Archaeology in the smallest Realm

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ARCHAEOLOGY IN THE SMALLEST REALM

Micro analyses and methods for the reconstruction of Cyprus early societies

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Getting under the slip: technological and compositional studies of Red Polished ware from Early and Middle Bronze Age Cyprus

Maria Dikomitou Eliadou

Abstract

This paper provides a concise presentation of the state of the art in Red Polished ceramic analysis, i.e., the analytical study of the most prominent class of pottery in Early and Middle Bronze Age Cyprus. It discusses the mainstream methods used in Red Polished pottery analysis, as well as important prerequisites for a successful microanalytical study, including a thorough understanding of the assemblage(s) to be sampled and a well-defined sampling strategy. The discussion then focuses on technological aspects of Red Polished pottery manufacture, technological changes indicated by archaeometric studies, and the organisation of ceramic production and distribution. Overall, the paper attempts to demonstrate how the application of a multidisciplinary approach can enhance our understanding of ceramic manufacture and distribution during the first half of the Cypriot Bronze Age, and, by extension, our comprehension of the prehistoric communities that produced, distributed and used Red Polished pottery.

Keywords: Red Polished pottery, ceramic analysis, prehistoric Cyprus, pottery production, pottery distribution

Introduction: building background knowledge

At the core of Archaeological Science lies material characterisation, the physical and mechanical properties of materials, and how these can be identified and recorded using methods borrowed from the fields of natural and material sciences. Analytical investigations of archaeological ceramics are nowadays considered mainstream archaeology, and they have been advanced to include an extremely varied range of mineralogical, elemental, isotopic and microstructural techniques that address issues of ceramic technology, manufacture, provenance, distribution, use and reuse, and essentially the entire *chaîne opératoire* of ceramic artefacts. In Cypriot archaeology, there has been a gradual integration of traditional archaeological practices, including typological, stylistic and contextual analyses, with a varied range of analytical methods of physicochemical, mineralogical and microstructural analysis that derive from the natural and formal

sciences, including geology, geochemistry and physics, and advanced spatial and statistical data interrogation.

Stewart (1962: 212) acknowledged the absence of references to ceramic fabric in Cypriot prehistoric pottery studies, as an important characteristic for the establishment of ceramic classification and the understanding of ceramic variability. Soon after, a turning point occurred in Cypriot prehistoric ceramic studies, with the work of Courtois (1970), Frankel (1974a; 1974b; Frankel *et al.* 1976), Jones (1986), King (1987), Barlow and Idziak (1989), and Knapp and Cherry (1994), with this list of contributions being indicative but certainly not exhaustive. Methods of statistical analysis and compositional interrogation were introduced to the Cypriot prehistoric archaeological record, while the work of David Frankel (1974a; 1974b; 1978; 1988; 1991; 1993; 1994; Frankel *et al.* 1976) established that the documentation and study of individual ceramic attributes are important for a comprehensive understanding of the ever-changing degrees of uniformity and variation within and between ceramic assemblages, and their "[…] fuzzy, complex and overlapping boundaries" (Frankel 1991: 242-243; cf. Frankel 1988).

This level of detailed examination and documentation, supported by a thorough morphological study, is the most effective avenue towards achieving a comprehensive understanding of the many attributes of the entire population, and for the application of analytical techniques for problem-solving and the testing of archaeological hypotheses. It admits an initial picture of the degree of morphological and technological variation within and among sample groups, so that the derivative analytical datasets can reflect regional, chronological, compositional, and/or technological patterns that apply to the extended ceramic assemblages; and by extension any resulting archaeological inferences can be projected to relevant ceramic populations. In other words, before embarking on an analytical trip to the microcosm of material characterisation, it is essential to have a well-documented and thorough grasp of the macrocosm, from where the sample has derived, and of what it is actually representative.

In recent years, the systematic study and publication of archaeological site assemblages, and specifically ceramics, from the north coast of Cyprus (Figure 8.1) (Dunn-Vaturi 2003; Webb *et al.* 2009; Webb 2017a; Webb 2018b), from the centre of the island (Frankel and Webb 2006; 2007; Webb and Frankel 2013a), and the southern (Georgiou *et al.* 2011; Bombardieri 2017), and south-western parts (Swiny *et al.* 2003; Graham 2015; Crewe *et al.* 2008; Crewe 2014; 2015), and the combined studies of archaeological materials, with the integration of archaeological theory and archaeological sciences, have significantly changed scholarly understanding of Early and Middle Bronze Age (Table 8.1) societies in Cyprus. While the apogee of social, economic and cultural transformations is to be sought in the ensuing Late Bronze Age, the Early and Middle Bronze Ages provide the arena, where cultural processes, transformations, causes and moti-

