Journal of Archaeological Science: Reports xxx (2015) xxx–xxx

Contents lists available at ScienceDirect

Journal of Archaeological Science: Reports

journal homepage: www.elsevier.com/locate/jasrep

A diachronic investigation of 'local' pottery production and supply at the sanctuary of Zeus, Mount Lykaion, Arcadia, Peloponnese

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ARTICLE INFO

Article history:
Received 31 October 2014
Received in revised form 2 September 2015
Accepted 22 December 2015
Available online xxxx

Keywords:
Pottery
Greece
Mount Lykaion
Bronze Age
Iron Age
Technology
Provenance

ABSTRACT

The present paper reports results of an integrated study of a selection of pottery recovered from the altar of Zeus, Mount Lykaion, Arcadia, in the Peloponnese, Greece, dating from the Neolithic to the Early Iron Age. A multi-analytical approach based on petrographic and chemical analysis, supported by refiring tests and geological sampling, has been employed to tackle issues of technology and provenance. Results shed light on patterns of raw material sources exploitation and pottery production and supply at the site over time.

1. Introduction

Archaeological investigations at the Sanctuary of Zeus at Mount Lykaion, Arcadia, Peloponnese (Fig. 1), have been carried out since 2004, and since 2006 through a collaboration between the 39th Ephorate of Prehistoric and Classical Antiquities and the American School of Classical Studies at Athens, under the direction of Dr. Anna Karapanagiotou, and Professors David G. Romano and Mary E. Voyatzis (Romano and Voyatzis, 2015, 2014, 2010). Significant amounts of pottery were recovered from the large ash altar of the sanctuary, spanning from the Neolithic to the Hellenistic periods, revealing the long history of use of the Mount Lykaion peak. The exact character of the site during the Neolithic (6500–3200 BC) – Early Helladic (EH, 3200–2050 BC) – Middle Helladic (MH, 2050–1600 BC), and whether it had been used as a cult place already in these earlier periods, remains unclear (for the absolute chronologies, see Warren and Hankey, 1989). The Late Helladic (LH, 1600–1065 BC) to Early Iron Age (EIA, 1065-around 900 BC) pottery, however, can be safely related to ritual practises: the co-existence of large amounts of LH drinking cups with figurines, calcined bones, and ash suggest that some behaviours during the so-called Mycenaean period are similar to those carried out in later periods, in particular the 'thysia' ritual and ritual dining (Wright, 2004; Starkovich et al., 2013).

2. Pottery sampling and methodology

Based on typology and the macroscopic examination of ceramic fabrics, one hundred (100) pottery samples were selected, spanning in date from the Neolithic through to the EIA (Table 1). It should be noted that the bulk of Neolithic-MH pottery retrieved from the site is extremely fragmented and the surfaces are heavily worn, often rendering its assignment to specific ware/shape quite difficult. On the contrary, the typological and stylistic characterization of LH-EIA pottery is more straightforward, due to better preservation and higher formal standardization of the material. The Neolithic, EH, and MH pottery found at the altar consists of semi-coarse and coarse, dominantly plain monochrome, wares and sampling included both slipped and plain, burnished and unburnished sherds. In addition, among the MH samples, two are related to matt-painted pottery and stand out from the rest of the Neolithic-MH assemblage due to their distinctively different surface treatment. The LH and EIA samples, which consist exclusively of fine wares, are

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http://dx.doi.org/10.1016/j.jasrep.2015.12.017
2352-409X/

Fig. 1. Mount Lykaion is located in Arcadia, in the Peloponnese, Greece.

all associated with drinking vessels, either plain or monochrome slipped and some pattern-painted (Fig. 2).

Petrographic analysis, refiring tests, and chemical analysis were undertaken to address questions of provenance and technology. Elemental composition (twenty-six major, minor and trace elements) of samples was determined with a Wavelength Dispersive X-Ray Fluorescence spectrometer (WD-XRF) BRUKER S8-TIGER with Rh excitation source. Samples were prepared as fused glass (lithium borates) beads with a 1:6 dilution. For refiring tests all samples were refired under the same controlled conditions (oxidation, 1000 °C, 1 h soaking time) in order to eliminate differences in clay colour due to ancient firing and to compare the clay pastes.

Petrographic analysis put more emphasis on semi-coarse and coarse wares, while the main focus of chemical analysis has been the fine wares. Therefore, all of the (coarser) Neolithic-MH samples were subjected to petrographic analysis, and all of the (finer) LH-EIA samples were analysed by WD-XRF. A set of purposely selected samples, however, was analysed by both methods (WD-XRF and petrographic analysis) to facilitate correlation of the analytical data provided by the two different techniques. More specifically, twelve (12) of the earlier pottery samples (Neolithic-MH), as representative of the petrographically defined pottery fabrics, were also subjected to chemical analysis, while thirteen (13) of the later pottery (LH-EIA) samples were selected for additional petrographic analysis, based on the defined chemical groups and their refiring colours.

Systematic geological sampling was carried out at targeted loci in the wider area of the site to explore the availability and the characteristics of the potential raw materials for pottery manufacture (Fig. 3). Three factors were taken into consideration: a. the mineralogy of the pottery fabrics, as defined through petrographic analysis, b. the actual geological formations of the region, c. the topography of the area, which is characterized by a mountainous zone, as well as lowland basins. Based on these, geological sampling was designed taking into consideration the local drainage system, including four main rivers (Alpheios, Loussios, Xerilas, and Ellison).The aim was to characterize mineralogical variation within each river's drainage, from the highlands to the lowlands, and across the different drainages.

