Latin American Antiquity (2024), **35**, 39–54
doi:10.1017/laq.2022.99

ARTICLE

"Ways of Doing" Pottery in the Cajón Valley (Argentine Northwest) during the First Centuries AD

María Fabiana Bugliani and Lucas Pereyra Domingorena

Instituto de las Culturas (IDECU), Universidad de Buenos Aires-CONICET, Buenos Aires, Argentina
Corresponding author: María Fabiana Bugliani. Email: fbugliani@gmail.com

(Received 4 February 2022; revised 4 July 2022; accepted 7 November 2022)

This article presents an example of ceramic circulation and exchange networks in the southern Andean region during the first centuries AD, derived from the study of the production, circulation, and consumption of the pottery assemblages found in the villages of Cardonal and Bordo Marcial, located in the Cajón Valley in Catamarca, Argentina. Our analysis of the technical, morphological, and design aspects of the ceramics suggested six morphological groups using three representation techniques and 16 paste recipes; we also found that locally manufactured vessels were used together with ceramics of nonlocal origin in similar domestic contexts. In addition, the foreign ceramic materials suggest that there were networks of interaction between Cardonal and Bordo Marcial and other regions, such as the southern Puna, the Hualfín Valley, the Rosario-Lerma Basin, and the San Francisco Valley in northwestern Argentina.

Este artículo muestra un ejemplo de los circuitos de intercambio y circulación de bienes cerámicos registrados en el sur del área Andina durante los primeros siglos dC, a través del estudio de la producción, circulación y consumo de los conjuntos cerámicos de las aldeas Cardonal y Bordo Marcial, ubicadas en el valle del Cajón (Catamarca, Argentina). Se implementó una metodología que contempló el estudio de aspectos técnicos, morfológicos y de diseño. Estas dimensiones fueron analizadas de manera integrada para comprender la producción y consumo de vasijas en Cardonal y Bordo Marcial. Los resultados muestran seis grupos morfológicos, el uso de tres técnicas de representación y 16 modos de pasta, e indican la elaboración y uso de recipientes de manufactura local, con cerámica de origen alóctono en contextos domésticos similares. Además, los materiales cerámicos foráneos sugieren que existieron redes de interacción entre las aldeas señaladas y otras regiones, como la Puna meridional, el valle de Hualfín, la cuenca Rosario-Lerma y el valle de San Francisco en el Noroeste argentino.

Keywords: ceramics; petrography; morphology; iconography; Northwest Argentina; interaction

Palabras clave: cerámica; petrografía; morfología; iconografía; Noroeste argentino; interacción

The different "ways of doing" pottery, which include their morphological, aesthetic, and technical aspects, inform us about the social processes of manufacture, consumption, and interaction in societies with pottery. The south Andes region, a mosaic of social landscapes, proves fruitful for research into this topic.

During the first centuries AD, agropastoral societies developed in northwestern Argentina. These were small-scale, self-sustaining societies with long-distance systems of exchange and circulation of goods and resources connecting ecologically diverse regions, such as the desert region of San Pedro de Atacama and the South American eastern lowlands (Tarragó 1984). There is archaeological evidence for long-standing networks of circulation of goods, people, and ideas that consolidated during the Archaic period (ca. 5500 BP) and continued to spread into northwestern Argentina during the Inca imperial expansion (AD 1450–1550; Aschero 2007; Lazzari 2005; López Campeny et al. 2014; Nielsen 2013; Núñez and Dillehay 1995; Sprovieri 2014).