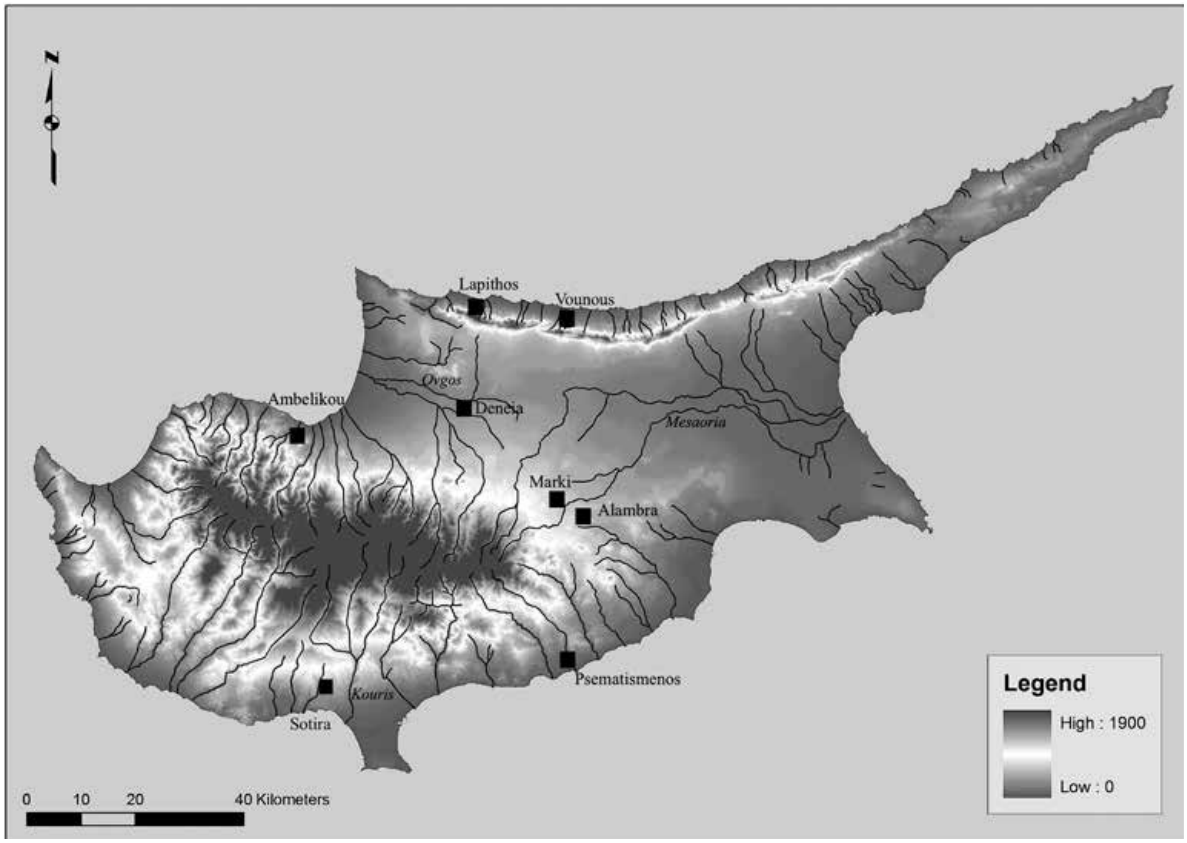

Figure 8.1. Map of Cyprus showing the location of archaeological sites and rivers mentioned in the text.

Early and Middle Cypriot Bronze Age chronology	
Period	Approximate dates
Philia Early Cypriot	2400/2350-2250 BC
Early Cypriot I-II	2250-2150 BC
Early Cypriot III	2150-1950 BC
Middle Cypriot I	1950-1850 BC
Middle Cypriot II	1850-1750/1700 BC
Middle Cypriot III	1750/1700-1680/1650 BC

Table 8.1. The chronology of the Early and Middle Bronze Age in Cyprus (Webb 2018b: 3, Table 1.1).

vating factors were already well underway prior to Late Bronze Age urbanisation (Webb 2018a; Webb and Knapp 2020, and references therein).

The small number of identified imports in Cyprus (Knapp 1990: 152, Table 3; Keswani 2005: 388-389, Table 13; Knapp 2013a: 307; Knapp 2013b: 24; Webb 2018b: 6) and the contemporary Cypriot pottery abroad (Keswani 2005:

Figure 8.2. Red Polished pottery from Marki *Alonia*. ã Courtesy of David Frankel and Jennifer M. Webb (Frankel and Webb 2006).

387, and references therein) indicate that during the Early and Middle Bronze Age, the inhabitants of the island were only "passively involved in long-distance exchange" and that any external contacts were very limited (Knapp 2013b: 24; Webb 2018b: 6). However, morphological and compositional studies of metal artefacts (Webb *et al.* 2006; Webb 2013; Webb 2018a; Charalambous and Webb 2020) were instrumental for understanding the real scale and nature of the overseas interactions of Cyprus during these periods and the underlying factors motivating cultural change.

