Journal of Anthropological Archaeology 51 (2018) 127–143

Contents lists available at ScienceDirect

Journal of Anthropological Archaeology

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

Craft production at Köhne Shahar, a Kura-Araxes settlement in Iranian Azerbaijan

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ARTICLE INFO

Keywords:
Craft production
Specialization
Kura-Araxes culture
Iranian Azerbaijan
The Caucasus

ABSTRACT

Considerable investigations and studies, especially during the past two decades, have substantially increased our information about the Kura-Araxes cultural tradition of the 4th and 3rd millennia BC. Yet, fundamental questions remain about the social and economic makeup of Kura-Araxes communities that require further investigation. In particular, our knowledge about societal organization within Kura-Araxes communities is still very limited. Kura-Araxes communities are known as either pastoral/nomads or sedentary/agriculturalist that possibly were socially undifferentiated. In this paper, we present evidence of workshop units and craft activities from the Kura-Araxes site of Köhne Shahar in the Chaldran area of Iranian Azerbaijan. We argue that Köhne Shahar represents a craft production site and Kura-Araxes community with signs of societal complexity.

1. Introduction

Specialized craft production and division of labor are usually considered key factors in the economies of complex societies, as they fostered and accompanied the development of social complexity (Clark and Parry, 1990; Peregrine, 1991; Stein, 1996; Costin, 2001, 2015; Hruby and Flad, 2007). Craft specialization as indicator of social complexity is often linked to the rise of middle-range societies (Stark, 1991; Cross, 1993; Earle, 2002). However, we should note that there are some examples such as some of the 5th millennium BC Vinča culture settlements in Balkans with highly specialized metallurgy that do not fit into this model (Radivojević and Rehren, 2015). In middle-range societies, a major concern of political leaders is maintaining their status through control of some essential activity and often public symbolism. The durability and sustenance of status is directly related to the processes by which leaders gain control over labor. Among these processes are warfare, ceremonial events, feasting, intensive food production, craft production, and control over group accumulation and storage (Manzanilla and Rothman, 2016). Control and management of craft production by a leadership group, can lead to the creation and institutionalization of social inequality (Brumfiel and Earle, 1987: 3; Hayden, 1995; Stein, 1996, 1998; Earle, 1999; Hayden, 2001; Arnold, 2009: 122). It should also be noted that because of insufficient studies on non-elite economies our understanding of how goods were produced and used in the past is very biased (Wattenmaker, 1998: 1–2).

Abundant evidence of craft production from Köhne Shahar, an Early Bronze Age Kura-Araxes settlement, inspired us to put the results in a theoretical framework which in turn may provide useful insights into the societal organization of Kura-Araxes cultural communities. Kura-Araxes cultural communities are not generally considered to be "complex" and understanding the context of craft production at the site may shed some light on these communities. In this paper, we present evidence of craft production from excavations at Köhne Shahar and discuss the findings and their implications.

2. Kura-Araxes communities

Kura-Araxes communities first emerged throughout the southern Caucasus in the mid-4th millennium BC (Sagona, 1984; Rothman, 2005; Kohl, 2009) or possibly earlier in Nakhchivan (Marro et al., 2014; Palumbi and Chataigner, 2014: 250; Marro et al., 2015; Palumbi and Chataigner, 2015). By the late 4th-early 3rd millennium BC, their characteristic material culture, particularly hand-made black burnished pottery, spread throughout much of Southwest Asia after 2900 BCE (Fig. 1). The widespread dissemination of this material culture, along with the small size of most sites, the ephemeral nature of their

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https://doi.org/10.1016/j.jaa.2018.06.006
Received 12 February 2018; Received in revised form 20 June 2018

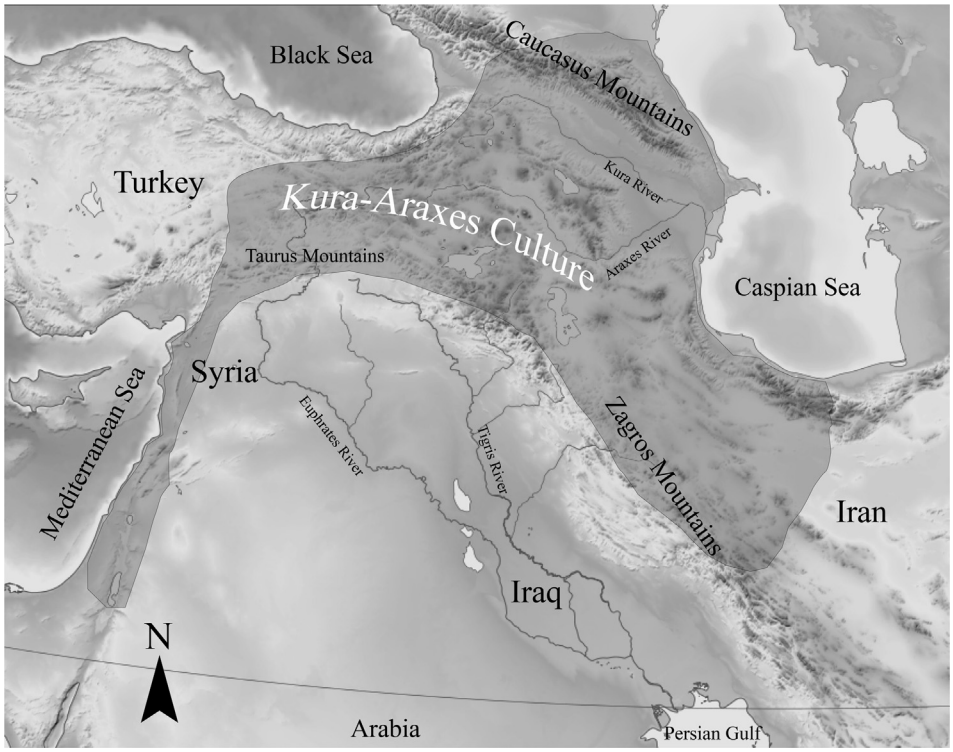

Fig. 1. Distribution of Kura-Araxes material culture in the Near East (modified from Wikimedia).

architectural remains in these smaller sites, and their presence in both fertile lowlands and seasonally-inhospitable highlands, have been used to portray Kura-Araxes communities as small, egalitarian communities of mobile pastoralists or sedentary agriculturalists; economically undifferentiated and socially non-hierarchical (Smith, 2005: 258; Frangipane and Palumbi, 2007; Kohl, 2007: 113; 2009: 250). Limited evidence for craft production and trade among Kura-Araxes communities has further strengthened the argument that Kura-Araxes economies were dominated by domestic and subsistence-related activities (Palumbi, 2008: 53). With some rare exceptions (Marro et al., 2010; Stöllner, 2014; Simonyan and Rothman, 2015), Kura-Araxes settlements lack any evidence of craft production, mining, or resource extraction.

Kura-Araxes communities, however, are also implicated in the evolution and transformation of regional trade in the Near East. Cause and effect of the spread of Kura-Araxes material culture beyond the Caucasus "homeland" and the establishment of diaspora is hotly debated. Among proponents of emigration, the strongest arguments for movement out of the Caucasus include the presence of strong pull factors, notably productive activities like meat and wool production, viticulture, and metals and metallurgy (Rothman, 2003). Kura-Araxes populations primarily inhabited mountains and intermontane valleys of the highland zone surrounding Mesopotamia. Kura-Araxes communities had access to metals, precious and semi-precious stones, stones for tool making, wood, and animal products; resources that were abundant in the mountain zone, yet critical to the evolution of Mesopotamian societies. The frequent appearance of simple bronze and copper objects at temporary camps of Kura-Araxes herders suggests that mobile agropastoralists engaged in metallurgy and trade in metals, especially with societies of the Upper Euphrates (Frangipane et al., 2001; Hauptmann et al., 2002; Rothman, 2003; Connor and Sagona, 2007; Frangipane, 2014). Wool and textiles products from sheep herded by mountainous communities may have been major exports of the mountain zone to Mesopotamia (Anthony, 2007: 284; Nosch et al., 2013; Breniquet and Michel, 2014).

It is argued that by the second half of the 4th millennium BC (Surenhagen, 1986; Algaze, 1989, 2004, 2007), Uruk polities of southern Mesopotamia established colonies across northern Mesopotamia, southern Anatolia, and western Iran to better control regional trade. Although the nature of these colonies and local developments is still debated (Stein, 2002, 2014), co-occurrence of the sudden abandonment of these colonies and regional expansion of Kura-Araxes communities by the end of the 4th millennium BC has led some scholars to argue that Kura-Araxes communities were emergent competitors of Mesopotamia whose economic activities possibly contributed to the decline and eventual collapse of the Uruk system (Algaze, 2001: 76; Kohl, 2007: 97–98; Lamberg-Karlovsky, 2008: 10).

These conflicting descriptions of Kura-Araxes communities as small, agropastoral, and undifferentiated, on the one hand, and as significant regional agents of economic and political transformation on the other, have resulted in an intellectual dissonance in our understanding of this cultural tradition. The unexpected suite of evidence for specialized craft production at Köhne Shahar provides a rare opportunity to address this incongruity (Alizadeh, 2015; Alizadeh et al., 2015).

3. Köhne Shahar

Köhne Shahar was first surveyed by a German team (Kleiss and Kroll, 1979) in the 1970s and it is considered one of the Pre-Urartian "Hillfort" sites in NW Iran (Biscione, 2009). Köhne Shahar is located 20 km northwest of the city of Chaldran in Iran's Western Azerbaijan province (Fig. 2). It is situated at 1905 m asl, in a narrow valley between small intermountain plains and high pastureland (Fig. 3a). It consists of a fortified citadel, an extramural residential area, and a cemetery. The site has a total area of approximately 15 ha, making it one of the largest known Kura-Araxes sites (Kroll, 2004: 46, 2005: 117). The 2.5 ha citadel sits atop a basaltic promontory 20 m above two riverbeds flanking its south-eastern and south-western margins. The close proximity of the final occupational phase (Phase 5) to the present-day ground surface facilitated initial mapping of structures and public spaces of the citadel, including the central plaza, its radial alleyways, and its northern defensive wall (Kleiss and Kroll, 1979).