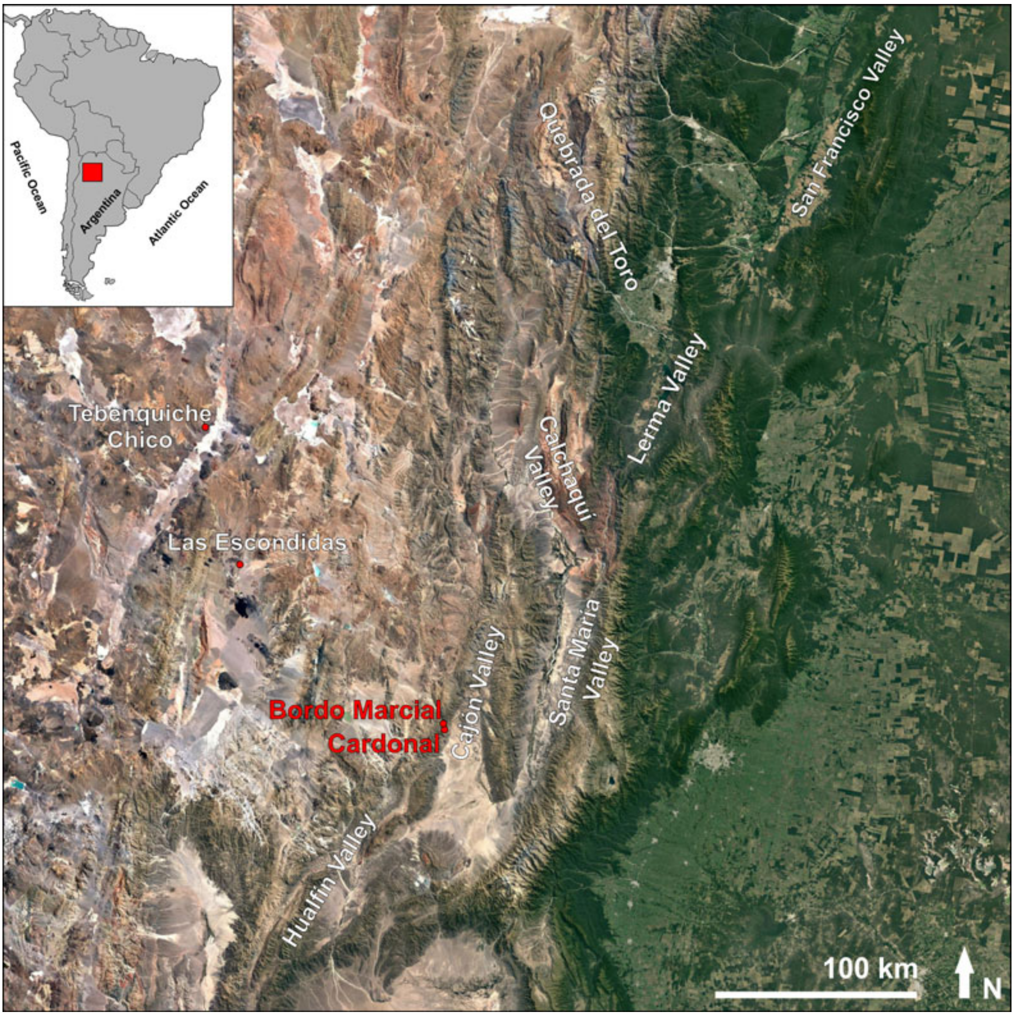

Figure 1. Location of sites and regions mentioned in the text (base image Google Earth 2021). (Color online)

Ceramic studies provide a strong line of evidence regarding the trade and circulation of archaeological goods; ceramic pieces were moved across hundreds of kilometers, thereby creating networks of interaction through their very materiality (Aschero 2007; Druc 1998; Tarragó 1984). A better understanding of this subject can be obtained through stylistic and petrographic analyses, analytic techniques that integrate data on the morphology, plastic expression, and paste type of vessels—aspects that usually are studied separately (Bugliani and Pereyra Domingorena 2012; Pereyra Domingorena and Bugliani 2019). Furthermore, these analyses provide information about the series of situated actions and necessary expertise used in the manufacture of ceramics within a particular social and natural context (Gosselain 2008).

This article examines the production, circulation, and consumption of ceramics in the sites of Cardonal and Bordo Marcial in the Cajón Valley in Argentina (Figure 1); these village societies were organized during the first millennium AD (Scattolin et al. 2015). It also explores the networks of interaction and trade of goods in which these societies were embedded.

Cardonal and Bordo Marcial

Cardonal and Bordo Marcial are very close—less than a kilometer away from each other—and were occupied at the same time. Radiocarbon dating indicates that both villages were inhabited during

https://doi.org/10.1017/laq.2022.99 Published online by Cambridge University Press

the first two centuries AD (Scattolin et al. 2015:Table 1), the time known as the Formative period. Each village contains about a hundred stone block structures with a circular floor plan. They are organized in groups of houses that were strongly integrated with grazing and growing areas (Figure 2).

