The Lowland Patayan in the southern U.S. Southwest: Tracking vessel movement through ceramic compositional analyses

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ABSTRACT

We evaluate possible source areas for the ancestral Yuman (Lowland Patayan) ceramics at Las Colinas (AZ T:12:10 [ASM]) in Arizona's Phoenix Basin approximately 1000–1200 CE, using neutron activation analysis and other compositional data from southern California, the eastern Papaguería in Arizona, and Las Colinas. Our study finds no evidence of ceramic vessels moving long distances between these different regions occupied by the Lowland Patayan, although vessels may have been moved over shorter distances. The Patayan ceramics at Las Colinas were not made there, but could have been made within a several-days walk of Las Colinas using an undocumented source of phyllite for temper.

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1. Introduction

During late prehistory, Native Americans throughout the U.S. Southwest engaged in widespread interactions, exchanges, conflicts, and population movements (Hill et al., 2004; Mills et al., 2013; Mills et al., 2015). These regional alliances, economies, and demographic shifts are perhaps best known from the archaeological record of village farmers, but smaller groups of mobile horticulturalists and foragers also participated. Here we address movement and exchange among ancestral Yuman (Lowland Patayan) groups in the southern Southwest using ceramic compositional data from southern California, the Gila Bend, Arizona area of the eastern Papaguería, and the site of Las Colinas (AZ T:12:10 [ASM]) north of the Salt River in Arizona's Phoenix Basin. Although other evidence suggests that Lowland Patayan people moved eastward across the Papaguería into the Phoenix Basin some time after 1000 CE, our study finds no evidence of ceramic vessels moving long distances between different regions occupied by the Lowland Patayan. Some vessels moved shorter distances, such as the phyllite-tempered Patayan ceramics recovered from Las Colinas.

1.1. Background

This research is set in and around the Papaguería (Fig. 1)—a portion of the Sonoran Desert in southwestern Arizona and northwestern Sonora lacking substantial water sources except those along its borders (the Gila River to the north, the Gulf of California to the south, the Colorado River to the west, and the Santa Cruz River to the east). Between 600–1300 CE, villages of Uto-Aztecan (Hohokam) farmers dominated the Lower Gila River, along the northern border of the Papaguería, to the east of Gila Bend, Arizona.

The Hohokam villages along the Lower Gila were similar to those along the Middle Gila in many respects, with ball courts, canal irrigation of agricultural fields, and production of Hohokam Buff Ware ceramics during the Colonial and Sedentary periods, approximately 750–1150 CE (Abbott, 2000a; Doyel, 2000; Lindauer, 1988; Shaul and Andresen, 1989; Shaul and Hill, 1998; Teague, 1981; Wasley and Johnson, 1965). After 700 CE, nearby ancestral Yuman (Lowland Patayan) groups interacted with the Hohokam, with the Patayan making ceramics using the same riverine clays as Hohokam potters and transporting vessels at least 50 km into the desert interior (Beck and Neff, 2007; Beck et al., 2012). After 1000–1100 CE, the Patayan may have moved into traditional Hohokam territory to the east, living within or between Hohokam communities along the Middle Gila, Salt, and Santa Cruz Rivers.

These ancestral Yuman neighbors were considerably less sedentary and less reliant on agriculture than were the Hohokam. Recognized

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Fig. 1. Location of the study area within the southern U.S. Southwest. The Hieroglyphic Mountains phyllite source is mapped following Abbott and Watts (2010).

archaeologically in part by Lower Colorado Buff Ware ceramics, Lowland Patayan groups are best documented along the Colorado River and elsewhere in southwestern California (Hildebrand et al., 2002; Rogers, 1945; Schaefer, 1994; Waters, 1982a). Along the Colorado River, Lowland Patayan groups occupied pithouses or more ephemeral structures in seasonal settlements (Schaefer, 1994). Patayan habitation sites have been tentatively identified along the Lower Gila west of Gila Bend (Vivian, 1965), although none have been excavated (McGuire, 1982), and people probably moved seasonally away from riverine areas into the desert interior (Rogers, 1945; Schaefer, 1994). Their settlement patterns are less well understood in the areas closest to the Hohokam, as the Hohokam settlements dominated the riverine habitat around Gila Bend and to the east. Some Patayan apparently engaged in seasonal non-riverine agricultural activities as documented at the Mobak site (AZ Z:1:29 [ASM]), on an alluvial fan within 15 km of the Gila River (Hill and Bruder, 2000; Hill et al., 2008). More mobile foraging groups may have occupied other sites dominated by Patayan ceramics, such as Lago Seco (AZ Y:8:3 [ASM]), over 40 km south of the Gila River (Huckell, 1979).

