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Ancient social landscapes of northwestern Argentina: preliminary results of an integrated approach to obsidian and ceramic provenance

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ABSTRACT

This article presents the results of ongoing instrumental neutron activation analyses (INAA) conducted on archaeological artifacts from the Formative period of northwestern Argentina (NWA). These studies are part of a wider archaeological project that seeks to understand the structure of the social landscape of the period by examining domestic and burial evidence from a wide range of villages across the area known as the southern Calchaquí valleys. Elemental data is discussed in the light of its potential contribution to reassess past social interaction strategies in the region.

This article presents the results of ongoing instrumental neutron activation analyses (INAA) conducted on archaeological artifacts from the Formative period of northwestern Argentina (NWA). These studies are included in a larger archaeological project that aims at understanding the social landscape of the period, by examining a wide range of contexts across the southern Calchaquí valleys. The study focuses on the western hillside of the Aconquija Mountains, the Santa María valley, and the Cajón valley (Fig. 1).

While provenance studies have become increasingly popular in NWA (Escola et al., forthcoming; D'Altroy et al., 2000; Lazzari, 1999; Plá and Ratto, 2007; Laguens et al., 2007; Williams et al., 2006; Yacobaccio et al., 2002), this is the first provenance research program to integrate ceramics and stone artifacts, which have traditionally been studied separately. Combining contextual and geochemical evidence, the joint study of these materials provides a more satisfactory avenue to approach complex social interaction patterns than previous studies that focus on single categories of material culture.

1. Social networks in northwestern Argentina: the first millennium AD

The first millennium AD (part of the Formative period, 600 BC–AD 1000) was characterized by a burgeoning cultural production that resulted in archaeological assemblages that combined materials, decorative styles and crafting techniques in widely variable ways. The human settlement of these areas during this period consisted mainly of stone-walled domestic buildings made of circular and sub-circular rooms attached to a courtyard, and dispersed through agricultural fields and corrals. A mixed economy prevailed, combining agriculture, llama herding, and the hunting and gathering of various wild resources from various distance ranges (Scattolin, 1990; Scattolin et al., 2007). Ceramic iconography and other forms of technology point toward the multiple links these sites had with several other areas that were contemporarily occupied (Lazzari, 2005; Scattolin, 2006, 2007), and the nature of these interactions requires careful examination.

Long distance connections have always been acknowledged by scholars across the region (Dillehay and Núñez, 1988). Yet while acknowledging the centrality of long distance exchanges, transactions are often assumed to have occurred within more or less defined cultural boundaries. Such boundaries are typically mapped following the variations in pottery distribution, settlement patterns and other materials displaying representational/figurative features (Tartusi and Núñez Regueiro, 1993: 38). While allowing exchange

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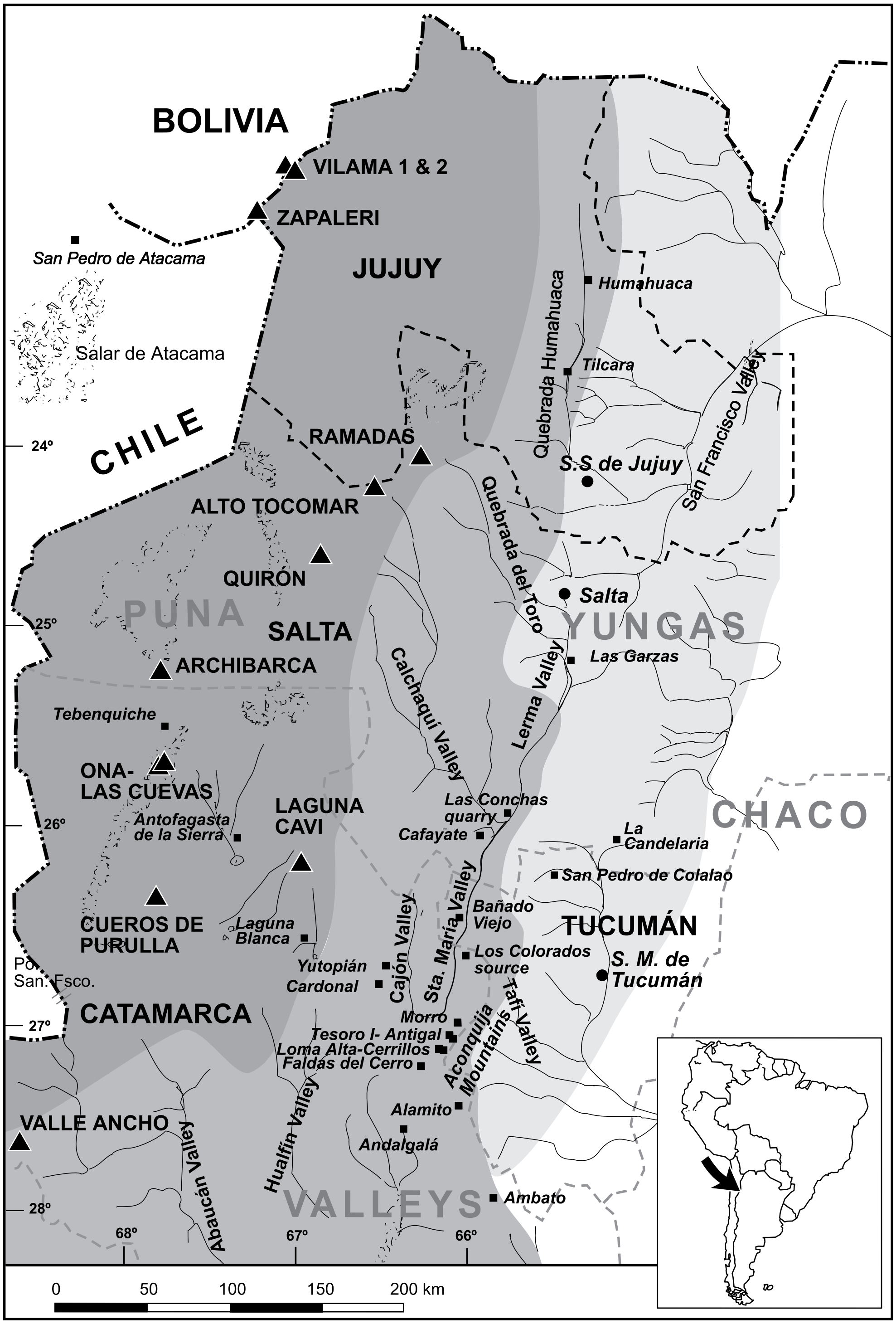

