Italia, System Cart, LAC, SELCA.

Rye, O. (1981), *Pottery Technology: Principles and Reconstruction (Manuals Arch 4)*. Washington: Taraxacum.

Rye, O. S. (1976), Keeping Your Temper Under Control: Materials and the Manufacture of Papuan Pottery. *Archaeology and Physical Anthropology in Oceania*, 11(2): 106–137.

Salerno, A. (1993), Revisione Della Tomba Brinson: Lo Scavo. *AION. Quaderni di Archeologia e Storia dell'arte antica*, 15: 323–328.

Salerno, A. (1995), Revisione Della Tomba Brinson: I Materiali. *Origini: Preistoria e protostoria delle civiltà antiche*, XIX: 395–414.

Salerno, A. and Marino, P. (2011), La Necropoli Dell'area "Forum" Di Gricignano Di Aversa (Caserta), US Navy: Composizione e Articolazione Dei Contesti Tombali Di Facies Laterza, in: *Atti della XLIII riunione scientifica - L'età del Rame in Italia (Bologna, 26-29 novembre 2008)*. Firenze: Istituto Italiano di Preistoria e Protostoria, pp. 323–327.

Santacreu, D. A. (2014), Identifying Spathic Calcite Recipe in Archaeological Ceramics: Possibilities and Limitations. *Ceramica*, 60(355): 379–391.

Santacroce, R. (1987), Somma-Vesuvius. *Quaderni della Ricerca Scientifica*, 8(114): 1–251.

Santacroce, R., Cioni, R., Marianelli, P., *et al.* (2008), Age and Whole Rock-Glass Compositions of Proximal Pyroclastics from the Major Explosive Eruptions of Somma-Vesuvius: A Review as a Tool for Distal Tephrostratigraphy. *Journal of Volcanology and Geothermal Research*, 177(1): 1–18.

Santangelo, N. (1991), Evoluzione Stratigrafica, Geomorfologica e Neotettonica Di Alcuni Bacini Lacustri Del Confine Campano Lucano (Italia Meridionale). Università degli studi di Napoli 'Federico II', Dipartimento di Scienze della Terra, dell'Ambiente e delle Risorse, PhD thesis.

Saracino, M. (2011), Tecnologia Della Produzione Ceramica Pre- e Protostorica Lungo l'arco Alpino e Territori Limitrofi - Technology of Prend Protohistoric Ceramic Production along the Alps and Surrounding Areas. *Preistoria Alpina*, 45: 309–319.

Sarti, L. (1989), Per Una Tipologia Della Ceramica Preistorica: Appunti Sullo Studio Morfologico Dei Manufatti. *Rassegna di Archeologia*, (8): 129–145.

Sarti, L. (2005), Per Una Tipologia Della Ceramica Preistorica: Aggiornamenti e Considerazioni Su Una Metodologia Analitica. *Rivista di Scienze Preistoriche*, Askategi: 567–576.

Sassaman, K. E. and Rudolphi, W. (2001), Communities of Practice in the Early Pottery Traditions of the American Southeast. *Journal of Anthropological Research*, 57(4): 407–425.

Saupe, T., Montinaro, F., Scaggion, C., *et al.* (2021), Ancient Genomes Reveal Structural Shifts after the Arrival of Steppe-Related Ancestry in the Italian Peninsula. *Current Biology*, 31(12): 2576-2591.e12.

Savino, M. L., Fico, D., Pennetta, A. and De Benedetto, G. E. (2017), La Ceramica Dell'Età Del Bronzo. Nuove Acquisizioni Dalle Ricerche 2013, in: Larocca, F. (Ed.), *Tra Pietra e Acqua Archeologia delle Grotte di Pertosa-Auletta Studi e ricerche 2004-2016*. Pertosa: Fondazione MiDa, pp. 56-69.