If the study of metal artefacts was proven crucial in comprehending long-distance exchange with regions outside Cyprus, ceramics have played an equally important role in investigations of commodity exchange, artefact distribution and social dynamics within the island. Being the most abundant and best-preserved material category in every Early and Middle Bronze Age site, ceramics provide the groundwork for the chronological and socioeconomic definition of archaeological contexts, and for tracing inter-settlement social interaction, as well as changes in ceramic production and distribution that could be associated with historical changes taking place in the individual communities and more broadly in Cypriot Early and Middle Bronze Age society. To that end, the study

of Red Polished pottery (Figure 8.2) is crucial, as it is the predominant Early and Middle Bronze Age ceramic type across Cyprus, with a series of temporal and regional variants that reflect the idiosyncrasies and fashions of individual periods and regions on the island.

Red Polished pottery is found across Cyprus during the Early and Middle Bronze Age, and it dominates most site assemblages. It has been argued that the ware follows a chronological evolution, defined as Red Polished I-II, Red Polished III, and Red Polished IV by pottery specialists. This seriation mostly follows Stewart's (1962) initial typology, primarily based on Red Polished from the north coast. Red Polished I-II includes EC I-II soft and fine calcareous fabrics of the north coast, distinguished for their thick, lustrous slips (Webb and Frankel 2013b: 64; Webb 2014: 219). Red Polished I-II evolved into Red Polished III during the EC III period. The production of Red Polished III was not restricted only to the north coast but became the dominant pottery class at the centre of the island (Webb 2014: 220). During MC III, Red Polished IV appears in locally varied forms, fabrics and decoration across the island (Webb 2014: 221-222). Actually, more recent morphological studies of pottery material from the southern part of the island (eg. Herscher 1991; 2003; Georgiou *et al*. 2011; Graham 2015; Webb 2017b) have shown that typological, stylistic and technological variations within the Red Polished ware are more diverse and more complex, and cannot be constrained within Stewart's series. Moreover, different functional forms seem to have different characteristics, associated with shape, size, and intended use, adding to the multidimensional internal variability of the ware.

The technological and compositional characterisation of Red Polished fabrics

There is a two-way relationship between ceramic technology and society. As Roux (2003: 3, and references therein) has argued, "technology and society are intrinsically linked, continuously reshaping themselves and each other in a never-ending feedback loop". In the study of prehistoric ceramics, the documentation of technology and the identification of technological change are instrumental in approaching indirectly the associated society. Ceramics are the end-products of a long process that entails all the materials, the actions and the cognition that bring these different elements together (Roux 2017: 101, and references therein). A given technology is part of a particular culture; the entire operational process of ceramic production and use is an integral part of a site- or a regional history or culture, and technological behaviour is firmly associated with the social group (Duistermaat 2017: 119-123). Consequently, differences or changes in ceramic technology indicate different cultural trends within and among social groups, or they can indicate technological evolution over time when counterpart ceramic artefacts, which are dated to different chronological periods, are comparatively studied for the technology of their production and composition.

Numerous analytical studies have involved the compositional and technological characterisation of Red Polished samples (Courtois 1970; Jones 1986; King 1987; Barlow and Idziak 1989; Barlow and Vaughan 1992; 1999; Summerhayes *et al.* 1996; Weisman 1996; Vaughan 2003; Dikomitou 2007; Chelazzi and Davit 2010; Eccleston *et al.* 2011; Dikomitou 2012; Frankel and Webb 2012; Dikomitou-Eliadou 2013; 2014; 2017; 2019; Webb and Frankel 2013a; Davit *et al.* 2014; Dikomitou-Eliadou and Martinón-Torres 2018, with this list indicative but not exhaustive). The broad picture that re-emerges with every analytical study is one of local production within each community, with imports differentiated on the basis of both their morphological characteristics and fabric composition.

Among the various methods of ceramic analysis, handheld (or portable) energy-dispersive X-ray fluorescence analysers (hhXRF or pXRF) are steadily becoming more and more popular because of their non-invasive and inexpensive capacity to analyse *in-situ* large numbers of samples in relatively short periods of time. Even though, pXRF can be used effectively for the compositional assessment of individual sample groups, it is more challenging and often impossible to comparatively study pXRF datasets deriving from studies that used different analysers and analytical protocols (for overview of the method and associated literature see Holmqvist 2016, and references therein). For the assessment of the pXRF data quality, the analysis of reference certified standards along the archaeological material should become a standard practise in any analytical exercise.

In Cypriot archaeology, a series of pXRF analytical campaigns (Eccleston *et al.* 2011; Frankel and Webb 2012; Webb and Frankel 2013a; Dikomitou-Eliadou and Martinón-Torres 2018) on well-documented Red Polished pottery from sites across the island and different sub-periods of the Early and Middle Bronze Age have provided concrete evidence for local and regional production and inter-regional compositional variability. In addition, compositional differences between chronologically earlier and later Red Polished samples at individual sites have been identified, that may be associated both with a change in clay sources and with technological changes occurring in pottery production over time. Most importantly, these analyses have confirmed the macroscopic observation of ware variants that on stylistic criteria may be associated with specific regions, and have been identified as either local or imported to the site(s) under study[1].