Table 1
Pottery samples analysed.

Period	Number of samples	Vessel forms
Neolithic	Seventeen (17)	Bowls, jar, and pithos
Early Helladic (EH)	Eighteen (18)	Bowls and jars
Middle Helladic (MH)	Fifteen (15)	Goblets, jars, and jugs
Late Helladic (LH)	Thirty (30)	Kylikes
Early Iron Age (EIA)	Twenty (20)	Skyphoi and deep bowls

3. Results and discussion

Petrographic analysis has identified nine different fabric groups among the Neolithic-MH pottery samples (Table 2). The predominant Neolithic-EH type (Fig. 4, Fabric 1), continues into the MH, but without being the dominant type. Fabrics 2 and 3 are also associated with all three earlier periods. There is no correlation between particular shapes and recipes for these three fabrics which are attested for a range of open and closed shapes. In addition to the long-lived Fabrics 1, 2 and 3, new fabrics seem to appear in the EH (Fabrics 6, 8) and the MH period (Fabrics 4, 7, 9), reflecting the overall use of new technologies and different types of raw materials after the end of Neolithic. The sand-tempered fabric (Fabric 6), for example, associated with plain and slipped ware of various shapes, was introduced in EH and continued in MH. Interestingly, one of the two MH matt-painted samples also falls into this group (Fabric 6), while the other sample is a loner (Fabric 7). Unlike the earlier fabrics (Fabrics 1, 2, 3), the newly introduced MH ones, finally, tend to be associated with particular shapes, either closed pots (Fabric 4) or goblets (Fabric 9), pointing possibly towards higher standardization in the production, if not simply specific consumers' preferences.

Taking into consideration the geology of the wider area (Exindavelonis, 1988; Lalechos, 1973; Papadopoulos, 1997; Papazeti, 2003) and the characterization of the geological samples collected, the Neolithic-MH pottery analysed from the altar of the sanctuary appears compatible with a broadly local provenance (i.e., from the basin of Megalopolis and the surrounding mountainous zones). No evidence for 'exotic' fabrics has come to light, although there is not much comparable reference material so far for the wider Peloponnese. An interesting pattern, however, seems to emerge for the broadly local pottery, reflecting a shift in the raw material sources through time. Fabrics 1 to 3 are obviously associated with immature sediments deriving from the weathering of limestone, chert and flysch and deposited close to the parent rocks in the upland areas in the vicinity of the site (Fig. 3). On the other hand, Fabric 6 bears close similarities to the geological sample MTLGS14/03, while the newly introduced MH fabrics 4 and 9 (Fig. 5) are associated with MTLGS14/07 and MTLGS14/08, all from the lower parts of the Megalopolis basin (cf. Fig. 3).

Concerning the later LH-EIA pottery samples, seven main compositional groups have been defined, based on cluster analysis performed on the sub-composition MgO, Al_2O, SiO_2, K_2O, CaO, TiO_2, V, Cr, Mn, Fe_2O_3, Co, Ni, Zn, Rb, Sr, Y, Zr, Ba, La, Ce, Nd, and Th (Table 3). A first separation of the groups can be made on the basis of their Ca content. The samples of Group 1 have low calcium content (ca. 3% CaO), while Groups 2 and 3 contain samples with intermediate calcium content (ca. 6–7% CaO) and the remaining Groups 4, 5, 6 and 7 contain samples with a calcium content of ca. 11–12% CaO. Group 2 and 3, the two groups with intermediate Ca content, differ in a number of elements, notably Cr, Ni, Co, Zn, Rb and Zr. For the four groups with high Ca content (ca. 11–12% CaO), groups 6 and 7 differ from groups 4 and 5 through a higher Sr content, but they also contain tendentially less Fe and Mn and more Rb than 4 and 5. Groups 4 and 5 are chemically very similar to each other with only slightly different Cr and Ni content. Groups 6 and 7 do not form very tight compositional groups, and differences appear to lie mainly in Mg, Fe, V and Zr. Overall, a tendency for discrimination is observed between the LH and EIA samples (see Table 3), indicating either discontinuity in the use of clay sources of the same production units or different sources of the pottery dedicated to the altar of the sanctuary through time. Moreover, the additional petrographic analysis applied on representative LH-EIA samples, confirmed the association of these later LH and EIA pottery with secondary calcareous clays (potentially associated with the Neogene formations) in lowland areas (cf. Fig. 3).

Finally, eight (8) of the twelve (12) Neolithic-MH samples that had been also analysed by chemical analysis form a non-calcareous group that is clearly different from all later fine ware samples, while four of them (dated to the EH and MH) do show some similarity to the low calcareous group 1, which contains exclusively LH samples.

Please cite this article as: Kordatzaki, G., et al., A diachronic investigation of 'local' pottery production and supply at the sanctuary of Zeus, Mount Lykaion, Arcadia, Peloponn, Journal of Archaeological Science: Reports (2015), http://dx.doi.org/10.1016/j.jasrep.2015.12.017