Scala, S. (2021), Nuclei Sepolcrali e Rituale Funerario Nelle Prime Fasi Dell'Età Del Bronzo Nella Città Di Salerno, in: *Dialoghi sull'Archeologia della Magna Grecia e del Mediterraneo, Paestum 15-17 Settembre 2019, vol. IV.3.*. Paestum: Pandemos, 107–118.

Scandone, R., Bellucci, F., Lirer, L. and Rolandi, G. (1991), The Structure of the Campanian Plain and the Activity of the Neapolitan Volcanoes (Italy). *Journal of Volcanology and Geothermal Research*, 48: 1–31.

Schiffer, M. B. (1990), The Influence of Surface Treatment on Heating Effectiveness of Ceramic Vessels. *Journal of Archaeological Science*, 17(4): 373–381.

Schiffer, M. B. (2011), *Studying Technological Change - A Behavioural Approach*. Salt Lake City: The University of Utah Press.

Schiffer, M. B. and Skibo, J. M. (1987), Theory and Experiment in the Study of Technological Change. *Current Anthropology*, 28(5): 595–622.

Schiffer, M. B. and Skibo, J. M. (1997), The Explanation of Artifact Variability. *American Antiquity*, 62(1): 27–50.

Sestieri, P. C. (1946), La Necropoli Preistorica Di Paestum. *Rivista di scienze preistoriche*, I(4): 245–266.

Sestieri, P. C. (1948), Primi Risultati Dello Scavo Della Necropoli Preistorica Di Paestum. *Rendiconti Accademia di Archeologia, Lettere e Belle Arti di Napoli*, 23: 251–308.

Sestieri, P. C. (1951), Primi Risultati Dello Scavo Della Necropoli Preistorica Di Paestum. *Rendiconti Accademia di Archeologia, Lettere e Belle Arti di Napoli*, 23: 251–308.

Sgrosso, I., Bonardi, G., Amore, O., *et al.* (2010), *Note Illustrative Della Carta Geologica d'Italia Alla Scala 1:50.000— Foglio 504 Sala Consilina*. Roma: ISPRA, Servizio Geologico d'Italia, System Cart, LAC, SELCA.

Shanks, M. and Tilley, C. (1987), *Social Theory and Archaeology.* Albuquerque: University of New Mexico Press.

Shanks, M. and Tilley, C. (1992), *Reconstructing Archaeology: Theory and Practice*. London: Routledge.

Shennan, S. J. (1982), Ideology, Change and the European Bronze Age, in: Hodder, I. (Ed.), *Symbolic and structural archaeology*. Cambridge: Cambridge University Press, pp. 155–161.

Shennan, S. J. (2008), Evolution in Archaeology. *Annual Review of Anthropology*, 37: 75–91.

Shennan, S. J. (2013), Demographic Continuities and Discontinuities in Neolithic Europe: Evidence, Methods and Implications. *Journal of Archaeological Method and Theory*, 20(2): 300–311.

Shennan, S. and Sear, R. (2021), Archaeology, Demography and Life History Theory Together Can Help Us Explain Past and Present Population Patterns: Archaeology, Demography and Life History. *Philosophical Transactions of the Royal Society B: Biological Sciences*, 376(1816).

Shennan, S. J. and Wilkinson, J. R. (2001), Ceramic Style Change and Neutral Evolution: A Case Study from Neolithic Europe. *American Antiquity* 66(4): 577–593.

Shepard, A. O. (1956), *Ceramics for the Archaeologist*. Washington D.C.: Carnegie Institution Of Washington.

Shepard, A. O. (1964), Temper Identification: "Technological Sherd- Splitting" or an Unanswered Challenge. *American Antiquity*, 29: 518–520.

Sherratt, A. (1981), Plough and Pastoralism: Aspects of the Secondary Products Revolution, in: Hodder, I., Isaac, G., and Hammond, N. (Eds.), *Pattern of the past: Studies in honour of David Clarke*. Cambridge: Cambridge University Press, pp. 261–305.

Sherratt, A. (1982), The Development of Neolithic and Copper Age Settlement in the Great Hungarian Plain. *Oxford Journal of Archaeology*, 1(3): 287–316.