Excavation of some of these houses has revealed entrance points and corridors for internal circulation, various activity spaces, storage areas, and a cooking place. Occupation floors show signs of combustion, camelid bone remains, waste from vegetable processing, carved and polished lithic instruments, carving waste, smoking pipes, and ceramic fragments from different kinds of pottery vessels (Scattolin et al. 2009). Similarities in the houses found in both sites and their simultaneous occupation enable a consideration of comparable patterns of pottery consumption in both villages. The ceramic assemblages analyzed here come from one of the houses in Cardonal (N1), made up of four rooms and a yard; one room in a house in Bordo Marcial (E18); and surface collections from both sites.

Integrated Methodology

Because of our interest in studying ceramics in their context and the possibility of reconstructing ceramic pieces, we considered the individual vessel as the privileged unit of analysis for our investigation. The vessels identified were the result of minimum number of vessels (MNV) calculations when the outline of the piece could be reconstructed, or of their grouping in families of fragments when they

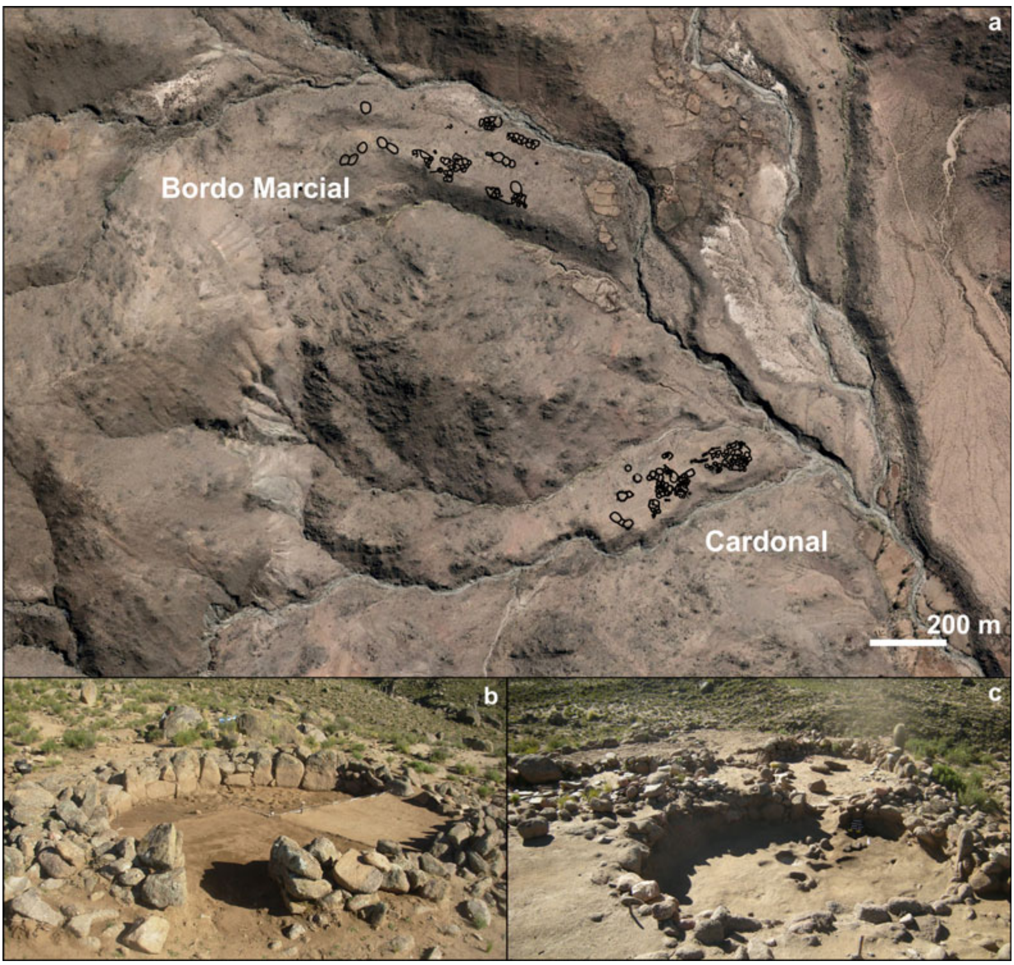

Figure 2. (a) Plans of the sites (base image Google Earth 2021); (b) excavated area at the Bordo Marcial site; and (c) excavated area of the Cardonal site (photos by authors). (Color online)

https://doi.org/10.1017/laq.2022.99 Published online by Cambridge University Press

were established as being part of the same piece but their shape could not be determined (Bugliani 2008; Orton et al. 1997).