[1] cf. the locally produced Red Polished Mottled I-II versus the imported Red Polished I-II and Brown Polished at Psematismenos, in Eccleston *et al.* 2011: 262, fig. 4.3; the noteworthy elemental differentiation of undecorated vessels from Ambelikou, Vounous and Psematismenos, in Frankel and Webb 2012: 1383, fig.2; the imported Drab Polished versus local Red Polished III and Red Polished Coarse at Ambelikou, in Frankel and Webb 2012: 1383, fig.3 and Webb and Frankel 2013a: 190, fig. 9.1; the small quantities of recognised Red Polished, Black Polished and Red Polished Black Topped, Red and Black Slip, Early Red Slip, White Painted and Plain White Handmade imports at Lapithos versus the bulk of the locally produced ceramics, in Dikomitou-Eliadou and Martinón-Torres 2018.

While pXRF is suitable for bulk chemical characterisation, ceramic petrography with the use of optical polarising microscopy has proven most beneficial for providing a range of information regarding the mineralogical and technological characteristics of ceramics. Ceramic petrography allows the description of fabrics as observed in thin section, and the documentation of the various components with reference to their arrangement, size, shape and frequency (Whitbread 1995; 2017; Quinn 2013). Systematic and detailed petrographic fabric descriptions that follow one of the published recording systems suitable for archaeological ceramics (Whitebread 1995, Appendix 3; Quinn 2013, Appendix 1), and accompanied by clear photomicrographs of the identified fabrics, can provide the groundwork for resultful comparisons among petrographic datasets deriving from different studies and/or produced by different researchers. The composition of ceramic fabrics and their properties are related not only to the original raw materials, but also to their processing, and subsequent shaping methods and firing conditions (Quinn 2013; Whitbread 2017). In the first instance, samples are grouped together or separated in different technological groups according to their mineralogical, compositional and technological characteristics, and in some cases, it is possible to associate a group(s) with a specific production centre or area of production, especially when geological and/or archaeological comparanda are available.

A general observation arising from mineralogical studies of Red Polished pottery is that local fabrics were used for the production of a variety of vessels (Barlow and Idziak 1989: 74; Barlow and Vaughan 1992: 9-11; Summerhayes *et al.* 1996: 179-180; Weisman 1996: 470-473; Eccleston *et al.* 2011: 269; Frankel and Webb 2012: 1383; Webb and Frankel 2013a: 192-195; Dikomitou 2007: 122; Dikomitou-Eliadou 2014: 203, 207; 2019: 80, 88). There is no evidence to suggest the prevalence of a particular fabric for the production of specific ceramic shapes. Early and Middle Bronze Age cooking pots are, however, an exception. This vessel type exhibits minimum intra-site compositional variability, and the use of typically hard-fired, non-calcareous clays throughout the Early and Middle Bronze Age (Frankel and Webb 1996: 166-170; Frankel and Webb 2006: 133-137; Frankel and Webb 2007: 84-85; Georgiou *et al.* 2011: 239-244; Webb 2017b: 168-172; Webb 2018b: 211-213).

Red Polished pottery from the north coast and the western half of the Mesaoria lowlands (Ovgos valley) is primarily made with soft, fine, calcareous fabrics (Figure 8.3a-b) (Dikomitou 2007; 2017; see also Webb 2018b). Conversely, Red Polished fabrics in the central and southern parts of the island are harder, coarser and characterised by a strong presence of ophiolitic inclusions (Figure 8.4a-b) (Barlow and Idziak 1989: 71; Barlow and Vaughan 1992: 8; 1999: 17; Weisman 1996: 462-463; Vaughan 2003: 213-216; Chelazzi and Davit 2010: 141; Dikomitou 2012: 167-194; Davit *et al.* 2014: 9-11; Dikomitou-Eliadou 2014: 202, 206-207; 2019: 80, 83-85). This differentiation mirrors geological