The Gila Bend area was the eastern frontier of the Lowland Patayan before 1000 CE (Waters, 1982a). After 1000–1100 CE, the distribution of Lower Colorado Buff Ware expanded eastward (Waters, 1982a), along with the frequent use of materials from and adjacent to the Papaguería. These include the production of ornaments from Gulf of California shell (Howard, 1985; McGuire and Howard, 1987; Slaughter and Lascaux, 2000) and the use of Saucedo obsidian, collected from the Saucedo Mountains south of Gila Bend and nearby Saucedo Wash (Bayman, 1994; Doyel, 1996; Mitchell and Shackley, 1995; Shackley, 1988, 1995). Lower Colorado Buff Ware ceramics became more common in the eastern Papaguería (Goodyear, 1975; Masse, 1980; Severson, 1978; Yablon, 1978). They also appeared by 1000 CE or later in sites in the Lower Santa Cruz River Valley to the northeast (Deaver et al., 1990) and along the Lower Salt River (Beck, 2005). The easternmost appearance of Lowland Patayan ceramics occurred after 1150 CE at the Hohokam site of Las Fosas (AZ U:15:19 [ASM]) along the Gila River (Crown, 1984:Table 2.7.2, 2.7.3). Sherd temper, which is common in Lower Colorado Buff Ware (Waters, 1982a, 1982b) and Hohokam ceramics from the Lower Gila area (Abbott, 2000a; Teague, 1981), appeared in plain ware from Lower Salt River Hohokam sites after 1150 CE (Mitchell et al., 1989:80). Aspects of the Patayan ceramic tradition eventually became part of the broader protohistoric ceramic tradition in the southern U.S. Southwest, including Patayan vessel forms and manufacturing techniques (Deaver et al., 1990).

The changing distribution of Patayan ceramics and ceramic traits probably reflects the movement of ancestral Yuman potters and other people as well as shifting exchange networks. Such a notion is

supported by modern linguistic evidence for a prehistoric “multi-ethnic system” in the southern U.S. Southwest (Shaul and Hill, 1998:388) that included an “areal speech community” with many bilingual speakers of ancestral Piman and River Yuman languages some time before 1000 CE (Shaul and Hill, 1998:380). Given the apparently peaceful co-existence and interaction of ancestral Yuman and Uto-Aztecan groups in the Gila Bend area after 700 CE (Beck and Neff, 2007) and continuing into the historical period (Ezell, 1963), it is plausible that some ancestral Yuman people joined existing Hohokam communities as they moved eastward into Uto-Aztecan territory after 1000 CE (Beck and Neff, 2007).

The best evidence for a resident Patayan group in a Hohokam site is between 1000–1200 CE at Las Colinas (AZ T:12:10 [ASM]) north of the Salt River. On the western end of two major Hohokam canal systems in the Lower Salt River valley, Las Colinas is located among the sites at the end of Canal System 2 on the west side of Cave Creek (Abbott, 2000b:Fig. 1.1, 25). An ancestral Yuman group may have occupied House Group XVII, where a relatively large Lower Colorado Buff Ware collection (4066 sherds and 12 reconstructible vessels) was recovered from contexts dating to approximately 1000–1200 CE (Beckwith et al., 1988). After 1150 CE, the proportion of obsidian coming from southern desert sources such as Saucedo increased enormously (Fertelme et al., 2012). Las Colinas apparently continued to be a multi-ethnic community in the Classic period (Hill et al., 2004) with markers of Kayenta/Tusayan identity such as perforated plates (Crown, 1981; Lyons, 2003) and local manufacture of Phoenix Red recurved-rim bowls (Abbott et al., 1988; Crown, 1981; Crown et al., 1988).