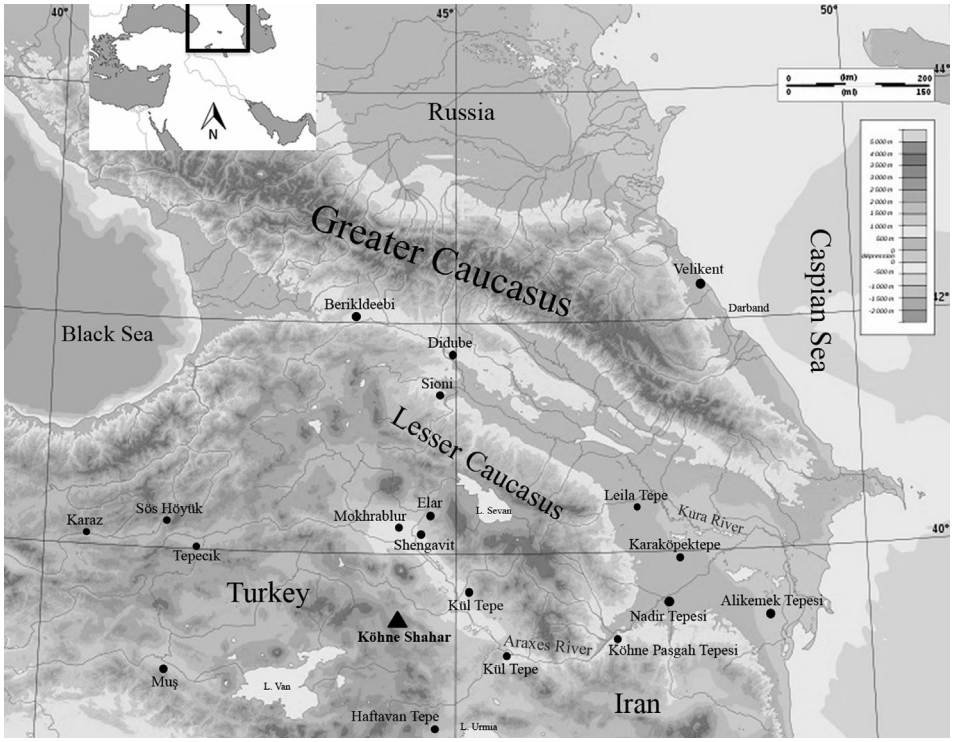

Fig. 2. Major Kura-Araxes sites in the Caucasus region and location of Köhne Shahar (modified map from wikimedia.org).

Between 2012 and 2014, a test trench for stratigraphy (TT1) near the fortification wall, five 10 m × 10 m trenches were excavated in the eastern, central, and western neighborhoods of the citadel. Another 10 m × 10 m trench was excavated in the extramural area (Fig. 3b). Structures, features, and large finds were piece-plotted, and all sediments were sieved using 2 mm and 5 mm mesh screens.

TT1 exposed 2.5 m of cultural deposits above the basaltic bedrock. It revealed five major architectural phases numbered 1–5, from bottom to top (Alizadeh, 2015; Alizadeh et al., 2015). Overall, parallels found for the limited ceramic assemblages from TT1 point to similarities with south Caucasian and east Anatolian styles rather than Yanik Tepe and Godin Tepe in western Iran. Thus, the citadel's chronology spans five occupational phases with ceramic finds typical of Kura-Araxes cultural phases II (ca. 3200–2800 BCE) and III (ca. 2800–2500 BCE) (for Kura-Araxes chronology see Sagona, 2000, 2014; Badalyan, 2014). The chronology is supported by preliminary ^{14}C dates, one from the bottom of the 3rd and the other from the 4th occupation phase (see Table 1). Considering the fact that these two samples fall into the time span from 29th to 27th centuries BC, we may infer that the earliest occupation layers in the citadel could have occurred during the last centuries of the 4th millennium BC and the abandonment of the site in the 5th phase could have happened in the mid-3rd millennium BC. Further details of the site's stratigraphy and its fortification wall can be found elsewhere (Alizadeh, 2015; Alizadeh et al., 2015).

4. Craft production at Köhne Shahar

Strikingly, all horizontal trenches revealed primary and secondary indicators of workshops and craft activities dating to three occupational phases. These indicators fall into three categories: archaeological, geochemical, and geophysical.

Excavation of the citadel focused on three distinct neighborhoods: the Eastern Neighborhood, Central Neighborhood, and Western Neighborhood. All trenches revealed the footings or lower parts of round and rectilinear architectural spaces and associated materials and deposits. Most structures (henceforth denoted by the letter S followed by a unique structure number) are preserved to a height of about 40–70 cm. All footings were built of unworked basalt or limestone cobbles. Mud mortar was used to bind cobbles in the lower part of the walls. Most stone walls were mud-plastered. The upper part of the walls was likely made from mud-bricks or pisé, but evidence for the roofing material of the buildings is inconclusive. In the following, we will present some of the major indicators of workshop activities in neighborhoods.

Eastern Neighborhood: S101 in trench 13J1 was characterized by a 25–35 cm-thick homogeneous layer of industrial ash (Fig. 4a). Interspersed in the ash were several crucible slag fragments, and miniature vessels or crucibles probably used in smelting (Fig. 4b–d). S101 also contained more than a dozen small plain clay objects (Fig. 4e and f). It is not clear if they were tokens, loom weights, or spools for thread in textile production. Other objects include a stamp seal (Fig. 4g), numerous stone beads, and knapped obsidian tools. The secondary nature of this context suggests that S101 was used for discarding waster debris.

Evidence for craft production is also found in S202 and S401. S202 in trench 13I5 (Fig. 5a) contained a scatter of ashy deposits and a small 30 cm × 20 cm pyrotechnological installation in its south-western corner. The installation had a multi-layer plastered wall, which was built about 30 cm above the floor, and included a 30 cm-deep oval-shaped ash-box. Other finds include a miniature ceramic crucible (Fig. 5b) comparable to similar example from Dzedzvebi in Georgia (Stöllner, 2014: fig. 21b), ground stone implements, soapstone beads, numerous bone and antler tools, a plain clay token (Fig. 5d), and small quantities of knapped debitage and lithic tools. A unique characteristic of S202 was a set of six large, mostly-complete storage jars along its eastern wall.

S401 in trench 12J21 is a round structure that was partitioned in half, and each half (S401/1 and S401/2) contained a small 50 cm × 50 cm pyrotechnological installation in its north-eastern end (Fig. 6a). The installations stood about 35 cm above the floor, and were supported by a thin layer of flat reddish-orange stones and gravel, finished by a layer of hard clay plaster. Analysis using a non-destructive X-ray fluorescence spectrometer (pXRF) (Tykot, 2016) confirms the

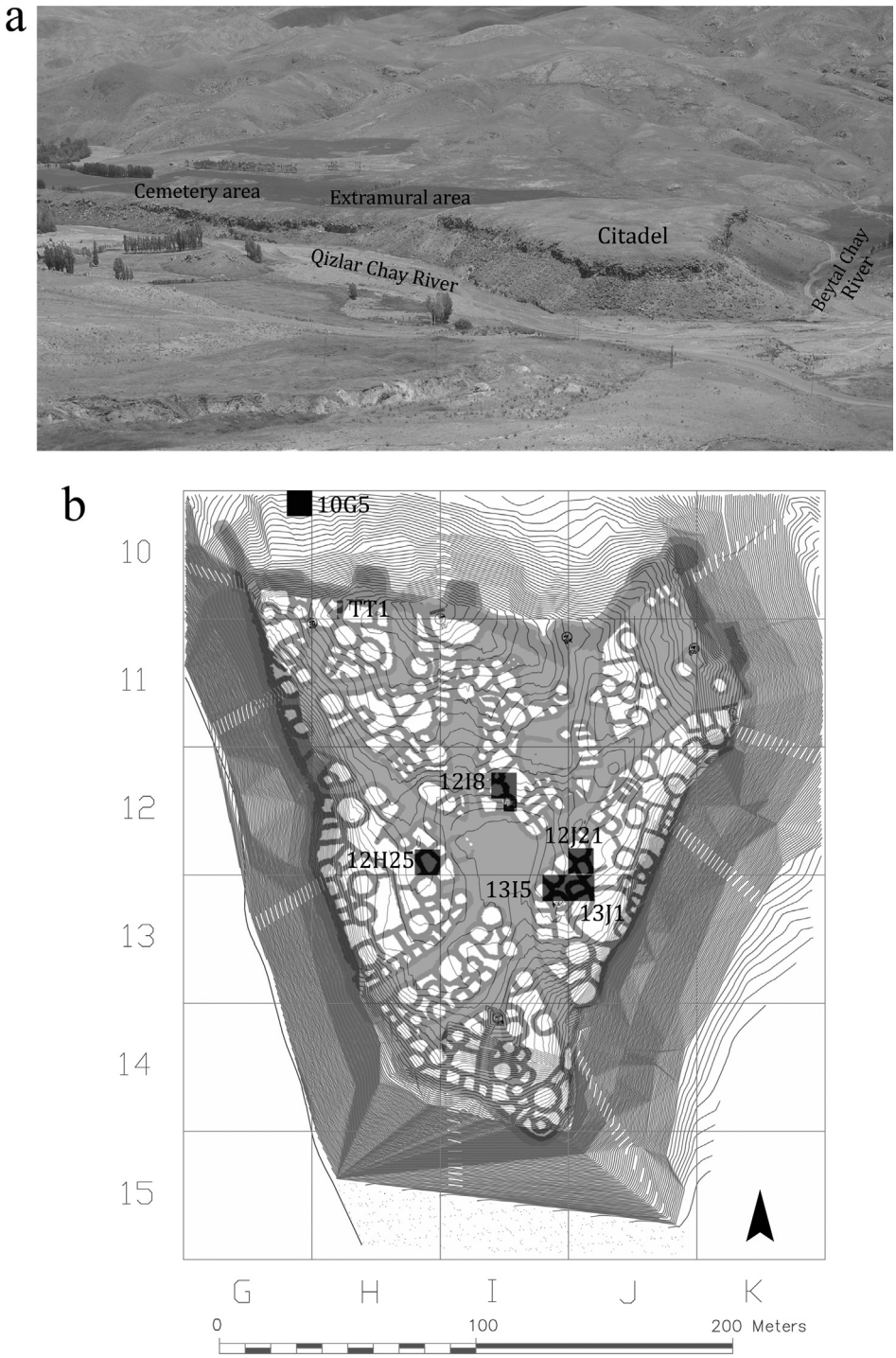

Fig. 3. (a) View of Köhne Shahar from the south. (b) Location of excavation trenches on an overlaid topographic map on a map drawn by Kleiss and Kroll (1979) (overlay of maps by Hamed Eghbal).