Sherratt, A. (2006), La Traction Animale et La Transformation de l'Europe Néolitique, in: Pétrequin, P., Arbogast, R.-M., Pétrequin, A.-M., van Willingen, S., and Bailly, M. (Eds.), *Premiers chariots, premiers araires. La diffusion de la traction animale en Europe pendant les IVe et IIIe millénaire avant notre ére*. Paris: CNRS éditions, pp. 329–360.

Shishlina, N. I., Van Der Plicht, J. and Zazovskaya, E. P. (2011), Radiocarbon Dating of the Bronze Age Bone Pins from Eurasian Steppe. *Geochronometria*, 38(2): 107–115.

Shoval, S., Gaft, M., Beck, P. and Kirsh, Y. (1993), Thermal Behaviour of Limestone and Monocrystalline Calcite Tempers during Firing and Their Use in Ancient Vessels. *Journal of Thermal Analysis*, 40(1): 263–273.

Shoval, S., Beck, P. and Yadin, E. (2006), The Ceramic Technology Used in the Manufacture of Iron Age Pottery from Galilee. *Geological Society Special Publication*, 257: 101–117.

Sillar, B. (1997), Reputable Pots and Disreputable Potters: Individual and Community Choices in Present-Day Pottery Productions and Exchanges in the Andes, in: Cumberpatch, C. G. and Blinkhorn, P. W. (Eds.), *Not so much a Pot, more a Way of Life*. Oxford: Oxbow Books, pp. 1–20.

Sillar, B. and Tite, M. S. (2000), The Challenge of 'Technological Choices' for Materials Science Approaches in Archaeology. *Archaeometry*, 42(1): 2–20.

Silvestrini, M. and Pignocchi, Gaia (1998), Gli Insediamenti Preistorici Di Fontenoce Di Recanati (Macerata) Ed Aspetti Del Neolitico Ed Eneolitico Marchigiano. *Origini*, XXII: 135–194.

Silvestrini, M. and Pignocchi, G. (2000), Recenti Dati Dalla Necropoli Eneolitica Di Fontenoce Di Recanati, in: Silvestrini, M. (Ed.), *Recenti acquisizioni, problemi e prospettive della 133 ricerca sull'Eneolitico dell'Italia centrale, Atti dell'Incontro di Studio, Arcevia, 14-15 maggio 1999.* Ancona: Regione Marche, pp. 39–62.

Skeates, R. (1993), Early Metal-Use in the Central Mediterranean Region. *Accordia Research Papers*, 4: 5–48.

Skeates, R. (1995), Animate Objects: A Biography of Prehistoric 'Axe-Amulets' in the Central Mediterranean Region. *Proceedings of the Prehistoric Society*, 61: 279– 301.

Skeates, R. (2016) Fetishism and visual culture in Later Neolithic Southeast Italy. *Time and mind*, 9(4). pp. 335-352.

Skibo, J. M. (1992), *Pottery Function. A Use-Alteration Perspective*. Berlin: Springer.

Skibo, J. M. and Schiffer, M. B. (1987), The Effects of Water on Processes of Ceramic Abrasion. *Journal of Archaeological Science*, 14: 83–96.

Skibo, J. M., Schiffer, M. B. and Kowalski, N. (1989), Ceramic Style Analysis in Archaeology and Ethnoarchaeology: Bridging the Analytical Gap. *Journal of Anthropological Archaeology*, 8: 388–409.

Smith, V. C., Isaia, R. and Pearce, N. J.G. (2011), Tephrostratigraphy and Glass Compositions of Post-15 Kyr Campi Flegrei Eruptions: Implications for Eruption History and Chronostratigraphic Markers. *Quaternary Science Reviews*, 30(25–26): 3638–3660.

Sofaer, J. (2017), Potter's Clay, in: Bender Jørgensen, L., Sofaer, J., and Stig Sørensen, M. (Eds.), *Creativity in the Bronze Age: Understanding Innovation in Pottery, Textile, and Metalwork Production*. Cambridge: Cambridge University Press, pp. 51-56.