Form description was carried out using broad categories (morphological groups), taking into consideration these aspects: the simple relationship of depth and diameters (maximum and of mouth), contour constriction or not (open or closed), different parts (mouth, body, wide neck), and secondary dimensions of the vessels (Balfet et al. 1983). Variants were recorded for some morphological groups. In addition, we analyzed the treatments applied to the surface of the pieces using such variables as color, finish, and texture (Bugliani 2008).

The analysis of plastic materials was performed through identification of the formal elements of design—motif, field, and composition—and of the techniques and materials used in their creation. Following a nonhierarchical approach (Jernigan 1986), we observed the units of design related to their combination, arrangement, and visual planes, thereby revealing the compositional structure of the designs.

Technical aspects of the ceramics were studied through petrographic analysis of the fabrics (Cremonte 1996; Pereyra Domingorena 2012, 2015), using a Leica DM EP polarized-light microscope. Photomicrographs of thin sections were taken with a CANON EOS Rebel T3i digital camera, with a 5×/0.12 lens, affording an optimal image of the section. Petrographic analysis enabled a classification of the matrix structure, textural analysis of the fabrics (Middleton et al. 1991), and identification of inclusions: rock fragments (volcanic, plutonic, sedimentary, metamorphic), crystalloclasts (quartz, potassium feldspar, plagioclase, amphiboles, pyroxenes, etc.), volcanic glass, opaque minerals and grog, and voids. The matrix structures were classified as pseudo-lepidoblastic (detrital micas are recorded), crypto-phyllitic (no detrital micas are observed and coloration of clayey matrixes is clear);, or microgranular (microcrystals less than 15 µm abound), according to the descriptions proposed by Courtois (1976). The characterization of nonplastic inclusions was done using Kerr's mineralogical descriptions (1965), which are based on the optical properties of the crystals—relief, birefringence, coloration, pleochrois, and so on—and a geological map of the area (Turner 1973). The proportions of the compositional elements of fabrics were obtained by means of point-counting analysis, applying the multiple interception method (Quinn 2013). Counting was done manually using a graduated scale attached as an accessory to the polarizing microscope rotating stage, with an average of 300 points counted per thin section. During point counting, we also recorded the shape and size of inclusions and voids. The shape categories correspond to sedimentary rock identification charts (Adams et al. 1997).

An exploratory clustering of the sample was made through principal component analysis (PCA) using PAST software, version 2.17 (Hammer et al. 2001). By combining quantitative data analysis with the qualitative description of matrices, inclusions, and voids, as well as with previous archaeological and experimental research in the area (Pereyra Domingorena 2012, 2013, 2015; Pereyra Domingorena and Bugliani 2019), we were able to establish the fabrics of the archaeological ceramics.

Integrating the data gathered from the three lines of evidence—shape, design, and fabric—by establishing morphological groups, plastic repertoires, and paste recipes has allowed us to understand the ways in which pottery was manufactured and consumed by the former inhabitants of Cardonal and Bordo Marcial.

Results

Following an initial characterization, the MNV count resulted in 62 pieces (some of which were only partially reconstructed), to which we added 36 families of fragments of unidentified shape but belonging to hypothetical pieces. The total number of cases was thus 98, of which 30 samples come from Bordo Marcial and 68 from Cardonal (Supplemental Table 1). This sample comprised the following ceramic types: Ordinario Alisado ($n = 25$), Ordinario Pulido ($n = 3$), Ordinario Inciso ($n = 1$), Ordinario Pintado ($n = 1$), Ordinario Rojo ($n = 4$), Gris Pulido ($n = 20$), Ante Pulido ($n = 9$), Rojo Pulido ($n = 2$), Gris Inciso ($n = 4$), Río Diablo ($n = 2$), Condorhuasi Rojo sobre Ante ($n = 1$), Vaquerías ($n = 25$), and Rojo sobre Ante ($n = 1$). Shape reconstruction and morphometric analysis of the pieces enabled identification of six morphological groups, with several variants (Figure 3; Supplemental Table 2).