Fig. 1. Archaeological areas and sources mentioned in the text.

and interaction at various levels, previous approaches emphasize the governing role of elites who controlled the production of highly specialized crafts and their distribution through llama caravan trade from specific cultic centers of regional importance (Tartusi and Núñez Regueiro, 2001: 151–152). In this article, we focus on how geochemical evidence provides elements to hypothesize a less centralized and hierarchical vision of past practices of acquisition and circulation than the ones allowed by previous interpretations.

It should be noticed that social interaction in the period has been mostly studied through fine ceramics (but see Fernández and Aschero, 2005; Escola, 2004; Scattolin and Lazzari, 1998). The resulting direct inference of social interaction patterns after the presence or absence of certain ceramic styles at particular locations has obscured the multilayered structure of circulation that characterizes the prehistory of the area (Lazzari, 2005, 2006). Recent excavations in the Cajón valley and the western slope of the Aconquija Mountains have provided evidence of the co-occurrence of ceramic types that have been traditionally assumed to belong to mutually exclusive spheres of interaction (Lazzari, 2006; Scattolin et al., 2007). Likewise, the stylistic analysis of pottery has disclosed that attributes belonging to traditional archaeological 'types' have been frequently observed in single artifacts. Ceramic technological analysis has also shown that Formative period assemblages are highly diverse and non-standardized, despite the existence of identifiable general types (Scattolin and Bugliani, 2005).

Additionally, the traditional taxonomies of "lowland" or "highland" traditions considerably limit the understanding of the period's material culture assemblages. The three main areas of interest to this study can be said to have participated in a heterogeneous iconographic/stylistic universe (Scattolin, 2006); a universe of shared motifs and techniques that—contrary to traditional views—included elements from assemblages across the whole spectrum of microenvironments in the region. The archeological sites of Laguna Blanca, Tebenquiche, Calchaquí valleys, Tafí, La Candelaria, among others (Fig. 1), partook of this stylistic universe.

Simultaneously, obsidian sources were used by the inhabitants of numerous sites located at various distances from the sources, from nearby locations in the highlands to remote localities in the lowland valleys. Many of these sites contributed to the iconographic universe described above, while others employed rather dissimilar material assemblages. These contextual variations point at the existence of alternative interaction routes and connections selectively used by communities (Scattolin and Lazzari, 1998).

Provenance studies can give evidence of the structure of these ancient "social landscapes," namely the networks of sites, paths and natural features laid out and influenced by both local and regional social needs (Gosden, 1989: 48). There is a long record in the Andes of the striking complexity of such networks, often at odds with pre-conceived ideas of neatly bounded interaction spheres (e.g., Göbel, 1998; Lecoq, 1987; Mayer, 2001).

2. Methods

NAA characterization methods and the statistical multivariate techniques for the interpretation of chemical results have been extensively described and discussed elsewhere (Glascock, 1992; Glascock et al., 1998; Neff et al., 1989) therefore here we will only briefly mention the basic procedures followed for both materials. In the case of obsidian, the analyzed samples are removed parts of the original pieces of around 25 g subjected to neutron irradiations of both short (5 s) and long (70 h) duration, with the subsequent measurement of gamma rays in each case. All of the samples were submitted to short irradiation and short decay to measure seven short-lived elements (Al, Ba, Cl, Dy, K, Mn, and Na). After examination of the data for the short-lived elements to identify possible chemical groups, some of the samples were selected for long irradiation. The specimens selected for long irradiation were either uncertain from the short irradiation results or were from unknown groups. The long irradiation procedure measures 22 long-lived elements (Ba, La, Lu, Nd, Sm, U, Yb, Ce, Co, Cs, Eu, Fe, Hf, Rb, Sb, Sc, Sr, Ta, Tb, Th, Zn and Zr). If the long-lived concentration for Ba was measured, it was preferred over the short-lived value (Glascock and Speakman, 2005).

Pottery samples consisted of 1 cm^2 fragments removed from each potsherd. Two analytical samples were prepared from each source specimen; the first one consisted of portions of approximately 150 mg of powder weighed into clean high-density polyethylene vials used for short irradiations at MURR and the second one consisted of 200 mg of sample powder weighed into clean high-purity quartz vials used for long irradiations. Short and long irradiations were also applied on pottery samples, with the subsequent measurements of gamma rays by short, medium, and long counts. The short count yielded gamma spectra containing peaks for nine short-lived elements (Al, Ba, Ca, Dy, K, Mn, Na, Ti, V). The medium count (7 days decay after 24 h irradiation) yielded determinations for seven medium half-life elements, namely (As, La, Lu, Nd, Sm, U, Yb). After an additional 3- or 4-week decay, a final count of 8500 s was carried out on each sample. The latter measurement yields the following 17 long half-life elements: Ce, Co, Cr, Cs, Eu, Fe, Hf, Ni, Rb, Sb, Sc, Sr, Ta, Tb, Th, Zn, and Zr (Cecil and Glascock, 2006; Speakman and Glascock, 2004).

The analyses produced elemental concentration values for 32 or 33 elements in most of the ceramic samples, and up to 28 elements for some obsidian samples. Statistical analysis was subsequently carried out on base-10 logarithms of concentrations (in the case of ceramics Ni was not considered, because in most samples it was below the detection limits, as is the norm for most New World ceramic analyses). Principal component analysis allowed the identification of compositional groups and the relationships of artifacts to them, rendering two-dimensional graphs in which the compositional groups are surrounded by 95% confidence degree ellipses. The complete dataset is available at http://archaeometry.missouri.edu/datasets/datasets.html.