Spataro, M. (2002), *The First Farming Communities of the Adriatic: Pottery Production and Circulation in the Early and Middle Neolithic*. Trieste: Società per la Preistoria e Protostoria della Regione Friuli-Venezia Giulia (Quaderno), Edizioni Svevo, Volume 9.

Spataro, M. (2006), Pottery Typology versus Technological Choices: An Early Neolithic Case Study from Banat (Romania). *Analele Banatului XIV 2006 Vol. 1*, XIV: 63–78.

Spielmann, K. A. (2002), Craft Specialization, and the Ritual Mode of Production in Small-Scale Societies. *American Anthropologist*, 104(1): 195–207.

Stark, M. T. (1998), Technical Choices and Social Boundaries in Material Culture Patterning: An Introduction, in: Stark, M. T. (Ed.), *The Archaeology of Social Boundaries*. Washington, DC: Smithsonian Institution Press, pp. 1–11.

Stark, M. T., Bowser, B. J and Horne, L. (2008), Why Breaking Down Boundaries Matters for Archaeological Research on Learning and Cultural Transmission, in: Stark, M. T., Bowser, B. J., and Horne, L. (Eds.), *Cultural Transmission and Material Culture*. Tucson: University of Arizona Press, pp. 1–16.

Steponaitis, V. P. (1984), Technological Studies of Prehistoric Pottery of Alabama: Physical Properties and Vessel Function, in: Van der Leeuw, S. and Pritchard, A. C. (Eds.), *The many dimensión of pottery: ceramics in archaeology and anthropology*. Amsterdam: Universiteit van Amsterdam, pp. 79–122.

Stig Sørensen, M. L. (2015), 'Paradigm Lost' – on the State of Typology Within Archaeological Theory, in: Kristiansen K., Šmejda L., Turek J. and Neustupný E. (Eds.) P*aradigm found: archaeological theory present past and future: essays in honour of Evžen Neustupný*. Oxford: Oxbow Books, pp. 84–94.

Stilborg, O. (2003), Pottery as a Source of Structural Information: Internal Structure and External Contacts of Uppakra 0-400 AD. *Acta Archaeologica Lundensia*, 40: 117–137.

Stoltman, J. B. (2001). The role of petrography in the study of archaeological ceramics, in: Goldberg, P., Holliday, V. T., & Ferring, C. R. (Eds.), *Earth sciences and archaeology*. New York: Kluwer Academic/Plenum, pp. 297-326.

Strahm, C. (1979), Les Épingles de Parure En Os Du Néolithique Final, in: Camps-Fabrer, H. (Ed.), *L'industrie en os et bois de cervidé durant le néolithique et l'âge des métaux*. Paris: CNRS, pp. 44–66.

Sullivan, A. P. (1989), The Technology of Ceramic Reuse: Formation Processes and Archaeological Evidence. *World Archaeology*, 21: 101–114.

Talamo, P. (2004), *Taurasi. Un Nuovo Aspetto Dell'Eneolitico in Campania. Guida Alla Mostra*. Taurasi: Comune di Taurasi, Ministero per i Beni e le Attività Culturali.

Talamo, P. (2008a), Le Aree Interne Della Campania Centro-Settentrionale Durante Le Fasi Evolute Dell´eneolitico: Osservazioni Sulle Dinamiche Culturali. *Origini: Preistoria e protostoria delle civiltà antiche*, (30): 187–220.

Talamo, P. (2008b), Dinamiche Culturali Nelle Aree Interne Della Campania Centro-Settentrionale Durante Le Prime Fasi Dell'Eneolitico. *Rivista di scienze preistoriche,* 58(1): 125–164.

Talamo, P. (2013), Sequenza Culturale Ed Eventi Vulcanici in Campania Dal Neolitico Alla Fine Dell'età Del Bronzo. *Miscellanea INGV,* 8: 100–104.