1.2. Research questions

In her original analysis of the Las Colinas ceramics, Beckwith (1988:216) suggested that the Lower Colorado Buff Ware vessels “originated somewhere along the Colorado River in the area between Yuma and Parker” or perhaps “in the vicinity of the Colorado River Indian Reservation,” based on previously reported type distributions. These source areas are located at least 140 miles (225 km) from Las Colinas. In contrast, Beck and Neff (2007) argued that a resident Yuman population within Hohokam territory, at Las Colinas and elsewhere, would have made at least some of their Lower Colorado Buff Ware vessels locally from nearby riverine clays. The buff-firing Lower Gila River clays used for Lower Colorado Buff Ware in the Gila Bend area are similar to Middle Gila River clays in their timing and manner of deposition, color after firing, and chemical composition (Beck, 2006; Beck and Neff, 2007; Beck et al., 2012). Given that Hohokam potters substituted Lower Gila River clays for Middle Gila River clays to produce Hohokam Buff Ware (Abbott, 2000a; Lindauer, 1988; Teague, 1981), ancestral Yuman potters

arguably could have used clays from the Salt–Gila Basin for Lower Colorado Buff Ware.

This study investigates the movement of ancestral Yuman people and objects through compositional analysis of Lower Colorado Buff Ware and associated wares to address the following questions: (1) Are the different regions sampled for this study compositionally distinct enough to reveal the movement of vessels? (2) Is Lower Colorado Buff Ware at Las Colinas compositionally similar to Hohokam Buff Ware at the site, suggesting manufacture in the Salt–Gila Basin? and (3) Is Lower Colorado Buff Ware at Las Colinas compositionally similar to sampled Lower Colorado Buff Ware from the Papaguería or southern California, suggesting manufacture in another region occupied by Low-land Patayan groups?

2. Sample and methods

Our study relies primarily on neutron activation analysis (NAA) conducted at the University of Missouri Research Reactor (MURR) and presents our previously unpublished analysis of 355 archaeological ceramic items from the Papaguería and from the Hohokam site of Las Colinas (AZ T:12:10 [ASM]; Table 1; see Fig. 1). The analyzed items are 353 sherds and two unfired archaeological clay pieces (one ceramic coil and one lump of clay). Our sample emphasizes types predating 1150 CE, although some later ceramics are present for comparison (Table 2), and deliberately incorporates sherds that were part of previous compositional studies as described further below. At the time of the analysis, all collections for this project were curated at Statistical Research, Inc. (SRI) or the Arizona State Museum (ASM), both in Tucson, Arizona.

The sample of 181 sherds from the Papaguería comes from the Barry M. Goldwater Range (BMGR)-East within three project areas (AUX-6, ETAC, and NTAC) and one rockshelter site, BMGR-02-F-04. The sites

Table 1

Sites included in this study by project area and number of NAA samples.

Project area and site number	NAA samples
<i>BMGR-East: AUX-6</i>	
AZ Z:1:29	84
AZ Z:1:30	5
<i>BMGR-East: BMGR-02-F-04</i>	
BMGR-02-F-04	62
<i>BMGR East: ETAC</i>	
AZ Z:2:63	1
AZ Z:2:65	1
AZ Z:6:100	1
AZ Z:6:103	1
AZ Z:6:112	2
AZ Z:6:115	1
AZ Z:6:118	2
AZ Z:6:167	1
AZ Z:6:176	1
AZ Z:6:183	1
<i>BMGR East:ETAC</i>	
AZ Y:8:17	1
AZ Y:8:19	1
AZ Y:8:23	1
AZ Y:8:44	1
AZ Y:8:80	2
AZ Y:8:84	1
AZ Y:8:85	1
AZ Y:8:99	2
AZ Y:8:102	1
AZ Y:8:104	1
AZ Y:8:105	2
AZ Y:8:106	1
AZ Y:8:110	1
AZ Y:8:200	1
AZ Y:8:203	1
<i>Phoenix Basin</i>	
AZ T:12:10 (ASM)	174
TOTAL	335

Table 2

Group membership of NAA samples by ceramic ware and recovery location.