3. Ceramic sample structure and results

A total of 139 pottery samples and four clay samples were processed at the MURR laboratory. Fig. 2 shows the percentages of ceramic fragments belonging to different compositional groups that appear at the sites with the largest numbers of samples. Table 1 shows the group means and standard deviations for each of the groups.

The majority of analyzed fragments came from Aconquija sites (61%), while 23% came from the Santa María valley and 10% from the Cajón valley. The remaining 6% of the sample consists of sherds coming from sites near these areas, as well as four sherds from sites in the San Pedro de Atacama area (Chile) that had stylistic and/or technical similarities with the ceramics normally found in the main areas covered by the study. The study also included clay samples from La Aspereza source at Cerrillos locality (Aconquija), Las Conchas quarry (Cafayate), Los Colorados source (NE of Santa María Cremonte, 1984), and the Cardonal source at Cajón valley (Fig. 1). A systematic study combining survey and petrographic examination is currently underway in order to assess the structure and quality of clay deposits in the area (Pereyra Domingorena, 2007).

The results obtained thus far show six ceramic groups: Group 2 (G-2), Group 3 (G-3), Group 4 (G-4), Group 5 (G-5), Group 6 (G-6), and Group 7 (G-7) (Cecil and Glascock, 2006; Speakman and Glascock, 2004). The largest number of samples collected from the sites clustered in G-2 (33.1%), while the second largest group is G-3 (26.6%). The remaining samples from NWA clustered as follows: G-7 (10.1%), G-6 (5.8%), G-5 (2.9%), while 19.4% remains unassigned. G-4 only includes the sherds from Chile.

The clay groups from our study area formed three larger clusters. Groups 2, 5, and 7 are characterized by the presence of high transition metals, which could indicate that this pottery was tempered with high mafic material such as crushed volcanic rocks (Speakman and Glascock, 2004). In this regard, petrography analysis conducted thus far has shown that some G-2 sherds have mafic material in their fabric (LAZ 113, 119, 121, 030, 118). However, it is worth mentioning that separate petrography studies of samples not subjected to INAA found that fragments of Vaquerías style (included in G-2) contained metamorphic materials but no volcanic materials were found in their fabric (Pereyra Domingorena, 2007). The G-3 and G-4 groups are enriched in zirconium and hafnium, which might be indicative of sand-tempered pottery. Group 6, which is richer in rare earth elements relative to the other groups, may be indicative of pottery with little or no temper.

Overall, the groups show unambiguous separation between them (Speakman and Glascock, 2004) (Fig. 3). For instance, the

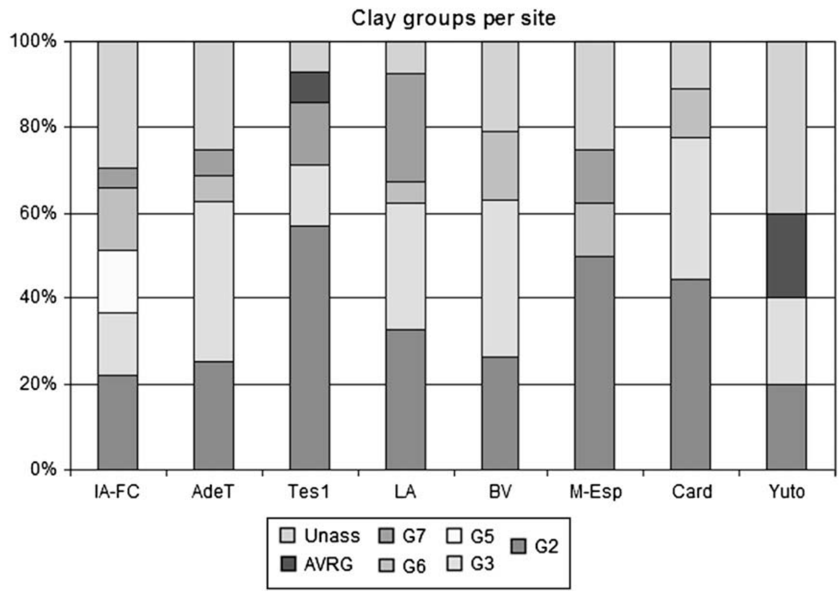

Fig. 2. Pottery groups per site (AdeT = Antigal de Tesoro, BV = Bañado Viejo; Card = El Cardonal, IA-FC = Ingenio Arenal Faldas del Cerro, LA = Loma Alta, M-es = Morro de las Espinillas, Tes 1 = Tesoro 1, Yuto = Yutopián).

separation between G-2 and G-7 is marginal but the only element that separates them is chromium, which would seem to indicate a common production area with slight variations on the paste recipe. G-6 separates itself more from the rest because this clay has rare earth elements (Speakman and Glascock, 2004).

As mentioned earlier, the study included three clay varieties. The clay sample from Las Conchas (LAZ173) consistently plots within the G-2 reference group, but does not demonstrate statistical membership in this group. The other analyzed clays—LAZ 174 from Los Colorados, LAZ040 from La Aspereza source at Cerrillos,

Table 1
Element concentrations and standard deviations for the pottery compositional groups.