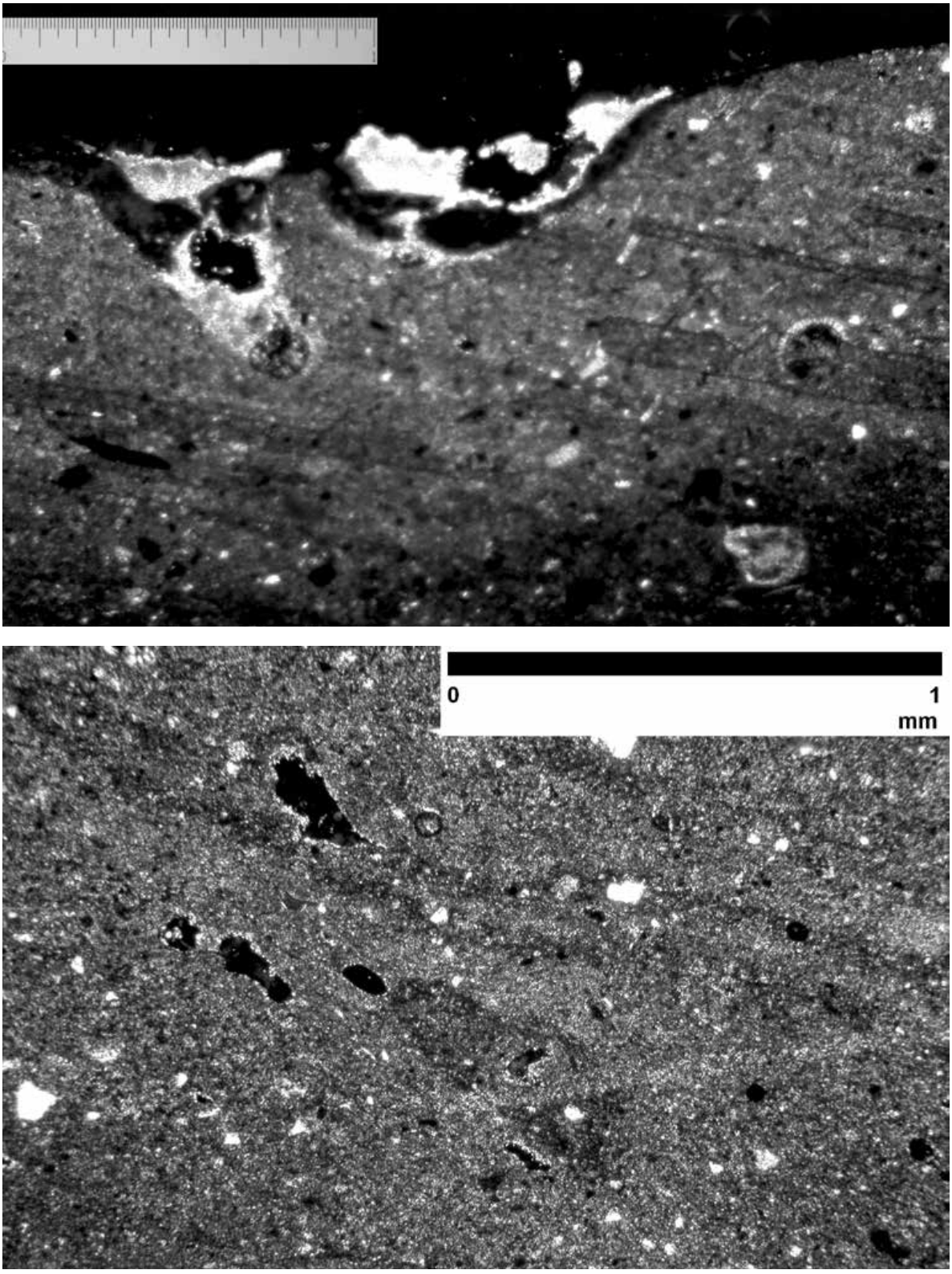

Figure 8.3a-b. Red Polished soft, calcareous fabrics with minimum presence of mineral grains and rock fragments from Deneia *Kafkalla* (a, RP III gourd juglet T 789, P294) and a northern import to Marki (possibly from Lapithos) (b, RP III gourd juglet P7256). Photomicrographs in XP, full scale: 1mm. In photomicrograph 2a, the red slip is visible in cross section, below the white decorative paste in the incision.