high calcium content in the plaster from the S401/1 installation, but without any clear evidence of copper or other metal residues in the sample tested (Appendix A). Other finds in S401 include ground stone implements (Fig. 6b–e) from S401/1, a clay token (Fig. 6f) from S402, a ceramic tuyère fragment (Fig. 6g) from S402, a metal awl from S401/2, numerous bone tools, many stone objects, possible weighing stones, a possible ceramic crucible from S402, and numerous stone beads. Homogeneous ash deposits were also documented in S402 immediately adjacent to the entrance to S401. Two small slag piles were also found in S411, which is situated next to S401. It seems that these finds are the byproduct of melting/casting, and they are not from primary smelting of ores. All of these suggest the possibility that metallurgy could be part of the production activities at the site that are yet to be discovered. In S401/1 partial removal of the partitioning wall revealed another pyrotechnological installation within a circular stone building from phase 3 or the lower occupation phase. Although these structures were not fully excavated, their similarities to the S401 were striking and suggest that production activities there span at least three phases of occupation. Trench 12J21 provided typical Kura-Araxes and some painted non-typical Kura-Araxes ceramics (Fig. 7). Painted ceramics are rare in Kura-Araxes world. Thus, painting as decoration could be related to the closest painted pottery tradition in northern Mesopotamia, Ninevite V

Table 1
AMC ^{14}C dates from KSH. Accelerated Mass Spectrometry Laboratory, University of Arizona; calibrated using OxCal v4.2.4 (Bronk Ramsey, 2013) and IntCal13 (Reimer et al., 2013).

Lab no.	Sample ID/ material	Context/ occupation phase	Radiocarbon age (BP)	Calibrated age BC (95%)
X30334	TT1/L114, Charcoal	On the floor of F.05 structure, Phase 3	4194 ± 22 years	2890–2694
X30752	12I8/ L315, Seed	S306, Phase 5	4170 ± 22 years	2880–2670

(Alizadeh et al., 2015).

Central Neighborhood: careful analysis of the relationship between S306 and other structures in trench 12I8 suggest that the construction of S306 preceded the construction of other buildings (Fig. 8). However, walls of S306 were integrated into other structures suggesting that it could have been in use even after construction of newer buildings such as S301, S302, and S303. We uncovered only a small portion of S306 and the rest of the structure goes beyond our trench to the north. However other associated materials and objects within a small area of the structure may allow us to have some speculations about the function of the space. In the lower layers (phase 4), we found a 30 cm thick deposit of a black, homogeneous ashy layer with some ceramic vessels, numerous slags fragments, and animal bones. In both phase 4 and 5, evidence of craft production is abundant, though perhaps not as

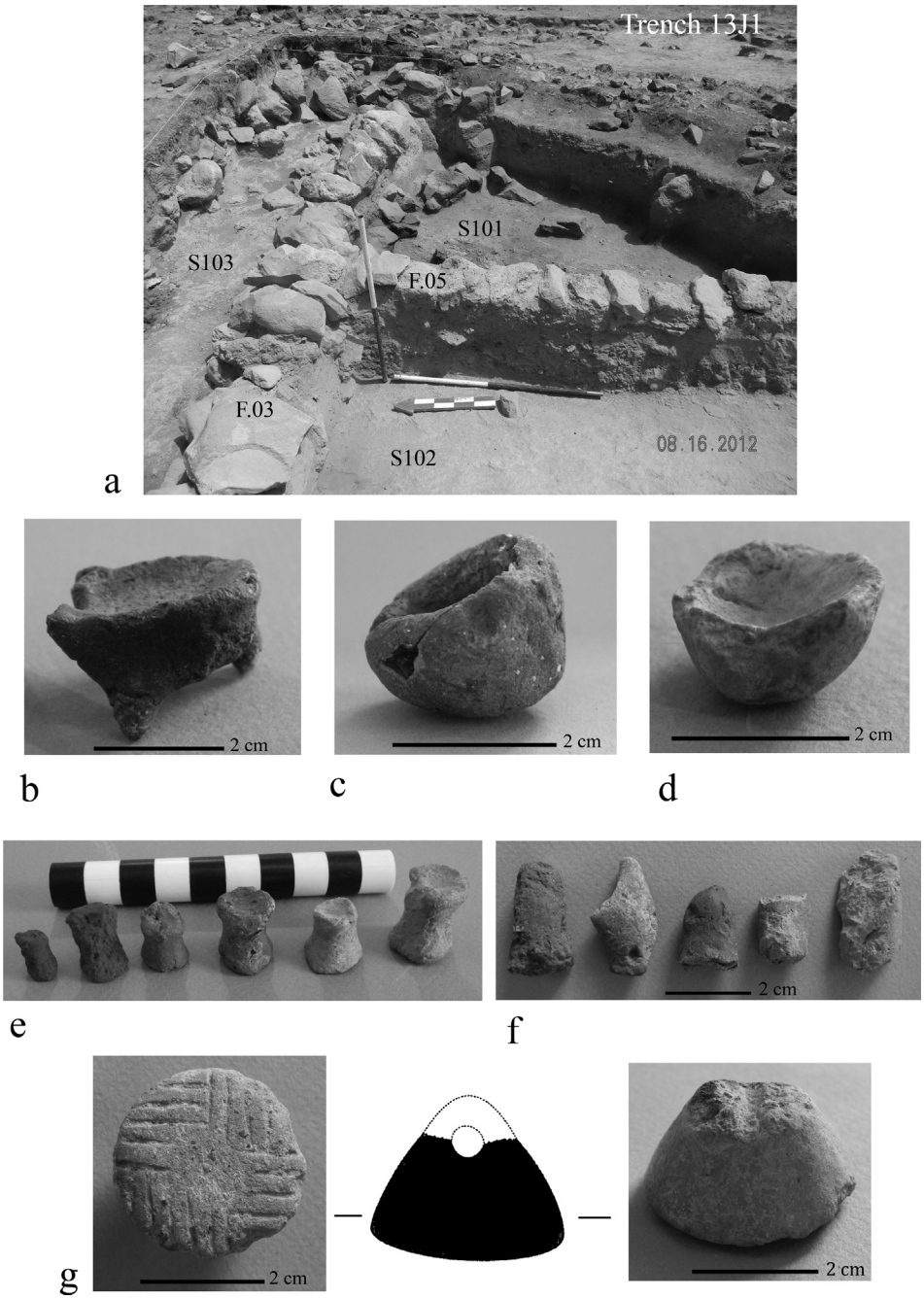

Fig. 4. (a) Some of the architectural remains from trench 13J1. (b, c, and d) Crucibles. (e and f) Possibly clay tokens. (g) Clay stamp seal.