Element	Group 2	Group 3	Group 4	Group 5	Group 6	Group 7
	($n = 46$)	($n = 34$)	($n = 3$)	($n = 4$)	($n = 11$)	($n = 14$)
	Mean ± SD	Mean ± SD	Mean ± SD	Mean ± SD	Mean ± SD	Mean ± SD
Na (%)	1.22 ± 0.19	1.52 ± 0.24	1.86 ± 0.46	1.06 ± 0.17	1.23 ± 0.20	1.44 ± 0.18
Al (%)	8.75 ± 0.41	8.36 ± 0.41	9.74 ± 0.32	9.68 ± 0.88	9.00 ± 0.38	8.53 ± 0.55
K (%)	2.99 ± 0.21	2.80 ± 0.50	2.34 ± 0.16	3.82 ± 0.65	2.72 ± 0.59	2.99 ± 0.45
Ca (%)	2.06 ± 0.37	1.28 ± 0.33	2.07 ± 0.21	1.78 ± 1.42	1.53 ± 0.59	2.07 ± 0.58
Sc	16.8 ± 1.4	11.6 ± 1.2	13.3 ± 0.9	19.2 ± 0.7	14.8 ± 1.3	14.4 ± 1.4
Ti	4364 ± 495	3676 ± 427	3428 ± 422	5953 ± 546	3887 ± 684	3514 ± 425
V	104.5 ± 9.8	82.7 ± 10.8	105.9 ± 10.6	139.7 ± 14.3	97.5 ± 12.8	88.5 ± 11.8
Cr	57.6 ± 3.6	42.9 ± 7.6	32.6 ± 3.6	90.0 ± 6.0	49.9 ± 9.5	38.7 ± 2.8
Mn	1000 ± 107	636 ± 108	352 ± 94	1127 ± 370	728 ± 110	839 ± 195
Fe (%)	4.58 ± 0.34	3.45 ± 0.33	3.47 ± 0.13	5.51 ± 0.30	4.04 ± 0.44	4.03 ± 0.34
Co	16.9 ± 1.3	11.3 ± 1.4	8.4 ± 1.1	21.2 ± 0.6	13.9 ± 1.5	14.2 ± 1.5
Zn	115.8 ± 9.5	76.5 ± 7.0	81.2 ± 3.4	145.9 ± 22.0	91.2 ± 17.8	104.1 ± 8.4
As	6.7 ± 2.6	9.6 ± 4.3	62.6 ± 16.9	6.0 ± 2.6	14.5 ± 6.4	8.5 ± 2.4
Rb	171 ± 14	172 ± 41	144 ± 3	257 ± 99	194 ± 88	209 ± 46
Sr	252 ± 37	202 ± 86	345 ± 13	174 ± 83	169 ± 96	215 ± 85
Zr	133 ± 18	175 ± 33	120 ± 4	101 ± 32	177 ± 41	128 ± 20
Sb	0.65 ± 0.28	0.59 ± 0.19	1.27 ± 0.08	0.33 ± 0.19	0.74 ± 0.25	0.55 ± 0.09
Cs	15.9 ± 2.6	16.7 ± 6.8	35.0 ± 19.1	26.0 ± 22.4	19.6 ± 8.1	21.6 ± 6.7
Ba	505 ± 118	491 ± 145	924 ± 283	528 ± 61	476 ± 89	433 ± 116
La	36.4 ± 3.3	38.5 ± 3.9	49.9 ± 16.4	30.6 ± 2.1	53.9 ± 8.0	39.9 ± 5.1
Ce	78.0 ± 6.8	78.8 ± 6.3	90.5 ± 30.2	67.1 ± 2.3	100.2 ± 18.3	85.8 ± 12.6
Nd	33.2 ± 3.5	36.5 ± 5.1	35.1 ± 7.7	28.5 ± 3.1	50.5 ± 8.5	36.6 ± 5.4
Sm	7.25 ± 0.57	7.86 ± 1.10	6.41 ± 0.82	6.39 ± 0.59	11.21 ± 1.33	7.88 ± 1.03
Eu	1.39 ± 0.10	1.39 ± 0.19	1.08 ± 0.03	1.27 ± 0.13	1.93 ± 0.56	1.36 ± 0.12
Tb	0.97 ± 0.12	0.96 ± 0.15	0.71 ± 0.13	0.82 ± 0.10	1.59 ± 0.30	1.01 ± 0.12
Dy	4.89 ± 0.40	5.44 ± 0.86	3.06 ± 0.22	4.61 ± 0.97	8.31 ± 1.28	5.25 ± 0.80
Yb	2.94 ± 0.27	3.13 ± 0.51	1.91 ± 0.10	2.29 ± 0.15	5.32 ± 1.58	2.86 ± 0.39
Lu	0.44 ± 0.04	0.44 ± 0.07	0.36 ± 0.00	0.40 ± 0.09	0.71 ± 0.18	0.45 ± 0.05
Hf	5.46 ± 0.44	6.81 ± 0.79	5.11 ± 0.13	3.50 ± 0.95	7.24 ± 1.59	4.84 ± 0.65
Ta	1.61 ± 0.18	1.51 ± 0.39	1.39 ± 0.03	2.20 ± 1.36	2.02 ± 1.19	1.98 ± 0.58
Th	14.5 ± 1.4	15.7 ± 2.6	23.7 ± 7.4	10.8 ± 2.4	20.6 ± 7.7	17.1 ± 3.4
U	4.72 ± 1.04	4.68 ± 3.91	5.44 ± 0.63	5.21 ± 4.63	5.04 ± 2.54	5.74 ± 0.97