Talamo, P. Passariello, I., Lubritto, C. and Terrasi, F. (2011), Evoluzione Culturale in Campania: Indagine Cronologica Sistematica Tramite Datazioni Radiocarboniche, in: *Atti della XLIII Riunione Scientifica* *dell'Istituto Italiano di Preistoria e Protostoria - L'età del Rame in Italia (Bologna, 26-29 novembre 2008)*. Firenze: Istituto Italiano di Preistoria e Protostoria, pp. 39-48.

Tegtmeier, U. (1993), Neolitische Und Bronzezeitliche Pflugspuren in Norddeutschland Und Den Niederlanden, in: *Archäologische Berichte*. Bonn: Holos.

Thér, R. (2020), Ceramic Technology. How to Reconstruct and Describe Pottery-Forming Practices. *Archaeological and Anthropological Sciences*, 12(8).

Thornton, C. P. and Roberts, B. W. (2009), Introduction: The Beginnings of Metallurgy in Global Perspective. *Journal of World Prehistory*, 22(3): 181–184.

Thorpe, I. and Richards, C. (1984), The Decline of Ritual Authority and the Introduction of Beakers into Britain, in: R. Bradley and J. Gardiner. (Eds.), *Neolithic studies*. Oxford: British Archaeological Reports, pp. 57-78.

Tilley, C. (2006), Identity, Place, Landscape and Heritage. *Journal of Material Culture*, 11(1/2): 7–32.

Tinè, V. (2009), *Favella. Un Villaggio Del Neolitico Antico Nella Sibaritide*. Firenze: Ist. Poligrafico dello Stato.

Tite, M. S. (1969), Determination of the Firing Temperature of Ancient Ceramics By Measurement of Thermal Expansion: A Reassessment. *Archaeometry*, 11(1): 131–143.

Tite, M. S. (1992), The Impact of Electron Microscopy on Ceramic Studies. *The British Academy*, 77(February 1991): 111–131.

Tite, M. S. (2008), Ceramic Production, Provenance and Use—a Review. *Archaeometry*, 50(2): 216–231.

Tite, M.S. and Kilikoglou, V. (2002), Do We Understand Cooking Pots and Is There an Ideal Cooking Pot?, in: Hein, A. and Maniatis, Y. (Eds.), *Modern Trends in Scientific Studies on Ancient Ceramics*, *(British Archaeological Reports International Series 1011)*. Oxford: Archaeopress, pp. 1–8.

Tite, M.S. and Maniatis, Y. (1975), Examination of Ancient Pottery Using the Scanning Electron Microscope. *Nature*, 257(Table I): 122–123.

Tite, M. S., Kilikoglou, V. and Vekinis, G. (2001), Strength, Toughness and Thermal Shock Resistance of Ancient Ceramics, and Their Influence on Technological Choice. *Archaeometry*, 43(3): 301–324.

Tocco Sciarelli, G. (2002), Il Paesaggio Antico Della Campania Meridionale, in: AA.VV., *Ambiente e paesaggio nella Magna Grecia*, Taranto: ISAMG - Istituto per la Storia e l'Archeologia della Magna Grecia, pp. 473–90.

Treherne, P. (1995) The Warrior's Beauty: The Masculine Body and Self-Identity in Bronze-Age Europe, *Journal of European Archaeology*, 3(1): 105-144.

Trigger, B. G. (2006), *A History of Archaeological Thought, 2nd Edition*. Cambridge: Cambridge University Press.

Trindade, M. J., Dias, M. I., Coroado, J. and Rocha, F. (2010), Firing Tests on Clay-Rich Raw Materials from the Algarve Basin (Southern Portugal): Study of Mineral Transformations with Temperature. *Clays and Clay Minerals*, 58(2): 188–204.

Trump, D. H. (1966), *Central and Southern Italy before Rome. Ancient Peoples and Places, Vol. 47*. Londra: Thames and Hudson.