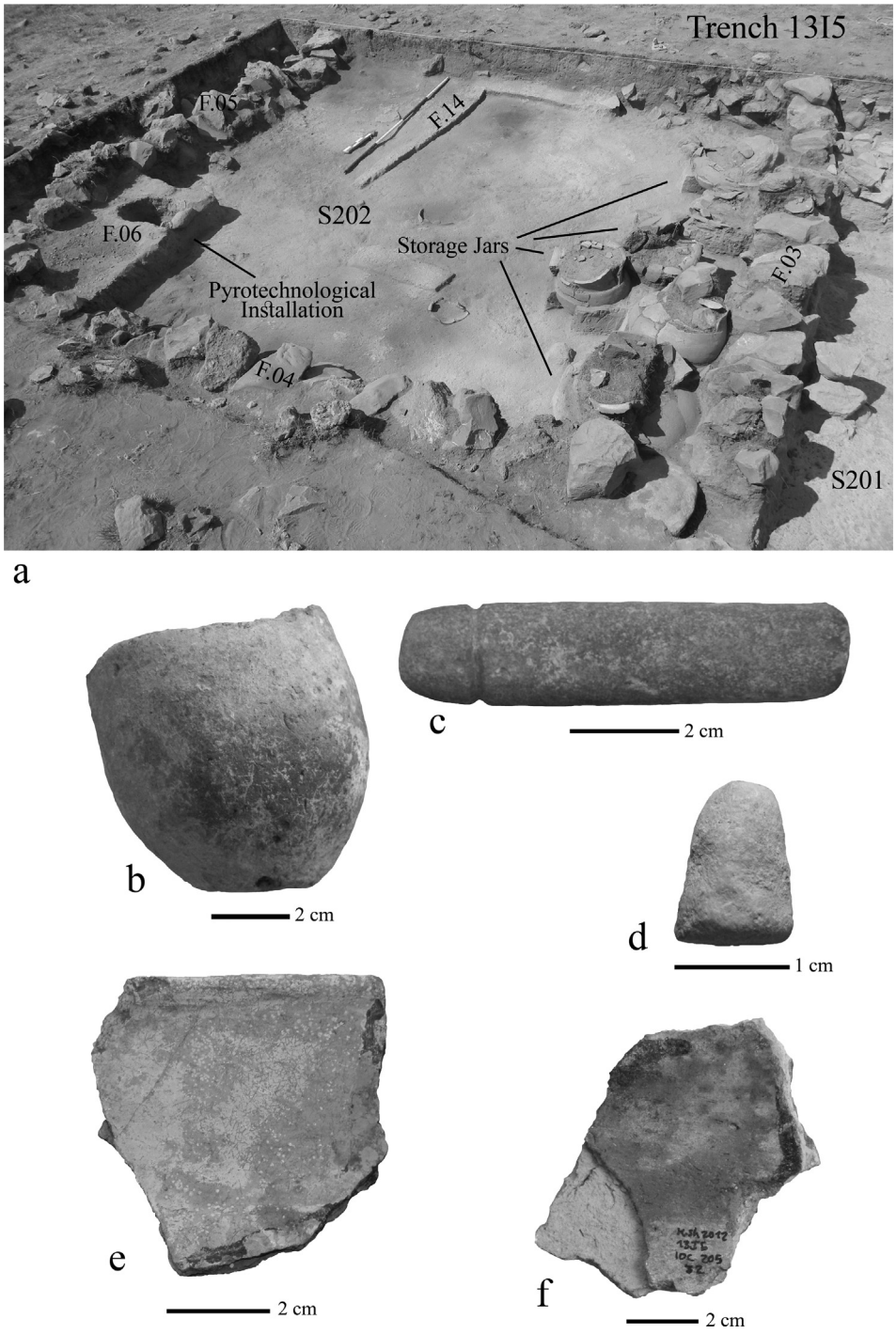

Fig. 5. (a) Trench 13I5 and some of the findings from S202. (b) A clay crucible. (c) A stone implement. (d) A clay token. (e and f) two ceramic shards with residue of bitumen on their broken edges.

concentrated as in the other two neighborhoods. S306 along with S303 and the Public Space in phase 5, contained several horncore fragments of cattle and wild caprines, some with basal cutmarks, which suggests horn-working activities took place in this area. Generally, the admixture of deposits and associated materials in S306 seem very similar to S101. The secondary nature of these contexts suggests that S101 and S306 were used for discarding waster debris.

Western Neighborhood: another pyrotechnological installation was documented in S502 (Trench 12H25) (Fig. 9a). This 60 cm × 60 cm feature was constructed and supported in the same manner as the features in S401. pXRF analysis was conducted on the installation's wall with settings and a filter for metals, and the results show a notable presence of copper on the wall surface (Appendix A). A unique feature of S502 is a mud-brick bench, on top of which we found numerous heavy stone pounders, hammer-stones, and anvil stones (e.g. Fig. 9d and e). Other finds from S502 include two slag fragments, various finished and unfinished stone beads (Fig. 10b), bone tools (Fig. 9g), a large stone object (Fig. 9c), two ceramic tuyère fragments (Fig. 9b and f), and a miniature container with dot-in-circle designs (Fig. 10a). The latter is yet to be analyzed for its material, however it is likely that it is made of either ivory or steatite.

Outer town: our excavation and intense surveys in outer town

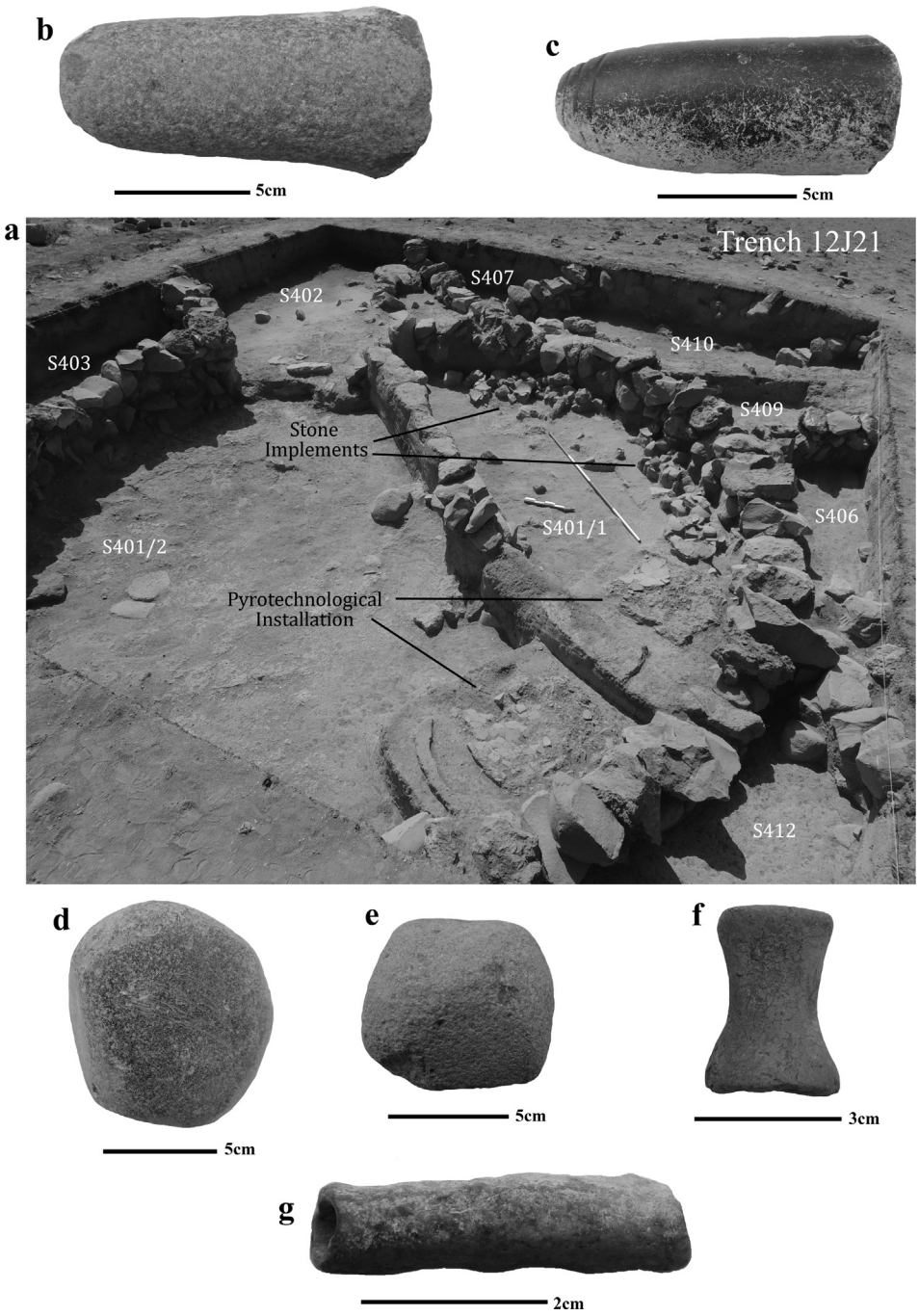

Fig. 6. (a) Architectural remains from trench 12J21. (b, c, d, and e) Some of the stone implements from S401/1. (f) A clay token. (g) A tuyère.

suggests that the unprotected area to the north of the citadel's defensive wall was probably much denser than it appears on the sketch map of the German team (Kleiss and Kroll, 1979). In trench 10G5, we uncovered 5 stone structures in two occupation phases (Fig. 11a). Ceramics from trench 10G5 represent a typical black-burnished Kura-Araxes tradition (Fig. 11b, d–f) with few exceptions (e.g. Fig. 11c). Black-burnished with incised decorations as one of characteristics of Kura-Araxes III phase suggest that the latest occupation of the outer town was most likely contemporary with the citadel. Recovered materials include stone pounders, hammer-stones, and anvil stones (Fig. 11g–j), possibly related to craft activities. However, we do not rule out multi-purpose function of these implements since they could also be used for food processing. In S602, a poorly preserved stone feature (F.09) resembles pyrotechnological installations inside the citadel. Although its clay plaster on the top was poorly preserved, we could estimate its size which could be about 50 cm × 50 cm. It was composed of a concentration of pebble stones in the bottom (even they have used broken stone implements among pebble stones as material) and then smaller flat reddish orange gravels among them and on the top.

5. Discussion

These workshop units and their associated features and objects are unambiguous and direct indicators of on-site production of various craft goods throughout three consecutive phases of occupation inside the citadel. The finds from Köhne Shahar are well-documented indicators of craft production (i.e. Tosi, 1984: 25; Costin, 1991; Matthews, 1995: 459). It is possible that residents of both the citadel and outer town