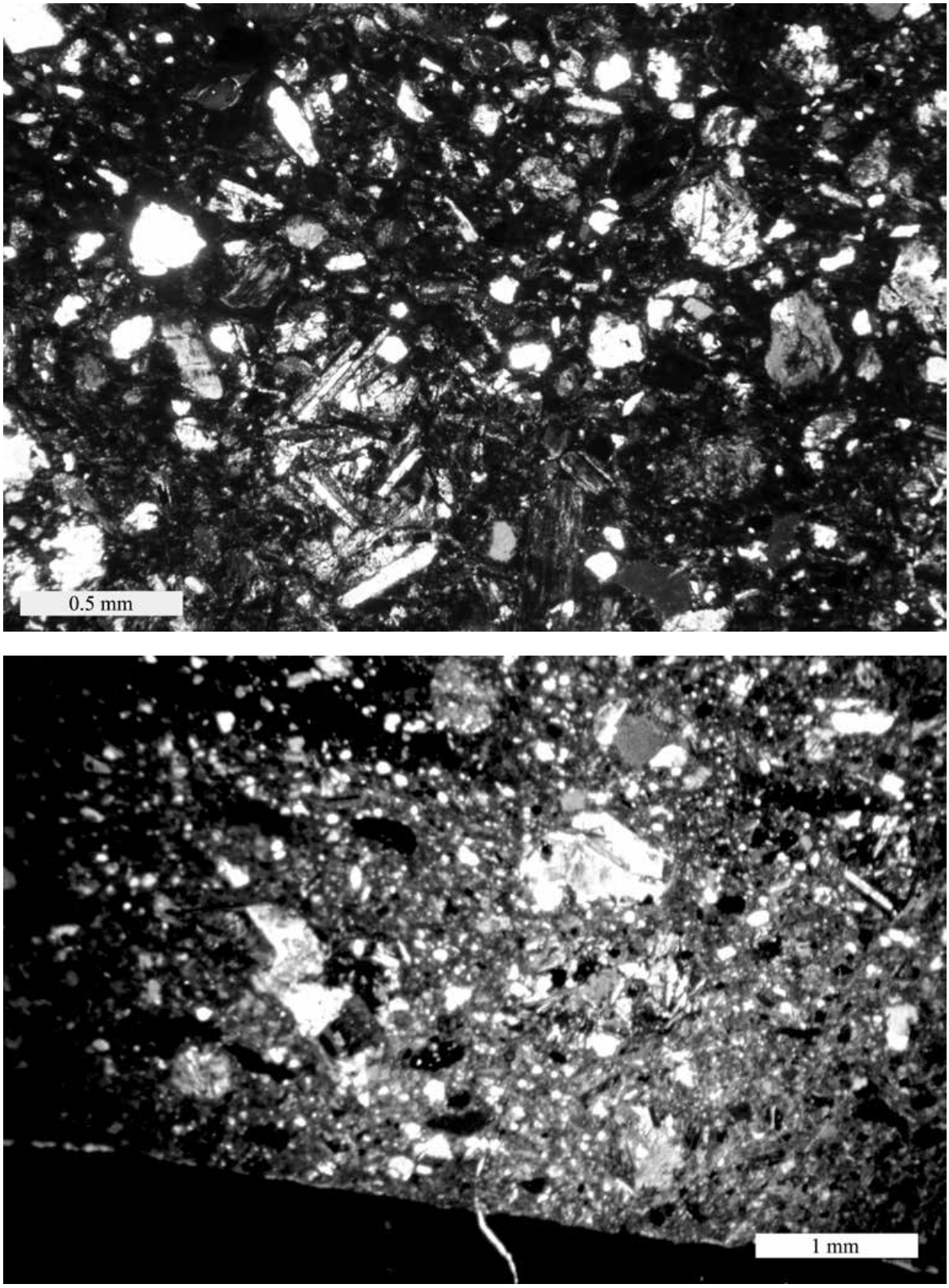

Figure 8.4a-b. Red Polished small jar P7316 (a) and Red Polished Coarse (cooking pot) P1089 (b) from Marki *Alonia* are made with non-calcareous fabrics that are distinguished by a distinct presence of ophiolitic components. Photomicrographs in XP, full scale: 0.5mm (a) and 1.0 mm (b).

differences between the north part of Cyprus and the rest of the island, as well as different technological choices by local craftspeople.

The softer, calcareous clays used in the northern part of the island also lack the density of aplastic inclusions observed in the calcareous and non-calcareous clays of the central and southern regions. Petrographic analyses of ceramic samples from both Sotira *Kamminoudhia* (Vaughan 2003: 217) and Marki *Alonia* (Dikomitou 2012: 245) indicate that the raw clays were not processed in any particular way, such as the use of sieving or water settling. The grain size of the fabric constituents varies significantly, and is often analogous to those of sampled, unprocessed natural sediments. It seems, therefore, that hand sorting was in most cases the main preparation technique (Vaughan 2003: 217).

Raw material processing appears to have changed considerably after Early Cypriot III in the central and south parts of the island, when a series of Red Polished fabrics finer in texture replaced their earlier, coarser predecessors. On the other hand, the naturally occurring fine-grained clays (Figure 8.3a-b) of the north coast, being soft and plastic in nature (Constantinou and Panayides 2019: 33), were an ideal and readily available medium for the production of elaborately incised vessels, spindle whorls, and terracottas, as well as composite vessels of high craftmanship, which were exclusively produced in this region and distributed in small numbers to other parts of the island (Webb and Frankel 2008; Webb *et al.* 2009; Webb 2014; 2017a; 2018b).

In this general framework of predominantly locally produced and used vessels, it is increasingly clear that small numbers of Red Polished pots were distributed over longer distances, perhaps along with other commodities, and in many cases for their contents. As Webb has argued (2014: 217, fig. 3), this is particularly evident in the case of small decorated flasks, which were used from the very beginning of the Early Bronze Age (Philia phase) and continued to be produced and distributed throughout the Early and Middle Cypriot periods. These flasks in Red Polished and other fabrics are mainly known from tombs and may have contained a substance used in mortuary ritual (Webb 2014: 217; Georgiou *et al.* 2011: 246-254, 347-350). In most instances, ceramic fabric analysis only confirms what morphological study already suggests, as ceramic imports can be recognised by an experienced ceramicist on stylistic criteria. Such imports indicate interaction between sites and regions across the island, perhaps motivated and sustained by copper distribution networks and the exploitation of agropastoral regions (Frankel 1974a; 1974b; Frankel 1993: 60; Frankel and Webb 2012: 1380; Webb 2014: 223; Webb2018a).