Ware and location	1	2	3	4	5	6	7	Unassigned	Total
<i>Lower Colorado Buff Ware</i>									
BMGR-East: AUX-6		8	36					13	57
BMGR-East: BMGR-02-F-04			6			1	4		11
BMGR-East: ETAC			6				3		9
BMGR-East: NTAC			6				4		10
Las Colinas	86	2	1				24		113
<i>Hohokam Buff Ware</i>									
BMGR-East: AUX-6		4					1		5
BMGR-East: BMGR-02-F-04		7		1			1		9
Las Colinas	2	36	6	11			4		59
<i>Historical-period Piman or Maricopa</i>									
BMGR-East: BMGR-02-F-04		2					3		5
BMGR-East: ETAC							1		1
<i>Indeterminate buff ware</i>									
BMGR-East: ETAC							1		1
BMGR-East: NTAC			1						1
<i>Unfired clay objects</i>									
Las Colinas			1				1		2
<i>Papagueria brown painted ware</i>									
BMGR-East: BMGR-02-F-04	2	1	3				2		8
<i>Brown plain ware</i>									
BMGR-East: AUX-6			12	1		2	12		27
BMGR-East: BMGR-02-F-04						12	3	4	19
BMGR-East: ETAC							1		1
BMGR-East: NTAC	1						1	4	6
<i>Red ware</i>									
BMGR-East: NTAC			1						1
<i>Tucson Basin brown painted ware</i>									
BMGR-East: BMGR-02-F-04							8	2	10
TOTAL	89	61	77	16	12	9	8	83	355

sampled include Mobak (84 sherds; AZ Z:1:29 [ASM]) and Rainy Day (5 sherds; AZ Z:1:30 [ASM]) from the AUX-6 project by Dames and Moore (Hill and Bruder, 2000; Hill et al., 2008), ten sites on ETAC (12 sherds; Lyon, 2000) and 15 sites on NTAC (18 sherds; Thurtell, 2001; Tucker, 2000) surveyed by SWCA, Inc., and Rockshelter 4 (62 sherds; BMGR-02-F-04), investigated by Statistical Research, Inc. (Doolittle, 2004). The sample focused on Lower Colorado Buff Ware and Hohokam Buff Ware, but included some historical-period Piman or Maricopa buff ware, indeterminate buff ware, indeterminate red ware, Papagueria brown painted ware, Tucson Basin brown painted ware (Tanque Verde Red-on-brown), and plain ware for comparison.

A portion of the Papaguería sample—141 sherds from Mobak (AZ Z:1:29 [ASM]), Rainy Day (AZ Z:1:30 [ASM]), and Rockshelter 4 (BMGR-02-F-04)—was previously analyzed by laser-ablation inductively-coupled plasma mass spectrometry (LA-ICP-MS; Beck and Neff, 2007). These 141 sherds make up 94% of the 150 samples analyzed by (Beck and Neff, 2007) and were chosen because sufficient material remained for NAA after the original LA-ICP-MS study. All 89 sherds from the Mobak and Rainy Day sites were also analyzed in an earlier petrographic study (Miksa, 2000), permitting comparison of the petrographic, LA-ICP-MS, and NAA results for this subset. All 30 sherds from the ETAC and NTAC sites were part of a larger study describing regional geology and temper types across the western Papaguería (Gregonis et al., 2001).

The sample from Las Colinas includes 113 Lower Colorado Buff Ware sherds, 59 Hohokam Buff Ware sherds, and two unfired archaeological samples of clay (recovered as lumps or coils). Five of the Lower Colorado Buff Ware sherds with phyllite temper were also submitted for petrographic analysis and chemical analysis by SED-EDS for comparison with known phyllite sources in central Arizona (Abbott et al., 2012).