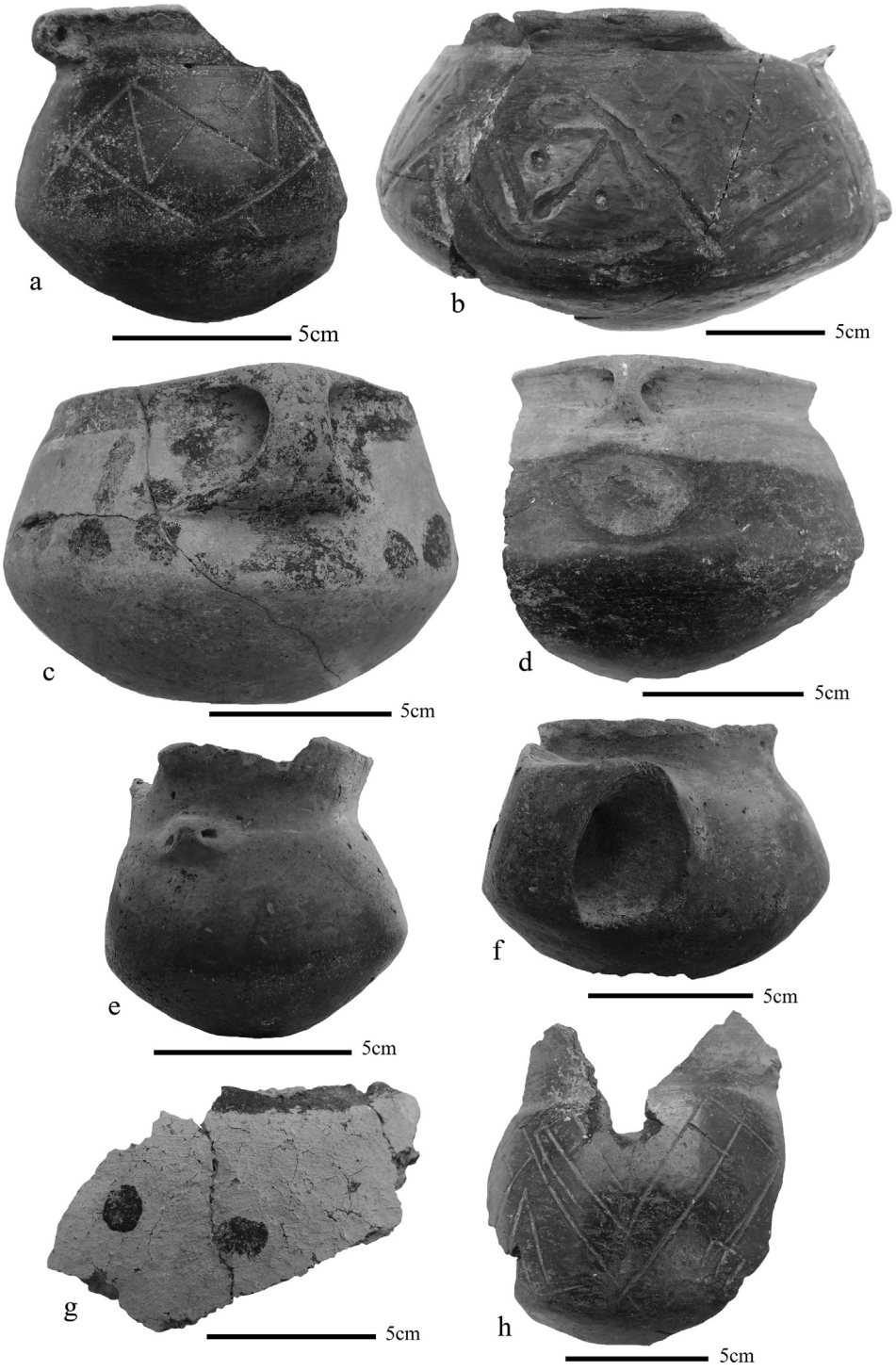

Fig. 7. A selection of Kura-Araxes ceramics from S401 in trench 12J21, Köhne Shahar.

were engaged in craft and workshop activities but probably with different scales. The evidence of craft activities in both the citadel and outer town suggest that a considerable portion of people, if not all, were involved with craft production and related activities, which were practiced at the community-level.

High iron and calcium pXRF values in some pyrotechnological samples are indicative of high-temperature activities like metal casting or ceramic firing. There is also clear archaeological evidence for multiple stages of bead making at the site, and there is zooarchaeological evidence (Samei et al., 2013 ; Alizadeh et al., 2015) for horn working and textile production. We can therefore conclude that at Köhne Shahar, workshop units produced a wide range of different products, the full range of which is not yet known to us. What was the scale of production, how were labor activities organized, and who consumed the finished products?

Determining the nature and scale of craft production activities in the archaeological record is often difficult, and doing so requires combining multiple lines of evidence to provide a more compelling image. The excavations and geophysical survey both show that workshop activities were distributed across a wide area encompassing three neighborhoods. While this does not mean that all structures were solely dedicated to production, the spatial scope of activities suggests that craft production

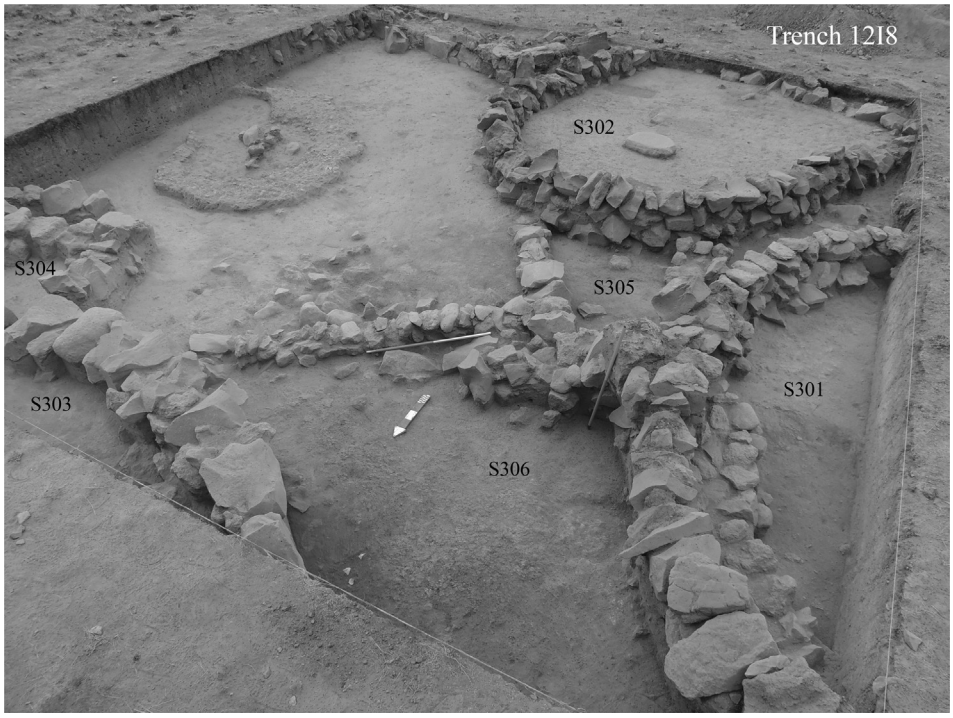

Fig. 8. Architectural remains from trench 12I8 on the northern edge of the central plaza.

was practiced at a community level at the site, a level of production similar to what Costin calls "community specialization" (1991). In this light, similar to the site of Dzedzvebi in Georgia (Stöllner, 2016) the absence of evidence for intensive domestic activities or food production in the excavated areas is noteworthy. Thus, in terms of scale of production, one may infer that production at Köhne Shahar could have been either *nucleated* or *administered* production (Wattenmaker, 1998: 4; Sinopoli, 2003: 32–33). Despite the need for sustenance and food production activities, at least a large portion of the population was dedicated to craft production, which indicates some level of labor division and specialization. Evidence for community specialization at the site, however, does not necessarily mean that all products were produced using the same mode of labor organization; economic specialization can take on many forms (Costin, 2001, 2015).

S401, S202, and S502 may represent production of different types of goods. S502 was primarily a bead and ornaments manufacturing area. Perforated soapstone beads and unperforated blanks show that all stages of their production took place in S502. These are soft enough that they can be drilled by hand using simple tools (Miller, 2007), like the numerous bone and antler perforators recovered in S502 (Fig. 9g). S502 also contains a blank of a synthetic steatite bead, and a miniature container, possibly made of a similar material. Working with steatite is more complex than softer soapstone. Steatite ores must first be crushed and powdered. The powder must then be heated to 1000 °C to render a paste, which can be shaped into bead blanks (Bar-Yosef Mayer et al., 2004). The blank can be cut to produce individual beads. Evidence for making such beads have been recorded in contemporaneous sites elsewhere, particularly in Indus Valley, the Arabian Peninsula, Anatolia and the Levant (Panei et al., 2005; Potts, 2008; Pickard and Schoop, 2013). We have not recovered any steatite ore fragments in S502, but the large stone implements on top of the platform could have been used to crush the ore, and produce the powder, which could then be heated in the pyrotechnological installations. The presence of all stages of bead production in the same single-cell chamber suggests that the same individual or set of individuals could have performed all tasks. This is different from S401, another bead making workshop.

In S401, differences in the type of artefacts between the two partitioned halves suggests that different stages of production took place in each. Presence of numerous soapstone bead, bead blanks, and bone perforators in S401/2 indicate bead production. In S401/1, where beads and bone perforators are absent, there are large stone implements, similar to S502. The exact function of activities here is unclear, but it may have been an area of processing steatite ores similar to S502. Under this scenario, ores were crushed and sorted in S401/1; and the paste then shaped and perforated in S401/2. Such division of labor in S401 points to producer level specialization (Muller, 1984; Rice, 1991: 262–263; Stark, 1991: 73; Flad and Hruby, 2007).

Unlike S401 and S502, S202 is a rectilinear structure with a different layout, and artefacts. Like those two, S202 also has evidence of bead use or bead manufacturing, but there is some zooarchaeological evidence of weaving here as well. Similar types of material but different layouts may suggest work by different groups of artisans and specialists. Yet, similarities, namely, the presence of the same sized pyrotechnological installations, suggest that they adhered to certain basic standards of production; the "kiln" is a standard furniture all over.

Another unique feature of S202 is its association with possible indicators of administrative control (Pollock, 1992; Pittman, 1994: 121). These include a stamp seal and more than a dozen clay objects in S101 (Fig. 4e–g) that could have been used as tokens (for parallels see e.g., Schmandt-Besserat, 1992). These clay objects could also be loom weights or spools for thread in textile production. They are comparable in shape with some of the loom weights in the ancient Near East and Europe (Cecchini, 2000: Fig. 1; Boertien, 2009: Fig. 6; Mårtensson et al., 2009). We should point out that most of the objects known as loom weights are bigger in size than clay objects at Köhne Shahar. Small objects also include a sealing clay in S201 with the impressions of string that suggest its use in fastening sacks on a container (Fig. 10c). This is interesting because S201 is next to S202 in which we recovered six large storage jars. We assume that such sealing could have been used in fastening the sacks on these containers.