With regard to the local Red Polished assemblage from the small village of Marki *Alonia*, ceramic petrography allowed the recording of a series of technological changes in production. One of these changes relates to raw material exploitation and processing; over time the calcareous component in Red Polished fabrics at Marki considerably reduced, while the size of rock fragments and min-

eral grains also diminished to fine fraction (Figure 8.5a-b) (see also Dikomitou 2014: 206; 2019: 92). At the same time, ceramic fabrics gradually became harder in texture, as a result of higher firing temperatures. This is paralleled in other pottery wares from other sites. For example, White Painted III and IV samples from Lapithos and Deneia, studied in thin section, exhibit differences in their groundmass' optical activity from earlier White Painted I-II from Lapithos. A technological change is also evident in cooking pot production at Marki. There is a shift towards the standardisation of cooking pot morphology (Frankel and Webb 2006: 133–137). This is associated with a similar shift toward standardisation in fabric composition and, most importantly, in the techniques used for building and shaping these pots (Frankel and Webb 1996: 167–168; 2006: 135).

In terms of firing, mineralogical and microstructural analyses of Red Polished pottery using X-ray Diffraction and scanning electron microscopy suggest that the majority was fired around 750-800 degrees Celsius (Webb 1994: 17; Barlow 1996: 243-244; Vaughan 2003: 218; Dikomitou 2012: 224), with some studies arguing for higher temperatures between 850 and 1050 degrees Celsius (Chelazzi and Davit 2010: 141; Davit *et al.* 2014: 11-13). At this point, the significance of a detailed association of analytical and archaeological data is crucial for our understanding of pottery technologies, and in this case of firing temperatures. For example, the findings of the archaeometric work conducted by the Kouris Valley project and involved Red Polished pottery dated to the Middle Bronze Age (Chelazzi and Davit 2010: 144, fig.2; Davit *et al.* 2014: 3) fit well and actually reinforce observations of technological changes occurring in ceramic manufacture from Early Cypriot III onwards, including the production of harder fabrics, fired at higher firing temperatures.

These technological changes in Red Polished production at local and regional levels can be perceived as an integral part of the cultural changes that took place from one period to the other. Specifically, Early Cypriot III is considered a turning point in the island's history. Various archaeological studies (see Catling 1962: 138-141; Frankel and Webb 2001: 120, fig. 5; Webb and Frankel 2004: 129-130; Georgiou 2006: 13-14, 417, 423-424; Webb and Frankel 2013a: 220) have shown that Early Cypriot III should be considered as a transitional period, during which new settlements were founded and pre-existing settlements increased in size. A series of site-based material studies (see Frankel and Webb 2006, 2007; Webb *et al.* 2009; Georgiou *et al.* 2011; Webb and Frankel 2013a; Webb 2014; 2017a; 2017b; 2018b) have indicated intensified interaction between neighbouring and more distant settlements, primarily reflected in the circulation of commodities and particularly in the inter-site distribution of pottery. Cultural and technological changes are also evident across the island, in both large and wealthy settlements, such as Lapithos, and smaller inland communities, such as Marki. At this time, also, imported fabrics become more evident at different sites, either due to an increase in inter-site contacts and ceramic exchange or