Comparative NAA data are drawn from 38 natural clay samples collected along the Lower and Middle Gila River in Arizona (Beck et al., 2012) and from Hildebrand et al. (2002), whose project in southern California includes 75 sherds and 25 natural clay samples collected in the

area around the Salton Sea west to the coast. Relevant samples here include 12 Lower Colorado Buff Ware sherds (Tumco and Topoc Buff) and four natural clay samples from Salton Trough sediments (Holocene Lake Cahuilla and the Palm Springs Formation), all of which cluster into Hildebrand et al.'s chemical group IMP-1A. The natural clay samples analyzed by Beck et al. (2012) were not included when defining the compositional clusters described below, although the Lower Gila samples had been included in clusters in a previous report of our study (Beck et al., 2009; Schwarz et al., 2009).

Statistical methods for defining clusters were similar to those previously used for chemical data collected by NAA (Glascok, 1992; Neff, 2002). In brief, a variety of pattern-recognition techniques were used to identify possible reference groups in the data, and these proto-groups were then refined by statistical group evaluation using Mahalanobis distances.

3. Results

We defined seven NAA compositional groups (Fig. 2; see Table 2) that include 272 of the analyzed sherds and one of the unfired pieces from Las Colinas (of the 355 specimens analyzed, 83—or 23%—were unassigned). Group 1 consists almost entirely of Lower Colorado Buff Ware recovered from Las Colinas. Group 2 is dominated by Hohokam Buff Ware from all sites, with a few pieces of Lower Colorado Buff Ware and historical-period Piman or Maricopa ceramics. Group 3 primarily contains Lower Colorado Buff Ware from the BMGR, with some brown plain ware from the BMGR and a few pieces of Hohokam Buff Ware from Las Colinas. It also includes the unfired ceramic coil from Las Colinas. Group 4 consists primarily of Hohokam Buff Ware from Las Colinas. Brown plain ware from the BMGR makes up all of Group 5 and most of Group 6. All of the Tucson Basin brown painted ware (Tanque Verde Red-on-brown) falls into Group 7.

None of the specimens (either in Groups 1–7 or unassigned) plot within a previously defined Lower Colorado Buff Ware group from southeastern California (Hildebrand et al., 2002). No specimen has more than 1.7% probability of membership in the Desert Buff

compositional group, with most of the samples having less than 0.005% probability of membership.

As noted earlier, 23% of the specimens overall were unassigned, and these were drawn from all ceramic wares and project areas. Combinations especially prone to being unassigned (and that have five or more specimens) are Lower Colorado Buff Ware from NTAC (40%), brown plain ware from NTAC (67%), brown plain ware from AUX-6 (44%), and historical-period Piman or Maricopa ceramics from BMGR-02-F-04, which is almost the entire sample of historical-period Piman or Maricopa ceramics in the study (60%).

For 141 sherds from the Papagueria, group membership can be compared between LA-ICP-MS analysis (Beck and Neff, 2007) and NAA as reported here (Table 3). Cluster A in the LA-ICP-MS study included most Hohokam Buff Ware and almost half of the Lower Colorado Buff Ware. Nine of the ten Cluster A sherds that could be assigned to a source area petrographically were local to the Mobak/Rainy Day area (Miksa, 2000). Cluster B was dominated by Lower Colorado Buff Ware, and all nine of the Cluster B sherds that could be assigned to a source area petrographically were local to the Mobak/Rainy Day area (Miksa, 2000). Based on the petrographic data, use of Lower Gila River clays was assumed for both Cluster A and B (Beck and Neff, 2007). Cluster A split between NAA Groups 2 and 3 along ware lines, while Cluster B went primarily into NAA Group 3.

4. Discussion

In this NAA study, there are groups dominated by buff ware (Groups 1–3) and groups dominated by brown ware (Groups 4–7). We can discern some geographic patterning in our results. Tucson Basin brown painted ware is compositionally distinct from brown ware, either plain or painted, from the Papagueria. Lower Colorado Buff Ware from Las Colinas almost always splits away from Lower Colorado Buff Ware from the BMGR. Finally, none of the analyzed specimens have a southeastern California provenance, based on comparative data (Hildebrand et al., 2002). Our results are more illuminating when combined with other lines of evidence, such as petrographic, LA-ICP-MS, and scanning

Fig. 2. The seven compositional groups defined using NAA plotted against Principal Components 1 and 2.