Such administrative artefacts are not common in Kura-Araxes settlements. For example, no tokens have been documented at any other Kura-Araxes settlements, and the total number of seals recovered from Kura-Araxes sites in the southern Caucasus does not exceed one dozen

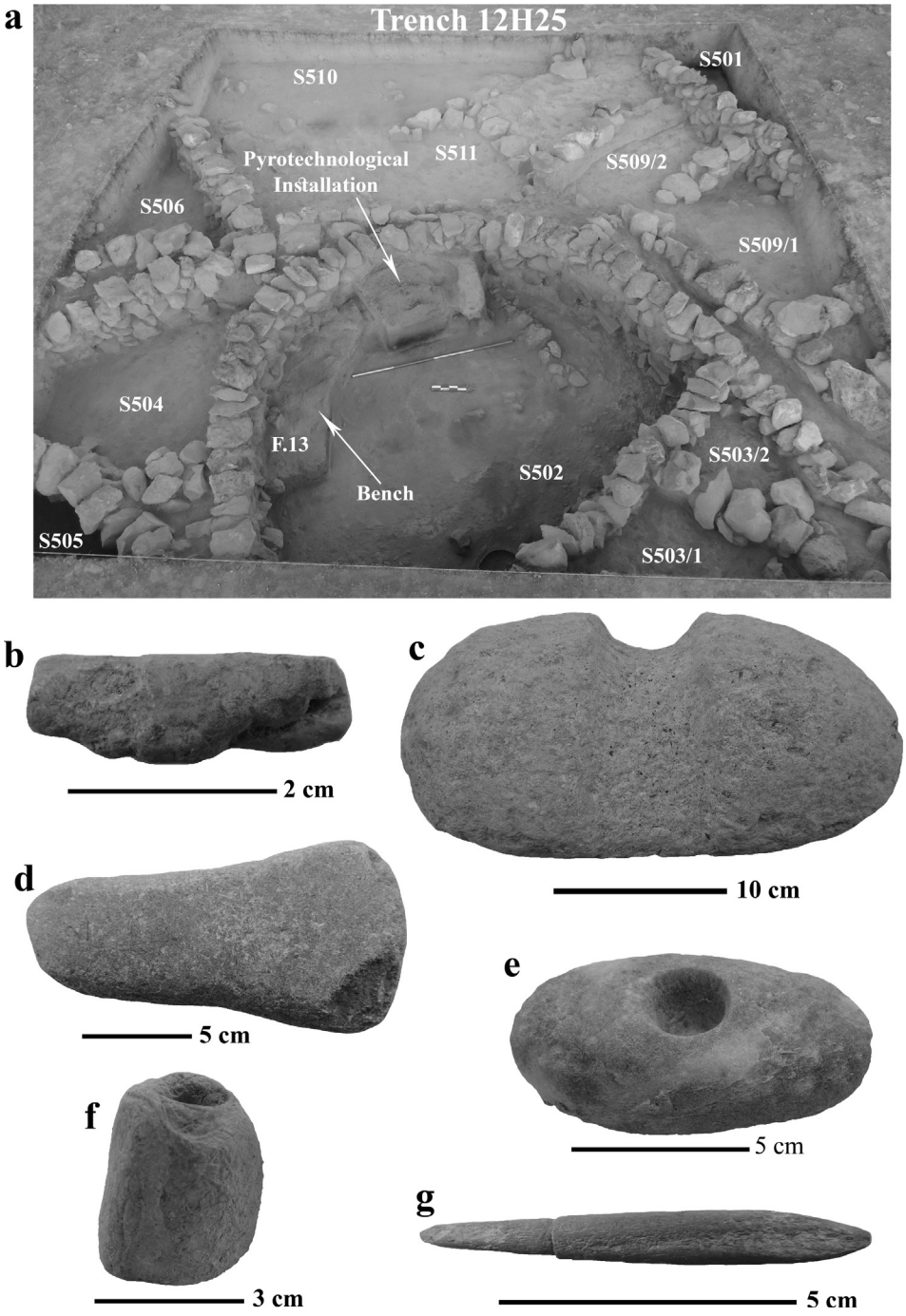

Fig. 9. (a) Architectural remains from trench 12H25. (b and f) Tuyères. (c, d, and e) Some of the stone implements from S502. (g) One of the bone tools from S510.

(Sagona, 1984: 117–118; Sherazadishvili, 2014: 168). We do not rule out the possibility that even the stamp "seal" could also be used as a stamp for decorating something like textiles. If, however, these objects had an administrative function, their number at Köhne Shahar is remarkable. S201, where the sealing clay was recovered, is a unique structure, as it was paved by mud-bricks and lacked any evidence for production activities. S201 also shares a wall with the eastern wall of S202, where six large storage jars were found. Similar juxtapositions of administrative objects such as sealing clays and storage facilities at Kura-Araxes occupations of Arslantepe VIA and Tepe Gawra (Ferioli and Fiandra, 1983; Rothman, 2004: 87) have been interpreted as indicators of exclusionary management of agricultural surplus by social elites. Administrative objects do not always suggest the existence of a state or political power, nor do they necessarily respond to the organizational needs of small kin-based societies. Rather, bureaucratic development is an indicator of control (Rothman, 2004: 76). The effective involvement of political power in specialized craft production and exchange systems requires control and administrative oversight. This suite of evidence points to the possibility that production in S202 may have required a higher order of labor and administrative specialization.

The evidence for community-level production then begs the question: who was the consumer? The abundant production-stage

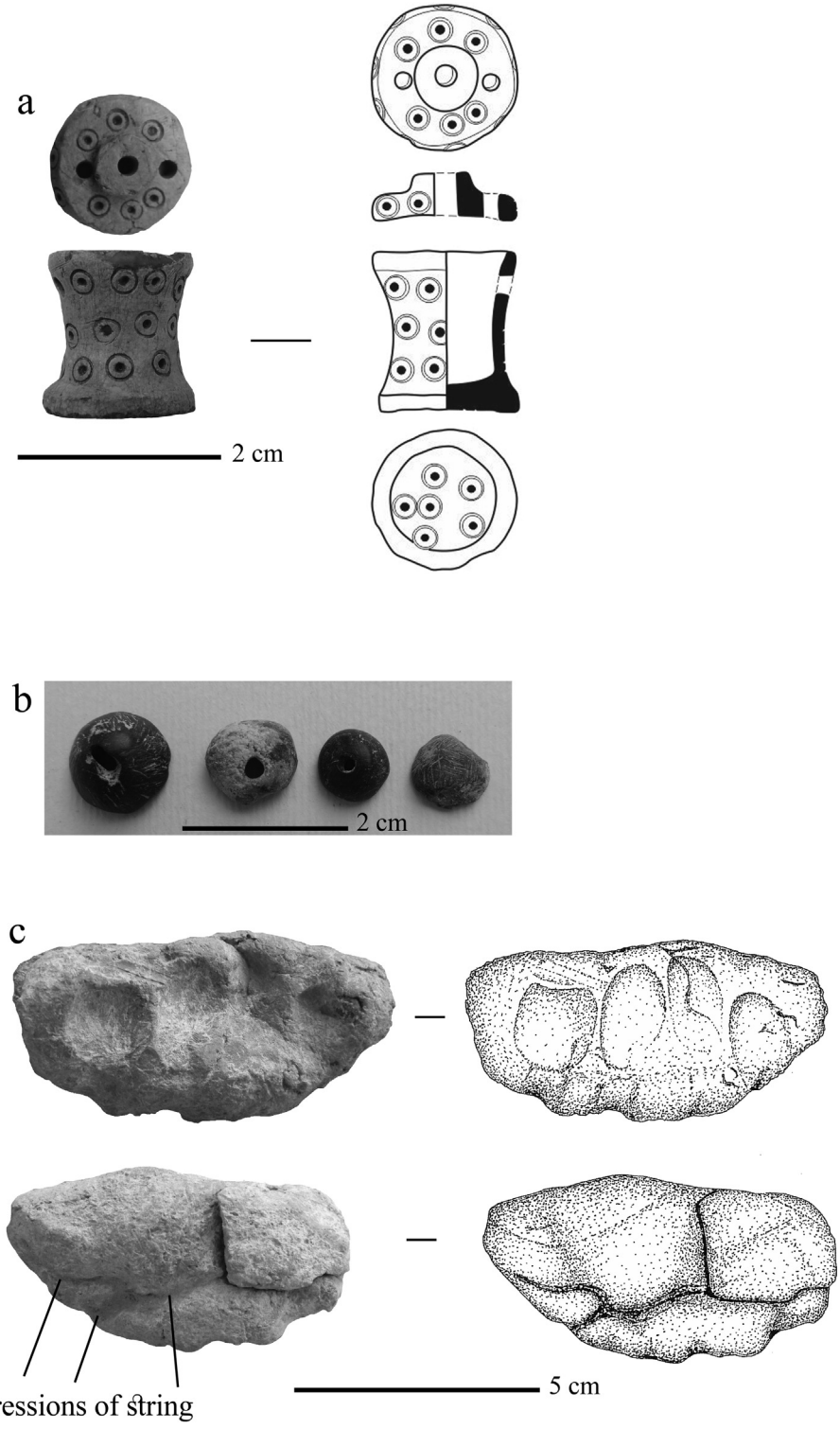

Fig. 10. (a) A miniature container from S502 in trench 12H25 (illustration by Halaleh Bayazidi). (b) Some of the unfinished stone beads from S510 in trench 12H25. (c) A sealing clay found in S202 in trench 13I5 (illustration by Hamed Eghbal).

material—waste (e.g. slags and ash), bone and antler tools, and unfinished stone beads—stands in stark contrast to the virtual absence of finished products suggesting a separation of loci of production and consumption. It is possible that producers, who may have lived among these workshops or in other as yet unexcavated areas of the citadel, may have consumed some of their own products. But it is difficult to imagine that production on this scale inside and outside the citadel was solely to fulfil the needs of the Köhne Shahar's residents.