Tunzi Sisto, A. M. (1999), *Ipogei Della Daunia: Preistoria Di Un Territorio*. Foggia: Claudio Grenzi Editore.

Tunzi Sisto, A. M., Bubba, D., Gasperi, N., *et al*. (2014), La Necropoli Eneolitica a Cremazione Di Giardinetto (Orsara Di Puglia), in: *34° Convegno nazionale sulla Preistoria - Protostoria - Storia della Daunia.* San Severo, pp. 141–164.

Tunzi Sisto, A. M. (2015), *Venti Del Neolitico. Uomini Del Rame. Preistoria Della Puglia Settentrionale*. Foggia: Grenzi editore.

Van der Leeuw, S. (1977), Towards a Study of Economics of Pottery Making, in: Beek, B. L., Brant, R. W., and van Watteringe, G. (Eds.), *Ex Horreo, Cingvla 4*. Amsterdam: Albert Egges van Giffen Instituut voor Prae-en Protohistorie, pp. 68–76.

Van der Leeuw, S. (1993), Giving the Potter a Choice Conceptual Aspects of Pottery Techniques, in: Lemonnier, P. (Ed.), *Technological Choices*. London: Routledge, pp. 238–288.

Vagnetti, L., Jones, R.. E., Levi, S. T. and Bettelli, M. (2006), Circolazione a Vasto Raggio Di Ceramiche Protostoriche: Il Caso Della Ceramica Micenea, in: Fabbri, G., Gualtieri, S., and Romito, M. (Eds.), *La ceramica in Italia quando l'Italia non c'era, Atti della 8° Giornata di Archeometria della Ceramica (Vietri sul Mare 2004)*. Bari: Edipuglia, pp. 11–22.

Vagnetti, L., Jones, R. E., Levi, S. T., Bettelli, M. and Alberti, L. (2009), Ceramiche Egee e Di Tipo Egeo Lungo i Versanti Adriatico e Ionico Della Penisola Italiana: Situazioni a Confronto, in: Borgna, E. and Càssola Guida, P. (Eds.), *From the Aegean to the Adriatic: Social Organisations, modes of exchange and interaction in Postpalatial time (12nd-11st cent. BC)*. Roma: Quasar, pp. 171–183.

van As, A. (1984), Reconstructing the Potter's Craft, in: Leeuw, S. E. van der and Pritchard, A. C. (Eds.), *The many dimensions of pottery: Ceramics in archaeology and anthropology*. Amsterdam: University of Amsterdam, pp. 129–164.

Van Vilsteren, V. (2004), El Túmulo de 'Odi': Una Tumba Neolítica Excepcionalmente Rica En Holanda, in: Díaz, J. S. (Ed.), *Campaniforme. Intercambio en la Prehistoria. Intercambio entre museos, Catalogo della mostra.* Alicante: Museo Arqueológico de Alicante, pp. 23–39.

Vander Linden, M. (2007), What Linked the Bell Beakers in Third Millennium BC Europe? *Antiquity*, 81(312): 343–352.

Vander Linden, M. (2016), Population History in Third-Millennium-BC Europe: Assessing the Contribution of Genetics. *World Archaeology*, 48: 714–728.

Vanzetti, A., Marzocchella, A. and Saccoccio, F. (2019), The Campanian Agrarian Systems of the Late Copper-Early Bronze Age (ca. 4550-3850 cal BP): A Long-Lasting Agrarian Management Tradition before the Pomici Di Avellino Eruption. *Quaternary International*, 499(September 2018): 148–160.

Vaughn, K. and Neff, H. (2004), Tracing the Clay Source of Nasca Polychrome Pottery: Results from a Preliminary Raw Material Survey. *Journal of Archaeological Science*, 31: 1577–1586.

Vekinis, G. and Kilikoglou, V. (1998), Mechanical Performance of Quartz-Tempered Ceramics: Part II, Hertzian Strength, Wear Resistance and Applications to Ancient Ceramics. *Archaeometry*, 40(2): 281–292.