Table 3

Group membership of NAA samples (Groups 1–7) by group membership (Clusters A–E) in LA-ICP-MS analysis (Beck and Neff, 2007).

INAA group	A	B	C	D	E	Unassigned	Total
1							0
2	12	3				5	20
3	16	24	1	1	2	8	52
4		1		2		1	4
5			8		4		12
6		1	4			1	6
7					8		8
Unassigned	13	7	6	1	1	11	39
Total	41	36	19	4	15	26	141

electron microscopy with energy-dispersive X-ray spectroscopy (SEM-EDS) data.

The previous LA-ICP-MS analysis (Beck and Neff, 2007) grouped some Hohokam Buff Ware and Lower Colorado Buff Ware together in Cluster A. LA-ICP-MS identifies the chemical composition of targeted areas of the paste, and was chosen by (Beck and Neff, 2007) to exclude mineral inclusions larger than silt size. Similar buff-firing clays, appearing as floodplain deposits from the Gila River when it was a meandering river system approximately 800–1500 years ago, are available along both the Lower and Middle Gila River (Beck and Neff, 2007; Beck et al., 2012). Beck and Neff (2007:297) explained LA-ICP-MS Cluster A as use of Lower Gila River clays to “make some locally-produced Hohokam Buff Ware and Lower Colorado Buff Ware dating to the period AD 700–1150. Lower Colorado Buff Ware could be, and in the Gila Bend area was, produced with the same raw materials available to Hohokam potters.” Earlier studies (Abbott, 2000a; Lindauer, 1988; Teague, 1981) concur that some Hohokam Buff Ware was produced in the Gila Bend area.

Although some Hohokam Buff Ware and Lower Colorado Buff Ware specimens are compositionally similar when only finer particle sizes are analyzed, grouping together in Cluster A (Beck and Neff, 2007), these wares split apart into two NAA compositional groups (Groups 2 and 3; see Table 3). Shared methods of paste preparation, including the use of temper, are important for compositional groups because the bulk chemical composition analyzed by NAA reflects both the raw “clay” (which includes clay, silt, and sand fractions) and also additions or deletions by the potters (Arnold et al., 1991; Neff, 1993). Almost all Hohokam Buff Ware sherds from both Las Colinas and the BMGR cluster together in NAA Group 2, even though these ceramics probably include vessels manufactured along the Middle Gila (recovered from Las Colinas) and the Lower Gila (recovered from the BMGR). In spite of previous optimism that Lower Gila River and Middle Gila River clays could be chemically distinguished (Beck et al., 2012), temper seems to overwhelm any such distinction. The mica schist temper causes most samples of this ware to group together, obscuring differences in production area. Abbott (2011, 2000a, 2000b) has also observed this effect of mica schist and therefore tried to exclude temper from Hohokam Buff Ware chemical analyses by using electron microprobe and laser ablation.

Of the two unfired archaeological clay pieces from Las Colinas, the ceramic coil fell into Group 3 and the clay lump was unassigned. Group 3 is primarily Lower Colorado Buff Ware from the BMGR. One Lower Gila River clay sample described in Beck et al. (2012; sample MEB364 from Trench 19, SS7) also clustered with the Group 3 ceramics in an earlier version of this study (Beck et al., 2009; Schwarz et al., 2009). We are not suggesting that NAA Group 3 represents a single production area for all of these pieces, given that much of the Lower Colorado Buff Ware appears to be made in the Papaguería (based on petrographic data) and the ceramic coil is assumed to be local to Las Colinas. Group 3 may instead represent a cluster of chemically similar clays with limited aplastics and much less, if any, mica schist. The ceramic coil does not appear to be tempered and contains only sparse

sand particles. Our attempts to find subgroups within Group 3 were unsuccessful, despite documented mineralogical variation. Identified plastics in the Lower Colorado Buff Ware and brown plain ware specimens in Group 3 include grog, quartz sand, granitic particles, schist, basalt, unidentified volcanic grains, and occasionally obsidian (Gregonis et al., 2001; Miksa, 2000).