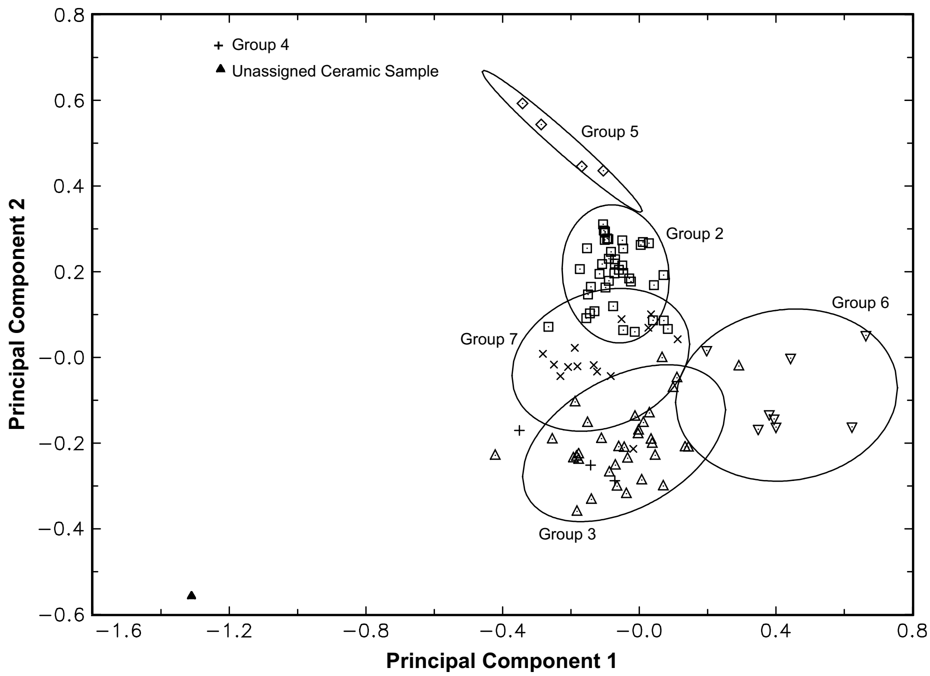

Fig. 3. NWA ceramics projected onto the first two principal components. Ellipses represent 90% confidence interval for group membership.

and LAZ175 from Cardonal—did not show membership to any of the groups (Figs. 4 and 5). Additional sampling and petrographic analysis should clarify the relationship between clay LAZ173 and the G-2 compositional group (Cecil and Glascock, 2006; Speakman and Glascock, 2004).

It is worth mentioning that similar analyses were simultaneously performed at MURR on pottery from another area of northwestern Argentina, the Ambato valley, located 180 km SE of the Aconquija. Studies conducted by MURR in this valley resulted in the definition of an 'Ambato valley reference group' (AVRG), constituted by most of the samples that have been analyzed so far from that area (Laguens et al., 2007).

Two of our sherds, one from Tesoro 1 and another one from Yutopián, plotted within AVRG. Additional results showed that our G-3 consistently plotted in most projections of the data with one clay sample (MGC001 sample) from Ambato Valley. Also in multivariate projection, G-3 plotted nearby to three more samples of the same valley (MGC002-004) (Fig. 6). It must be highlighted that none of the clay samples from Ambato could be related to the archaeological pottery fragments of the same valley (Laguens et al., 2007: 156).

One of Speakman and Glascock's (2004) suggestions is that "it is possible that clay deposits similar to the Ambato Valley clays extend north to western slope of the Aconquija Mountains." Indeed,

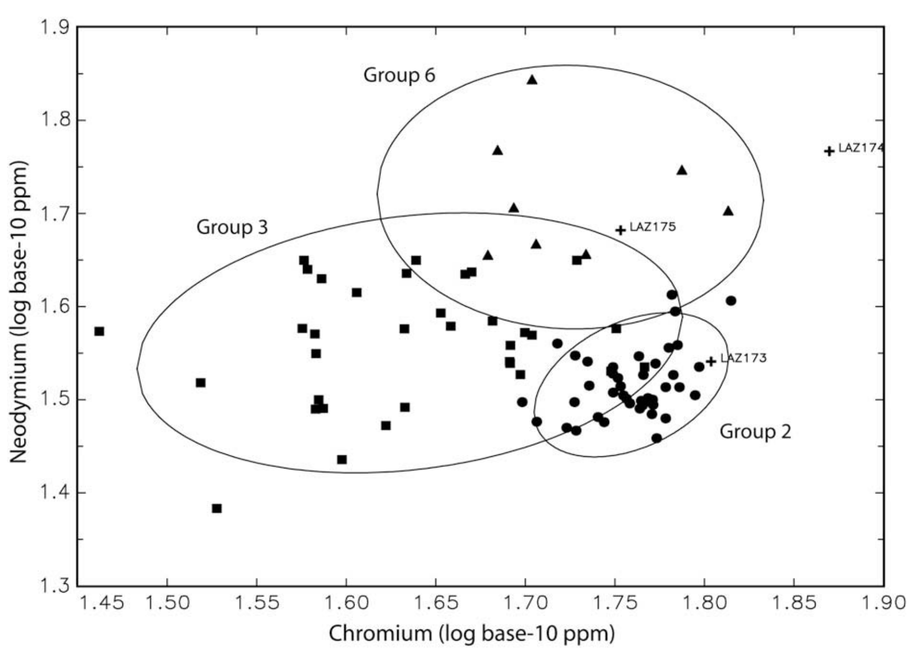

Fig. 4. Plot of chromium and neodymium base-10 logged concentrations of potsherds and clay samples (LAZ 173, LAZ174 and LAZ175).

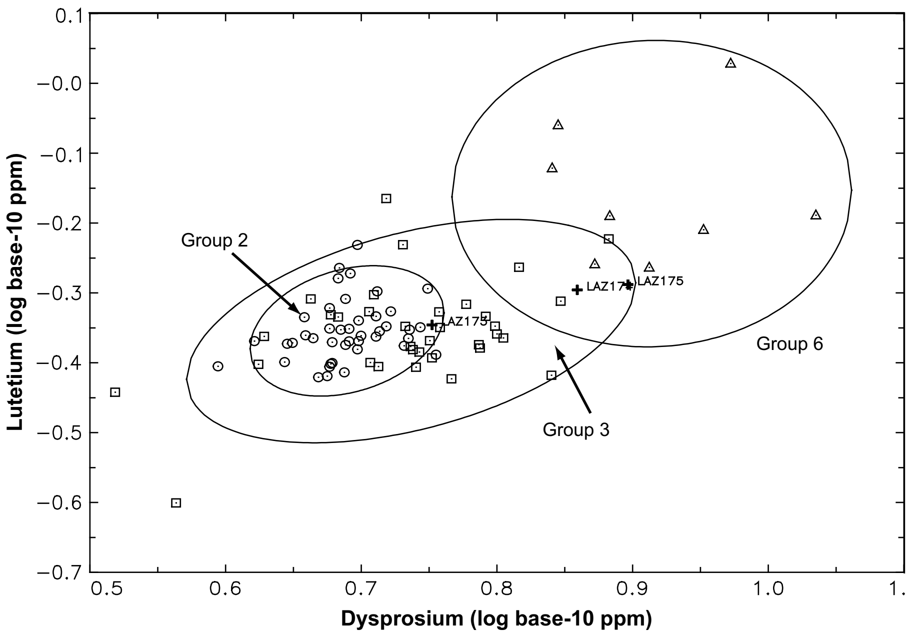

Fig. 5. Plot of dysprosium and lutetium base-10 logged concentrations of potsherds and clay samples LAZ173, LAZ174, LAZ175.

the study fails to identify the location of the commonly used source (either in the Aconquija, in Ambato valley, or elsewhere). Yet archaeologically this is very significant: the evidence challenges the long-standing interpretations that assume the centrality and dominance of the Ambato Valley in the manufacture and distribution of crafts for the period.