Velde, B. and Druc, I. C. (1999), *Archaeological Ceramic Materials. Origin and Utilization.* Berlin: Springer.

Venturo, D., Martinelli, M. C., Mossa, A. M. and Saponetti, S. S. (2011), La Necropoli Eneolitica Di Grotta Nisco. *Atti della XLIII Riunione Scientifica dell'Istituto Italiano di Preistoria e Protostoria - L'età del Rame in Italia.* Firenze: Istituto Italiano di Preistoria e Protostoria, pp. 335–341.

Vidal, A. (2008), Cerámica y Sociedad: La Producción Alfarera Neolítica En El Sur Peninsular, in: *Actas de las I Jornadas de Jóvenes en Investigación Arqueológica: dialogando con la cultura material*. Madrid: OrJIA, pp. 163–170.

Vidale, M. (2007), *Ceramica e Archeologia*. Roma: Carocci.

Vitale, S., Ciarcia, S., Mazzoli, S. and Zaghloul, M. N. (2011), Tectonic Evolution of the 'Liguride' Accretionary Wedge in the Cilento Area, Southern Italy: A Record of Early Apennine Geodynamics. *Journal of Geodynamics*, 51(1): 25–36.

Vitale, S. and Ciarcia, S. (2013), Tectonophysics Tectono-Stratigraphic and Kinematic Evolution of the Southern Apennines / Calabria – Peloritani Terrane System (Italy). *Tectonophysics*, 583: 164–182. .

Vitale, S. and Ciarcia, S. (2018), Tectono-Stratigraphic Setting of the Campania Region (Southern Italy). *Journal of Maps*, 14(2): 9–21.

Vivent, D. and Albore Livadie, C. (2001), Contribution de La Palynologie à l'étude Des Comportements Humains En Contexte Volcanique Actif: L'exemple de l'âge Du Bronze En Campanie (Italie), in: Juvigné, E. and Raynal, J. P. (Eds.), *Tephras: chronologie, archéologie. Congrès International. Dossier de l'Archéologis, vol. 1*. Clemond Ferrand, pp. 245–254.

Voza, G. (1962), Paestum - Giacimento Preistorico Presso Il Tempio Di Cerere, in: *Mostra della preistoria e protostoria nel Salernitano*. Salerno: Lavaglia Editore, pp. 13-37.

Voza, G. (1964), Ultimi Scavi Della Necropoli Del Gaudo, in: *Atti della IX Riunione Scientifica dell'Istituto Italiano di Preistoria e Protostoria*. Firenze: Istituto Italiano di Preistoria e Protostoria, pp. 265–275.

Voza, G. (1974), Necropoli Del Gaudo, in: Bailo Modesti, G., D'Agostino, B., and Gastaldi, P. (Eds.), *Seconda mostra della Preistoria e Protostoria del Salernitano.* Salerno: Lavaglia Editore, pp. 7-24.

Voza, G. (1975), Considerazioni Sul Neolitico e Sull'Eneolitico in Campania. *Atti della XVII Riunione Scientifica dell'Istituto Italiano di Preistoria e Protostoria*. Firenze: Istituto Italiano di Preistoria e Protostoria, 51–84.

Wallaert-Pêtre, H. (1999), Manual Laterality Apprenticeship as the First Learning Rule Prescribed to Potters. Ethno-Analogy and the Reconstruction of Prehistoric Artefact Use and Production. *Urgeschichtliche Materialhefte*, 14: 185–206.

Warfe, A. (2015), A Study on the Strength and Thermal Shock Resistance of Egyptian Shale-Tempered Pottery. *Journal of Archaeological Science*, 55: 26–33.

Wenger, E. (1998), *Communities of Practice: Learning, Meaning, and Identity*. Cambridge: Cambridge University Press.

Wengrow, D. (2008), Prehistories of Commodity Branding. *Current Anthropology*, 49: 7–34.