Of the 63 Lower Colorado Buff Ware specimens from the BMGR that could be assigned to a group, 54 (86%) belong to Group 3. One stray appears in Group 6 with brown plain ware from the BMGR, but the vast majority of the remainder (8 specimens from AUX-6) fall into Group 2 with Hohokam Buff Ware. Based on Miksa's (2000) petrography study, three of the eight contain gneiss/schist—which probably explains their presence in Group 2—but the other five are sand-tempered with quartz and unidentified rock fragments.

The relationship of the Lower Colorado Buff Ware at Las Colinas to other samples is most important for this study. Of the 89 Las Colinas Lower Colorado Buff Ware sherds that could be assigned to a group, 86 of them cluster in Group 1 separate from almost all of the other ceramics. These were apparently not made in two known production areas for Lower Colorado Buff Ware—the Papaguería of southwestern Arizona or in southeastern California—given that they are compositionally distinct from Lower Colorado Buff Ware sherds from the BMGR (Group 3) and do not have reasonable probabilities of membership in a previously defined Lower Colorado Buff Ware group from southeastern California (Hildebrand et al., 2002).

This result prompted Beck et al. (2009) to suggest local production of Lower Colorado Buff Ware at Las Colinas. Later petrographic and chemical (SEM-EDS) analyses of five phyllite-tempered sherds (two from Group 1 and three previously unanalyzed sherds from the Las Colinas collection), however, revealed that the phyllite temper did not come from the Phoenix Mountains near the site (Abbott et al., 2012). The phyllite could not be clearly linked to any other known source, leading Abbott et al. (2012:991) to conclude that “despite our confidence that the Patayan ceramics at Las Colinas were not made there, we still do not know where they originated.” Subsequent attempts to find subgroups within Group 1, as with Group 3, were unsuccessful. It is a remarkably tight cluster, despite some variation in temper. Although 48 (56%) of the Group 1 sherds contain phyllite and another 10 (12%) contain mica schist, other sherds in this group lack these materials (as observed by hand lens) and instead contain basalt, quartz, or grog.

5. Conclusions

Lowland Patayan ceramic technology moved eastward after 1000 CE, but apparently not through the long-distance movement of vessels. We find no evidence of direct vessel exchange or transport between different regions occupied by the Lowland Patayan (southern California, the eastern Papaguería, and Las Colinas near the Salt River). Although long-distance movement of Lower Colorado Buff Ware seems unlikely, vessels may have been moved over shorter distances. We still do not know where the Patayan ceramics at Las Colinas were made, since they appear to be neither locally manufactured nor brought from the Papaguería or farther west. The currently documented phyllite sources (Abbott and Watts, 2010; Fig. 2; Abbott et al., 2008) are in the uplands to the north of Las Colinas. Investigations to the west of this area, including the western flank of the Hieroglyphic Mountains (see Fig. 1), might reveal additional Patayan communities within a several-days walk of Las Colinas and the source of phyllite used in the Las Colinas Lower Colorado Buff Ware (David Abbott, personal communication, May 2010).

Identifying vessel movement within the eastern Papaguería would have been especially interesting, in light of larger questions about the size and changing location of Lowland Patayan regional territories here. Unfortunately, we could not discern these patterns in our study. The vast majority of Lower Colorado Buff Ware from all project areas of the BMGR lumps together in Group 3, in spite of the documented

mineralogical variation (Gregonis et al., 2001; Miksa, 2000), when we had hoped instead for some separation between the AUX-6, ETAC/BMGR-02-F-04, and NTAC areas. A similar lumping also happens when using bulk chemical composition in Hohokam Buff Ware, prompting researchers to analyze clay and aplastic inclusions separately (Abbott, 2009, 2011, 2000a, 2000b; Abbott et al., 2007). Petrographic analysis is probably the most promising analytical technique for identifying areas of manufacture in this region, once the geographic availability of some of the less common inclusions (such as obsidian and other volcanics) is better understood.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at <http://dx.doi.org/10.1016/j.jasrep.2016.05.008>.

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