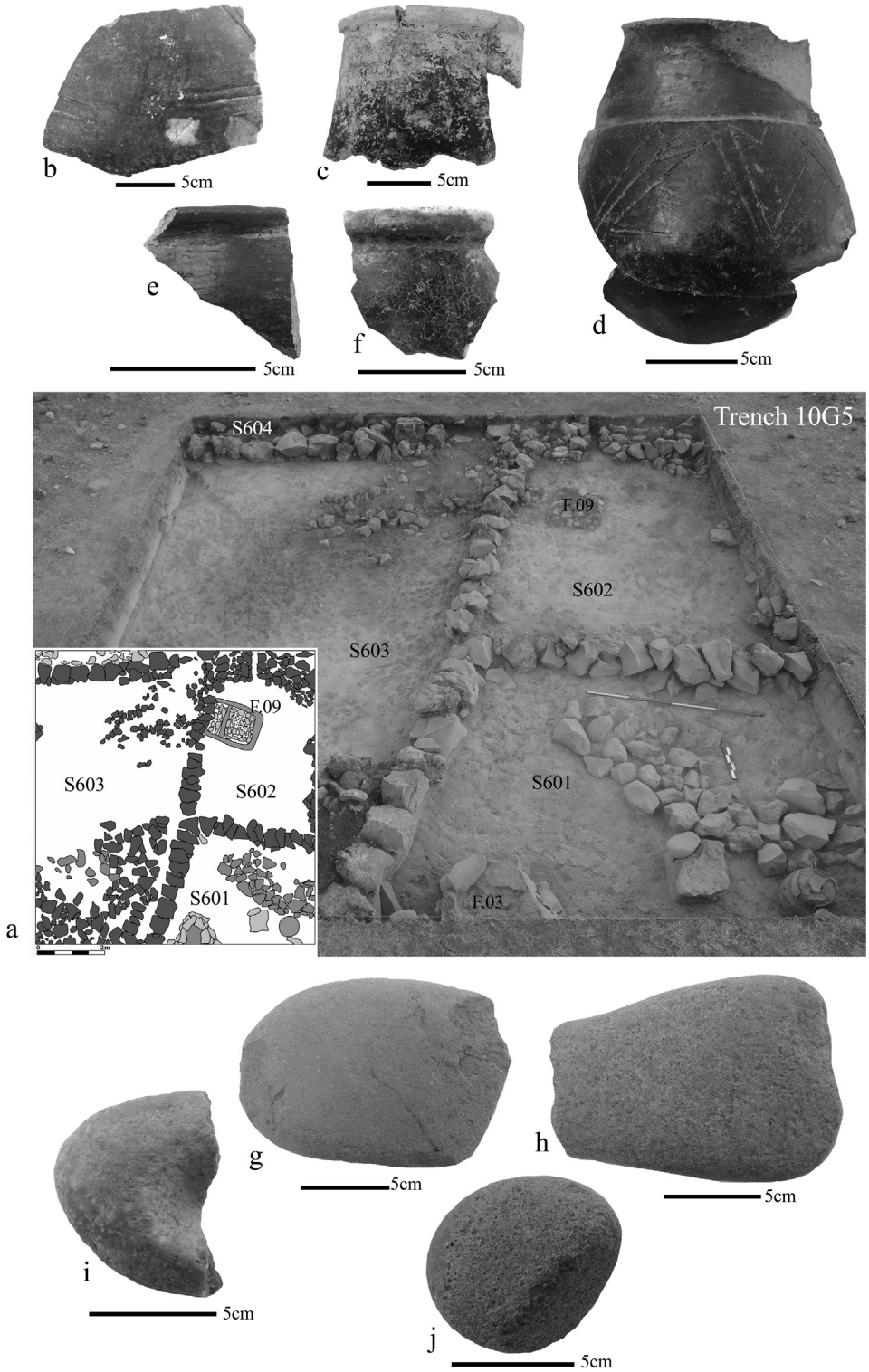

Fig. 11. (a) Architectural remains from trench 10G5. (b–f) Some of the Kura-Araxes ceramics from trench 10G5. (g–j) Some of the stone implements from S601 and S602.

The combined indicators for community-level production and the separation of loci of production and consumption suggest that production activities at Köhne Shahar primarily targeted consumers residing in other communities in the vicinity of the site or elsewhere in the region. This is tentatively supported by evidence of possible long-distance exchange, or at least inter-regional interaction. For example, a unique and elegantly-made miniature container made of ivory or steatite from S502 (Fig. 9a) is characterized by carved dot-in-circle designs that find parallels on other steatite and ceramic containers from 3rd in eastern and south-eastern Iran, the Indus world, and even Central

Asia and early 2nd millennium BC settlements in the Persian Gulf region (David, 2002; Potts, 2008; Morello, 2014). The only parallel from the Caucasus might be a small pendant from the Middle Bronze Age or latest Kura-Araxes contexts of Shengavit (Simonyan, 2013). The container from Köhne Shahar may have been a sumptuary object, since the time and energy invested in its manufacturing was probably incongruous with its functionality.

Another indicator of inter-regional contact is the trace of bitumen found on many ceramic fragments (Fig. 5e and f). Bitumen acting as an adhesive and waterproofing agent has been recorded in many archaeological and ethnographic cases in the Near East (Connan, 1999; Schwartz et al., 1999; Schwartz and Hollander, 2000; Gregg et al., 2007). The closest sources of bitumen to Köhne Shahar could be Siirt in south-eastern Anatolia, or Mosul in northern Mesopotamia (Connan and Van de Velde, 2010). All of these indicators point to possible long-distance trade and inter-regional exchange. Exchange networks were another venue through which leaders could maintain their social status and perpetuate social inequality in their communities (Rathje, 1971; Earle and Ericson, 1977; Ericson and Earle, 1982; Cobb, 1993: 60–65).

Finally, Köhne Shahar's location says something about its interaction with the outside world. Residents of Köhne Shahar chose to settle, not in the fertile high plain of Chaldran, 12 km to the SE, but in the surrounding high mountains. This suggests that agricultural output was not an economic priority. Rather, they seem to have opted for a location that is generally equidistant between eastern Anatolia and the Caucasus, and along the path of least resistance to the Araxes river valley (64 km to the NNE); which would provide direct access to agricultural communities of the Araxes river valley, but also access to the mountainous areas of the Caucasus, and the Kura-Araxes communities of eastern and SE Anatolia, particularly in Erzurum, Mus, and Malatya. This strategic location would also furnish the site with access to mobile pastoralists who supplied the site with animal products, but also served as critical vessels of communication and exchange with other Kura-Araxes communities. Thus, Köhne Shahar would have been ideally situated to serve as one of the major economic centers of the Kura-Araxes cultural tradition.

6. Conclusions

The abundant evidence of craft specialization at Köhne Shahar clearly shows that Kura-Araxes communities were not all homogenous and undifferentiated. Excavations and a geophysical survey at Köhne Shahar demonstrate that multi-craft production activities were practiced at a community-level inside the citadel at the site, and that a large portion of the population may have engaged in this specialized, extra-household craft economy. The possible involvement of a political apparatus with a specialized craft economy at Köhne Shahar may have necessitated control over various aspects of production such as labor, commodities, resource procurement, exchange, and grain storage. As Adam Smith (Smith, 2015: 106) argues, all of these point to complex labor coordination at Köhne Shahar.

Although excavations exposed a limited area, the scale of craft production at Köhne Shahar and the scarcity of finished products may suggest that consumers of finished goods were not necessarily residents of Köhne Shahar, but instead occupied other areas on the landscape. Communication between these nodes of production and consumption necessitated a network of exchange and interaction. The miniature sumptuary container at Köhne Shahar points to possible interaction with regions of Central Asia and the Persian Gulf, while the bitumen used to mend vessels points to interaction with northern Mesopotamia or the Zagros mountains in western Iran. It is possible that long-distance interaction brought Köhne Shahar chiefs into contact with other complex societies in the region, connecting them to a larger inter-regional exchange and trade network.

Archaeological and geophysical evidence for community-level production documents Köhne Shahar's emergence as a regional economic center. The extent of Köhne Shahar's regional engagements and ambitions, however, have yet to be fully understood. Köhne Shahar's economic focus on production may have enabled its producers to contribute to regional transformations. When trade became a significant part of the economy of early complex societies in the Near East in the second half of the 4th millennium BC (Surenhagen, 1986; Algaze, 1989, 2004), Kura-Araxes communities like Köhne Shahar may have emerged as a primary center of specialized craft production in the late 4th/early 3rd millennium BC. Alternatively, Köhne Shahar's economic success may have been due to its ability to satisfy regional demand (highlands of NW Iran, eastern Anatolia, or northern Mesopotamia) by filling a supply vacuum created following the collapse of Uruk colonies. Political and entrepreneurial ambitions of Köhne Shahar chiefs may have also provided the impetus for the selection of the site's naturally defensible area and the construction of a large and defensive fortification wall; two barriers intended to safeguard the production machinery of the citadel from the onset of the site's occupation in the late 4th millennium BC (Alizadeh et al., 2015).

It should be noted that we do not imply that Köhne Shahar followed the same developmental processes that other complex societies did in the Near East. Our understanding of social organization at Köhne Shahar is in a preliminary stage and the data at disposal is not sufficient to apply any model yet. However, Köhne Shahar could be somewhere between two ends of a spectrum where in the one end existed a centralized social organization and in the other a decentralized organization.

Acknowledgments

KA and SS thank their advisors and committee members Jason Ur, Natalie Munro, C.C. Lamberg-Karlovsky, Philip Kohl, Richard Meadow, and Gideon Hartman for their inspiration and guidance. We benefited greatly from insights and comments of Stephan Kroll, Mitchell Rothman, Adam Smith, Karen Rubinson, and Catherine Marro. We also thank the Iranian Center for Archaeological Research and its directors, Hamideh Choubak, Siamak Sarlak, and Mahmoud Mireskandari, for issuing excavation permits. Thanks to the directorate of the General Office of the Cultural Heritage and Tourism Organization of West Azerbaijan for its support. Special thanks to our team members and colleagues Hamed Eghbal, Ebrahim Kharrazi, Halaleh Bayazidi, Sepideh Maziar, Hakimeh Afsharinejad, Narges Bayani, Akbar Azizi, Qader Ebrahimi, Parastoo Hosseini, whose invaluable support made this project possible.