Finally, the remaining groups are too small to provide any significant trends. G-4 comprises three pieces from Chile, G-5 contains a few of the ubiquitous polished grey sherds, and G-6 is constituted by only eight fragments, some polished and some ordinary. G-7 only includes fragments found at Aconquija sites, which nevertheless share technological and stylistic attributes with ceramics produced elsewhere. Further studies will help to reach a certain conclusion regarding these smaller groups.

It is interesting to comment briefly on the stylistic diversity of the sherds included in each of the compositional groups, as diverse decorative motives and finishing techniques occur in different ceramic pastes.

For instance, G-2 includes a large number (29) of the ubiquitous plain polished grey variety. It also includes other decorated types such as red slipped (6), painted (6), Condorhuasi polychrome (1), Vaquerías polychrome (3), and Aguada painted (1). Similarly, the decorated sherds included within G-3 show attributes of the frequent incised grey styles (7), as well as varieties of Condorhuasi

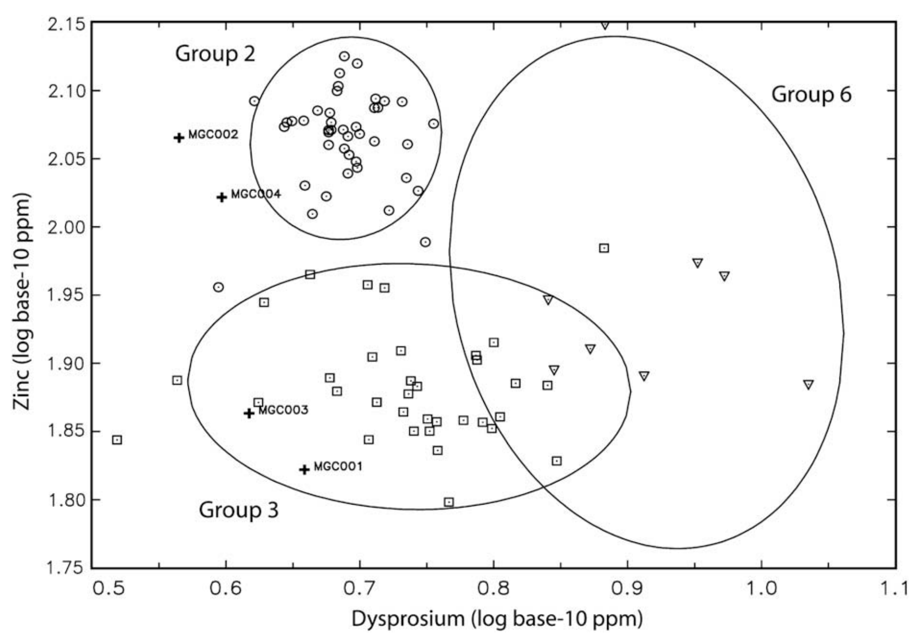

Fig. 6. Plot of dysprosium and zinc base-10 logged concentrations of potsherds with Ambato valley clays (MGC001-004).

Table 2
Obsidian provenance in study area.

Province	Area	Site	Source and # of samples
Catamarca	Aconquija Mountains	Antigal de Tesoro	O-LC; LC; K (5)
		Tesoro 1	O-LC; J & G-2 (8)
		Loma Alta	O-LC; M (21)
		Ingenio Arenal	O-LC; CdeP (6)
	Cajón valley	El Cardonal	O-LC; CdeP; LC; K (4)
	Santa María valley	Bañado Viejo	O-LC (6)
	Laguna Blanca	Laguna Blanca and Corral Blanco	O-LC (3)

References: O-LC, Ona-Las Cuevas; CdeP, Cueros de Purulla; LC, Laguna Cavi; AToc, Alto Tocomar; Zap, Zapaleri. J, K, G-2 and M, unknown sources.

style (4), and an assortment of other styles such as polychrome Guachipas (1), incised red (1), brushed (1), modeled red (1), and white slip (10). Interestingly, 61.7% of the ordinary fragments (from Bañado Viejo, Loma Alta, Antigal de Tesoro, Tesoro 1, El Cardonal) bear the chemical signatures of G-3.

These results introduce new archaeological questions. It has long been assumed that the manufacture of styles such as Condorhuasi, Vaquerías and Aguada was concentrated in locations out of our study area (González, 1998). The former was an early fine pottery that displayed elaborate zoomorphic and anthropomorphic modeling, as well as geometric surface painting, which appeared at both domestic and burial contexts. The second is a high-quality polychrome pottery thought to have been originated in the Lerma Valley, which has been associated to llama caravan trade dated to the beginnings of the first millennium AD. The latter is a highly distinctive iconographic style, depicting mostly feline