Whitbread, I.K. (1986), The Characterisation of Argillaceous Inclusions in Ceramic Thin Sections. *Archaeometry*, 28(1): 79–88.

Whitbread, I. K. (1989), A Proposal for the Systematic Description of Thin Sections towards the Study of Ancient Ceramic Technology, in: Y. Maniatis (Ed.), *Archaeometry: proceedings of the 25th international symposium*. Amsterdam: Elsevier, pp. 127–138.

Whitbread, I. K. (1991), Image and Data Processing in Ceramic Petrology, in: Middleton, A. and Freestone, I. (Eds.), *Recent Developments in Ceramic Petrology*. *British Museum Occasional Paper*. London: British Museum Research Laboratory, pp. 369–386.

Wilkin, N. (2011), Grave-Goods, Contexts and Interpretation: Towards Regional Narratives of Early Bronze Age Scotland. *Scottish Archaeological Journal*, 33: 21–37.

Wilkin, N. (2013), *Food Vessel Pottery from Early Bronze Age Funerary Contexts in Northern England: A Typological and Contextual Study*. Diss. University of Birmingham, 2014.

Wilkin, N. and Vander Linden, M. (2015), What Was and What Would Never Be: Changing Patterns of Interaction and Archaeological Visibility across North-West Europe from 2500 to 1500 Cal BC, in: Anderson-Whymark, H., Garrow, D., and Sturt, F. (Eds.), *Continental Connections: Exploring cross-Channel relationships from the Mesolithic to the Iron Age.* Oxford: Oxbow Books, pp. 99–121.

Williams, J. L. (1980), A Petrological Examination of The Prehistoric Pottery from the Excavations in the Castello and Diana Plain of Lipari - An Interim Report, in: Bernabò Brea, L. and Cavalier, M. (Eds.), *Meligunìs Lipára, IV. L'acropoli di Lipari nella preistoria*. Palermo: Erma di Bretschnider, pp. 847–868.

Williams, J. L. (1991), The Petrographic Analysis of Capo Graziano Pottery from Filicudi and Milazzese Pottery from Panarea, in: Bernabò Brea, L. and Cavalier, M. (Eds.), *Meligunìs Lipára, VI. Filicudi - Insediamenti dell'età del Bronzo*. Palermo: Erma di Bretschnider, pp. 239–259.

Wulf, S., Kraml, M. and Keller, J. (2008), Towards a Detailed Distal Tephrostratigraphy in the Central Mediterranean : The Last 20,000 Yrs Record of Lago Grande Di Monticchio. *Journal of Volcanology and Geothermal Research*, 177(1): 118–132.

Yoffee, N. (2005), *Myths of the Archaic State. Evolution of the Earliest Cities, States and Civilization*. Cambridge: Cambridge University Press.

Zanchetta, G., Sulpizio, R., Giaccio, B., Siani, G., Paterne, M., Wulf, S. and D'Orazio, M. (2008), The Y-3 Tephra: A Last Glacial Stratigraphic Marker for the Central Mediterranean Basin. *Journal of Volcanology and Geothermal Research*, 177(1): 145–154.

Zanchetta, G., Sulpizio, R., Roberts, N., Cioni, R., Eastwood, W. J., Siani, G., Caron, B., Paterne, M. and Santacroce, R. (2011), Tephrostratigraphy, Chronology and Climatic Events of the Mediterranean Basin during the Holocene: An Overview. *Holocene,* 21(1): 33–52.

Zanchetta, G., Bini, M., Di Vito, M. A., Sulpizio, R. and Sadori, L. (2019), Tephrostratigraphy of Paleoclimatic Archives in Central Mediterranean during the Bronze Age. *Quaternary International*, 499(June 2018): 186–194.

Zubrow, E. (2014), Paradigm Lost: The Rise, Fall and Eventual Recovery of Paradigms, in: Kristiansen, K., Smejda, L., and Turek, J. (Eds.), *Paradigm Found. Archaeological Theory Past, Present and Future*. Oxford: Oxbow Books, pp. 167–176.