Funding

This work was supported by the Department of Anthropology at Harvard University and the American School of Prehistoric Research to Karim Alizadeh, and the Department of Anthropology at University of Connecticut and the National Science Foundation (NSF-DDRI) grant (#5635840) to Siavash Samei.

Appendix A

Eight samples from Köhne Shahar were analyzed to identify their major components and interpret their use (Table in below). The analyses were conducted using a non-destructive, portable X-ray fluorescence spectrometer (Tykot, 2016). Specifically, a Bruker III-SD instrument was used, with analyses conducted for 60 s while at 40 kV and 1.5 μA. Two types of analyses were conducted, on multiple spots for each sample: the first was using a vacuum (and no filter), to assess the broad composition of the material, including major elements as low as Mg and including Si, Al, Ti, K, Ca, and Ti.

The second used a filter (12 mil Al + 1 ml Ti) specifically for enhancing the measurement of metals including Fe, Ni, Cu, Pb, Zn, As, Ag, Sn, Sb, Au, Hg, and Pb. In both cases, the beam size was 8 mm in diameter XRF analyses only reveal values for the surface, with the thickness of adhering materials and coatings affecting their contribution to the results. Two spots on each object were analyzed to assess intra-sample variability.

USF #	Site	Year	Trench	Locus/feature	Sample	Comment
29741	KSH	2013	12I8	L315	Slag	lightweight, not “slag”
29742	KSH	2013	13I5	L239	Slag	lightweight, not “slag”
29743	KSH	2014	12J21	L429 (S403)	Slag	lightweight, not “slag”
29744	KSH	2012	13J1	L112 (F09)	Slag	higher density
29745	KSH	2014	12J21	L438	Slag	lightweight, not “slag”
29746	KSH	2014	12J21	L435 (S401/1)	Crucible piece	dense, ceramic?
29747	KSH	2014	12J21	F11	Sample from wall of installation	plaster coating on inner surface; no clear indication of copper
29748	KSH	2014	12H25	L.514 (S503)	Sample from wall of installation	plaster with black interior; clear evidence of copper

Multiple analyses of the same spot of a variety of materials have shown that the precision (plus/minus) of pXRF analyses is as good as regular XRF and many other analytical instruments; the accuracy of the values produced, however, depends on the analysis of many standards of similar bulk composition and creation of a calibration curve. This has not been done yet for Ca- and Fe-based materials.

XRF results for the five “slag” samples are very similar, with four of the five having low silicon (and varying amounts of calcium), and one (USF no. 29742) with much higher silicon. Iron is a noticeable component too, but overall these samples may be identified more as the byproduct of melting/casting rather than as primary smelting. They may be from furnace lining or other material altered at high temperature.

The “crucible” sample does not have more iron or copper than the “slag” samples. The “crucible” sample does have less Sr than the “slag” samples, however, supporting the interpretation that these materials came from a different place or type of material.

The F11 wall sample (USF no. 29747) has very high calcium (presumably plaster covering the wall material). Analyses were done on both the thin outer layer (red), and the exposed bulk material (blue) as seen in Fig. A1, without any noticeable amount of copper or other metals. The L514 wall sample (USF no. 29748) reveals a modest amount of copper present. This strongly supports the interpretation of the function of this unit as for casting (Fig. A2).

Additional study and analysis of the materials found at this site, and their specific contexts, would allow further conclusions on the activities that were performed.

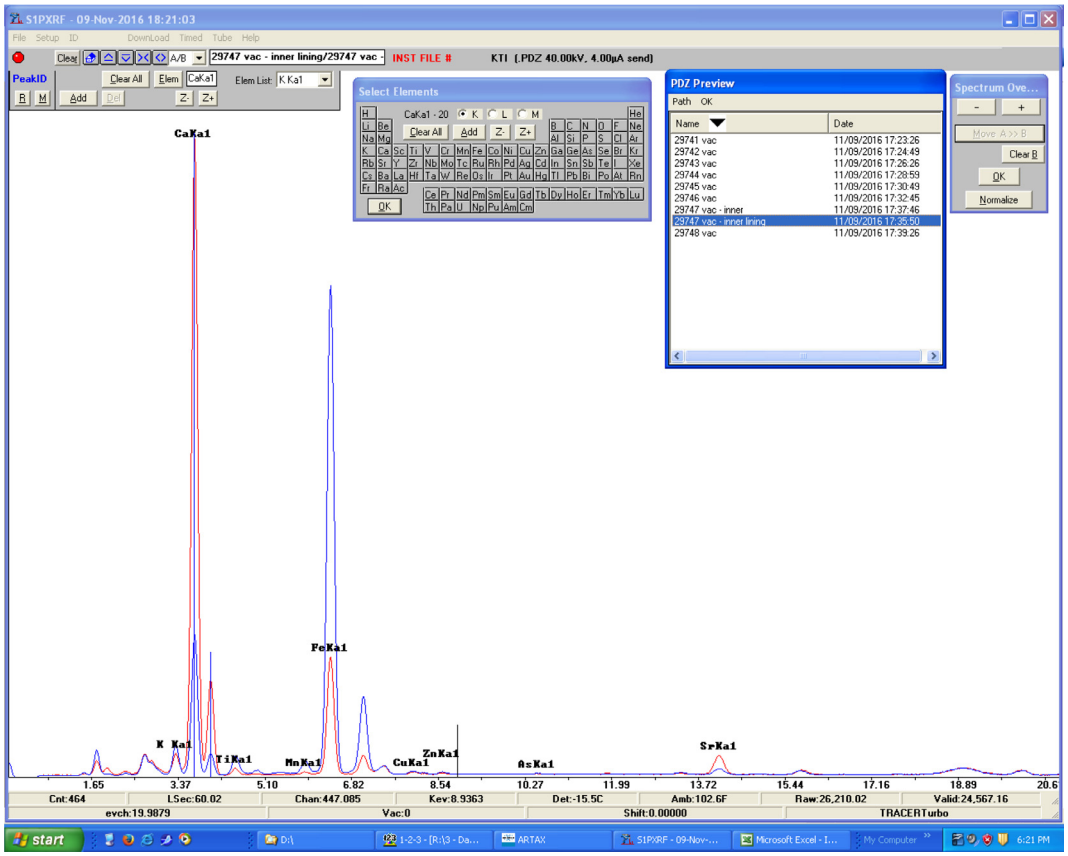

Fig. A1. Analyses of USF no. 29747 at both the inner lining (in red) with very high calcium, and the overall main material (blue). The differences in Ca and Fe are the result of the thickness and/or purity of the calcium-based plaster and the material of the wall (e.g. clay with higher Fe). (For interpretation of the references to colour in this figure legend, the reader is referred to the web version of this article.)

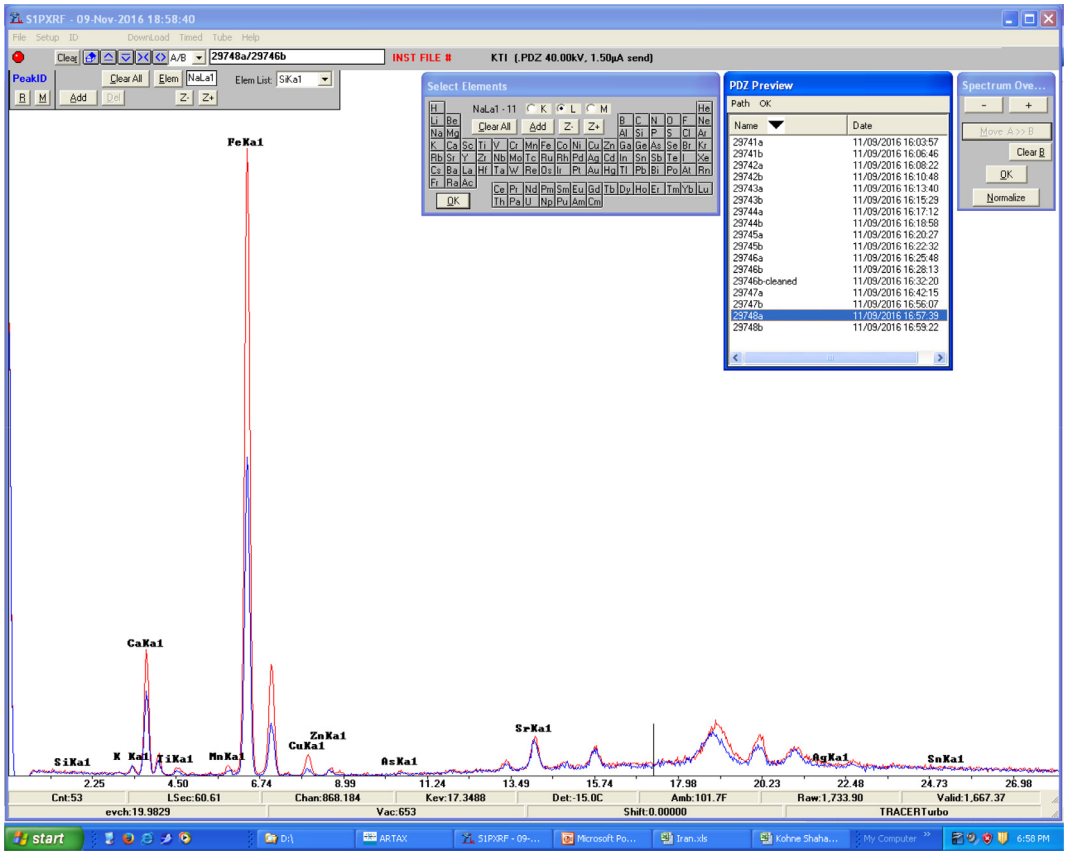

Fig. A2. Analysis of a wall sample (USF no. 29748, in red), clearly indicates a notable presence of copper, while the "crucible" sample (29746, in blue) may have traces of some copper in its surface residue. (For interpretation of the references to colour in this figure legend, the reader is referred to the web version of this article.)

Appendix B. Supplementary material

Supplementary data associated with this article can be found, in the online version, at https://doi.org/10.1016/j.jaa.2018.06.006.

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