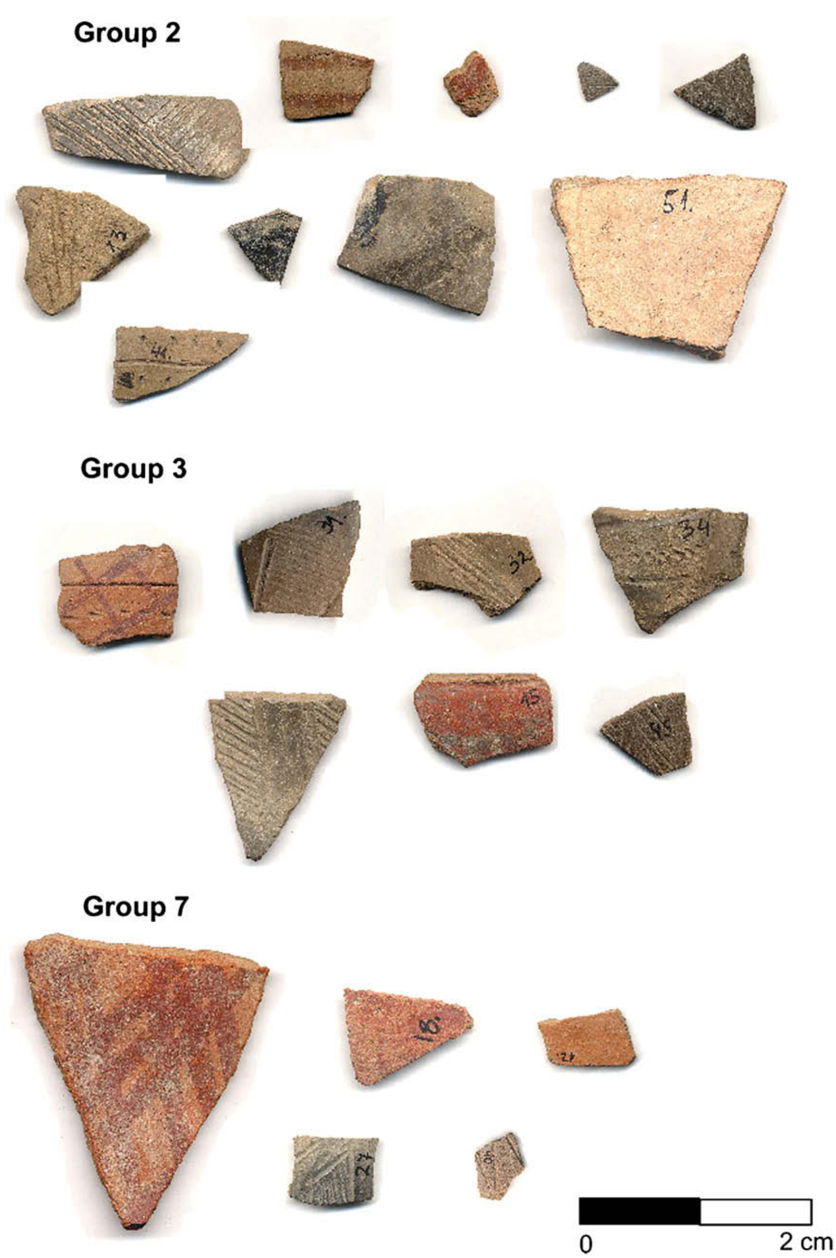

Fig. 7. Potsherds submitted to INAA from the site Loma Alta.

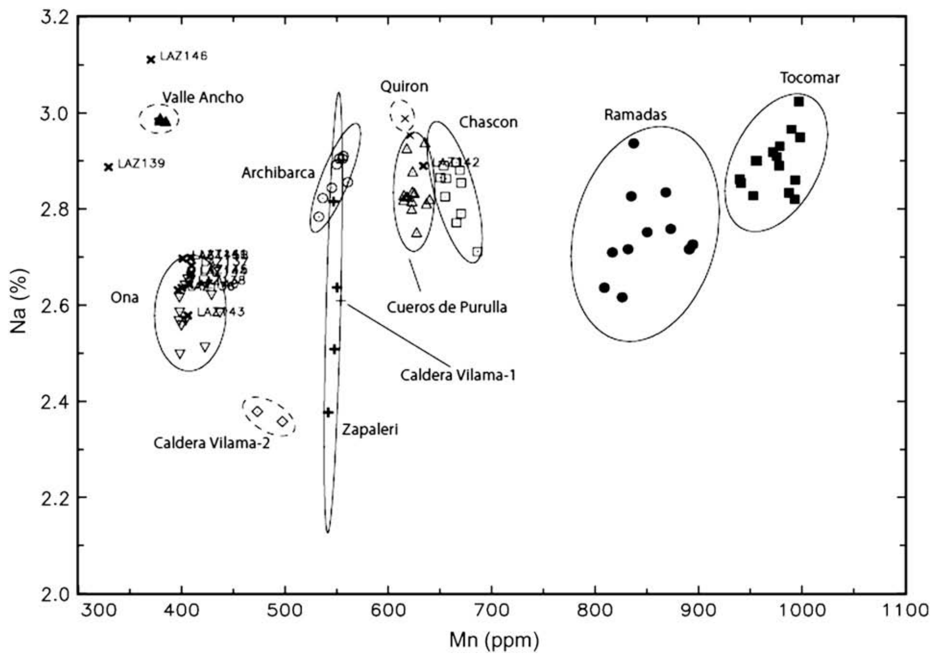

Fig. 8. Plot of manganese and sodium base-10 logged concentrations of obsidian artifacts with NWA obsidian sources.

and warrior/priests images in either engraved or painted wares. Nowadays, it is considered that the Ambato and Hualfin valleys (Fig. 1) were two of the main production areas of both strands of this style, spanning from 600 to 1000 AD (González, 1998).

Evidence obtained for G-2 may imply that settlements within a wide area used a single source to manufacture a large variety of styles, which contradicts the standard 'core-periphery' interpretation of the prehistory of the region. Whether there were one or many 'original' areas for some of these widespread styles, the rather extreme stylistic variability of these groups calls for interpretive caution in terms of what it represents archaeologically.

4. Obsidian sourcing

The analyzed artifacts consist of small-sized flake tools and debitage (see Lazzari, 2005) mostly from Aconquija sites (43 artifacts, 36% of the totality of obsidian in these sites), and additional samples from El Cardonal (4), Bañado Viejo (6), and Laguna Blanca (3),(see Figs. 1, 9). Many of our samples were included within the first large-scale study of obsidian sourcing in NWA, which identified major and secondary sources, and sourced artifacts from 41 archaeological sites throughout NWA (Yacobaccio et al., 2002, 2004).