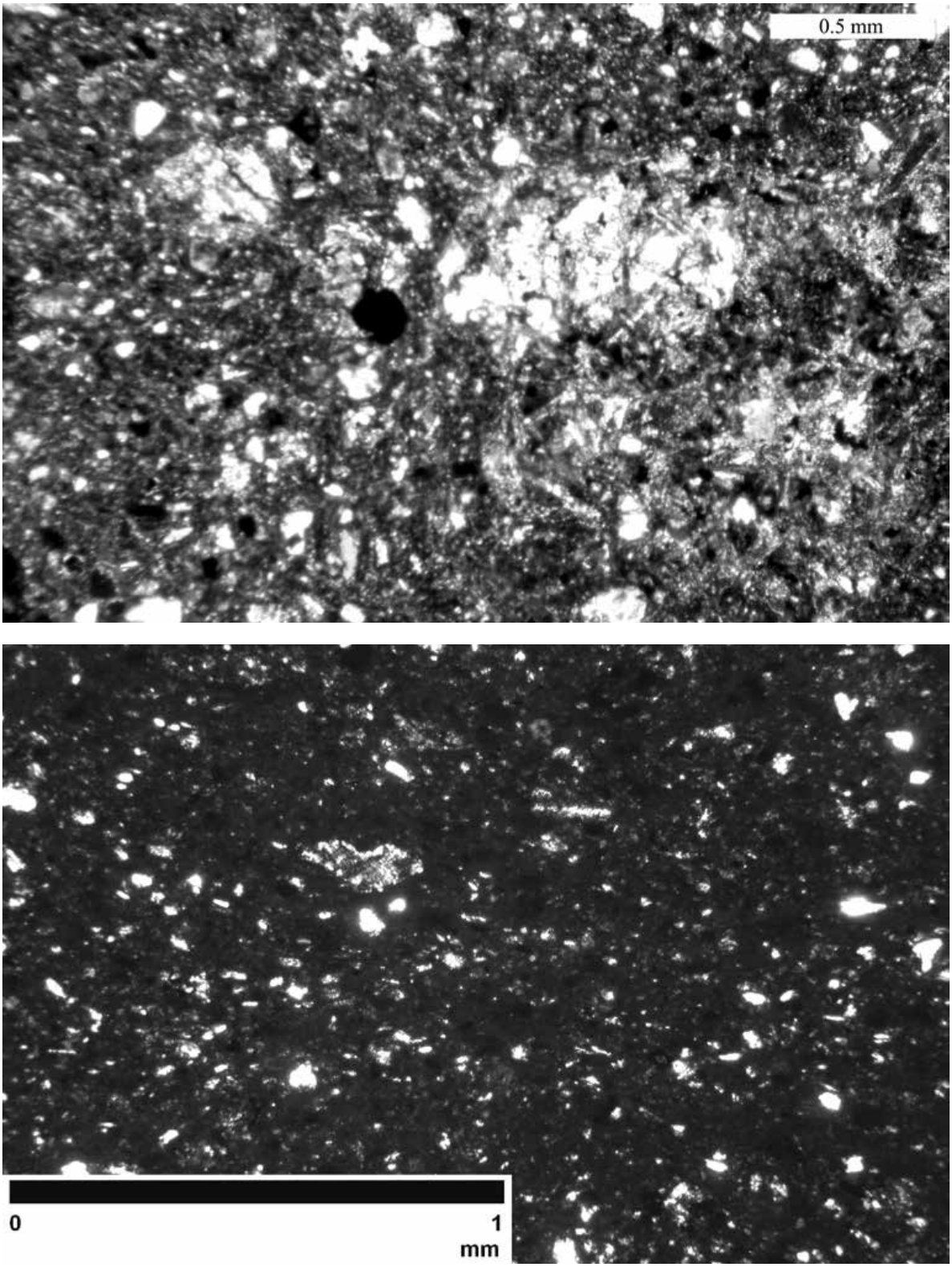

Figure 8.5a-b. The gradual reduction in the density and size of mineral grains and rock fragments is observed in the local production of Red Polished pottery at Marki. Photomicrograph 4a (XP, full scale: 0.5 mm) depicts the composition of Red Polished bowl P12800 from the settlement's occupation phase E (EC III) and photomicrograph 4b (XP, full scale: 1 mm) depicts the composition of Red Polished bowl P14204 from occupational phase G (Middle Cypriot I).

because fabrics became more standardised and thus more easily distinguished, or both (Dikomitou-Eliadou and Martinón-Torres 2018: 254).

The Middle Bronze Age pottery workshop at Ambelikou *Aletri* (Webb and Frankel 2013a; Frankel and Webb 2014), currently the only pottery production locus known from prehistoric Cyprus, is crucial to our understanding of the context(s) and organisation of pottery production within this framework of social and cultural transformations. Together with other analytical and archaeological evidence, it points to an organised and specialised form of pottery production by skilled craftspeople in dedicated extra-household workshops (Frankel and Webb 2001; Webb 2014; Webb and Knapp 2020). The identification of a kiln in the Ambelikou workshop also supports technological arguments about more controlled firing conditions and temperatures in the Middle Cypriot period.

What does the future hold?

This paper concludes with a repetition in underlining the significance of a targeted sampling strategy prior to any archaeometric study, accompanied by a thorough understanding of the sampled material and how it is representative of the total pottery population. Even though a correlation between archaeological and archaeometric data is frequently assumed, more often than not archaeometric studies lack detailed accounts of the original population, from which the samples derive, and consequently of the temporal and spatial parameters that govern them. In the study of Early and Middle Bronze Age Red Polished pottery, as in the study of premodern ceramics more generally, this association between archaeological and archaeometric data is crucial for exploring technological and compositional variability in time and space, and for any meaningful understanding of the significance of this variability within the wider sociocultural and historical context.

Undoubtedly, analytical studies of Red Polished pottery, and more generally of prehistoric ceramics, have made considerable progress. In juxtaposition with the study of other material categories, such as metals, they have provided information about the technology and materials employed in pottery production, the scale of distribution, and the types of social, economic and cultural interactions that they represent. More importantly, the technological and compositional study of Red Polished pottery has contributed to an enhanced understanding of the complexity and diversity of Early and Middle Bronze Age society (see most recently Webb and Knapp 2020, and references therein).

There are still, of course, many challenges. Beyond the technological and compositional characterisation of ceramic materials *per se*, their interdisciplinary study has the capacity to contribute to our understanding of the mode(s) of organisation and context(s) of craftmanship, the degree of labour specialisation and technical knowledge, and the scale and mode(s) of product distribution within and among smaller and larger communities. Certainly, ceramics cannot on their

own provide answers to these questions. However, their analytical study, with a quantifiable, problem-targeted and inclusive approach, can add significantly to our understanding of the nature and scale of connectivity among the various settlements that comprised the socio-economic and cultural landscape of Early and Middle Bronze Age Cyprus.

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