The sites on the western hillsides of the Aconquija Mountains mostly used banded/translucent obsidian from Ona-Las Cuevas (O-LC) (88%), located 260 km W as the bird flies. O-LC was a major source in NWA, mostly supplying settlements in the southern sector of NWA throughout prehistory. Few artifacts from Aconquija sites matched the composition of other minor sources such as Cueros de Purulla (CdeP, a source providing opaque obsidian, see Fig. 9) and Laguna Cavi (LC), while various show distinct compositions that however remain unmatched to any known source (unknown sources F, G-2, J, K, and M, Table 2 and Fig. 7). Some of these obsidian artifacts of unknown provenance may come from obsidian sources already known, but it is impossible to establish a match at the moment because the internal chemical variability of most of the sources remains unknown, except for O-LC (Yacobaccio et al., 2004). Yet there is enough difference among the groups of unknown sources, and between them and the known sources, to justify the treatment of the unidentified obsidian types as coming from separate sources for the time being Fig. 8.

The regional distribution and contextual association of these obsidian types is archaeologically significant. As said before, O-LC obsidian predominated in the southern sector of NWA, with minor presence of CdeP and other sources of even less frequency. Importantly, a few archaeological sites that used O-LC obsidian also had access to the northernmost obsidian sources in NWA. For instance, early settlements at Quebrada del Toro and in Antofagasta de la Sierra (Fig. 1) used obsidian from sources located in the province of Salta and Jujuy, in addition to the raw material coming from the Catamarca sources (Fig. 1, see Yacobaccio et al., 2004 for details). Interestingly, in these areas, O-LC obsidian is contextually associated to material assemblages quite different from the ones found at our sites, indicating that they participated in rather

Fig. 9. Obsidian from Loma Alta: opaque dark (left); banded/translucent (right).

different networks for accessing stylistic, technical, and material resources (e.g., Antofagasta de la Sierra and the Abaucán valley, Olivera, 1991). Conversely, an interesting example of the opposite case is Las Garzas in the Lerma valley (Cremonte, et al., 1998; Fig. 1). This archaeological settlement participated in the ceramic stylistic and technical networks that included our sites, yet unlike ours, Las Garzas had access to obsidian from the northernmost source in NWA (Yacobaccio et al., 2004).

It is noteworthy that the settlements directly included in our study area (W Aconquija Mountains, Cajón valley, and the lower Santa María valley), did not participate in any of the northern NWA obsidian networks. However, they did share with the above mentioned sites the use of O-LC and other minor sources, as well as a variety of other material resources and technical skills. Clearly, archeological sites in the region participated in several networks and interaction spheres whose spatial distributions were not always coterminous Fig. 9.

5. Approaching complex acquisition and circulation practices

To summarize the information, it is possible to say that there are two major source areas for clays and ceramics in our study area: one extending north of the Aconquija Mountain sites (G-2), possibly centered in the northern sector of the Santa María valley/Cafayate area, and another one (G-3), which possibly extends to the south, but at the moment remains uncertain. These two areas of clay acquisition and circulation were not mutually exclusive.

The geographic distribution of G-2 type ceramics confirms that this area coincides with the more intimate range of the stylistic universe as defined by Scattolin (2006). Samples from other areas stylistically related to the Aconquija such as Laguna Blanca, Tebenquiche, Hualfín valley, Candelaria among others (Fig. 1) have not been included in this study, but will be in the near future. The stylistic variability and dispersion of this group indicates the existence of a common pool of stylistic motifs, techniques, and raw materials combined in multiple ways in local contexts.

The results obtained thus far indicate that it is worth considering as a working hypothesis that past inhabitants of this region had access to a repertoire of motifs and techniques that they chose to reproduce, modify or even ignore to various degrees. This selectivity operated according to the expectations and demands established by the complex social networks that extended people's involvement beyond their daily locations into the wider regional world (Lazzari, 2005, 2006).

While the overall extension and internal variation of the involved clay beds should be evaluated with the aid of geomorphology, the distances between these areas are suggestive of the considerable movement involved in the use of these resources. While potters use clay sources close to where they work, this does not mean that they only use the ones that are closest (Costin, 2000). A great diversity of factors may affect the choice of clay sources, distance and quality not being the main ones many times (Gosselain, 1998). The preliminary results of geochemical analysis of ceramics allow us to hypothesize a greater diversity of practices for the acquisition and circulation of both clays and pots in the first millennium AD.

As regards to obsidian, the available evidence indicates that while the two major spheres of distribution were stable through time, these areas overlapped since early times throughout late prehistory (Yacobaccio et al., 2002). While the archaeological sites included in this study only used obsidian from sources located in the southern sector of NWA, some of them shared ceramic iconography with archaeological sites that had access to obsidian from the northern sources.

Obsidian provenance data also indicates that the archaeological sites considered here shared the circulation of specific obsidian types with a number of other contemporaneous settlements, several of which had very different iconography and material culture assemblages. In spite of the visible differences in their material assemblages, the use of obsidian unambiguously places all of these sites within the same network, a structured spatial pattern of resource access and interaction. Additionally, most of the archaeological sites in the area used obsidian from smaller sources, whose distribution crosscut the wider spheres of obsidian supply (see Yacobaccio et al., 2004). The regional spaces of interaction during the first millennium AD were heterogeneous and had very porous boundaries.

Conclusion

This article presented the available evidence and the interpretative avenues stemming from the first stage of our integrative research program on circulation practices in ancient NWA. A second stage of geochemical analysis is already on its way to expand the sample size to match the current standards in sourcing studies, particularly for pottery. Additional petrography and geomorphology studies will be combined with those of INAA in the near future.

The results obtained indicate that our archeological sites participated in various social networks that co-existed at the time. Importantly, stylistic distributions do not correlate neatly with the active connections established by the past inhabitants of currently studied archaeological areas. The juxtaposition of both obsidian and pottery—typically studied separately—questions the assumptions concerning the structuring of the social universe that affected individuals and communities in their daily life.

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