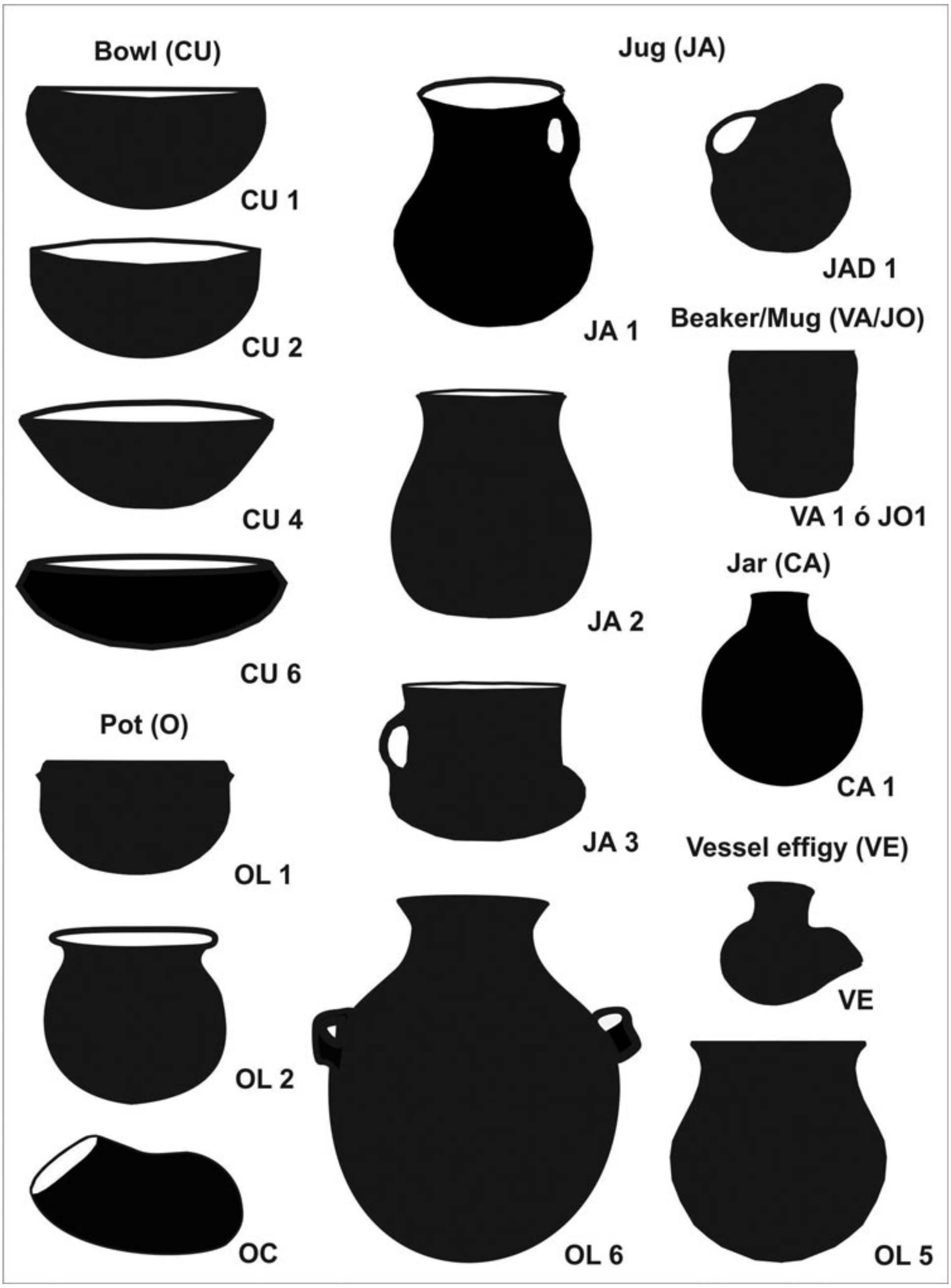

Figure 3. Repertoire of forms (figure by María Fabiana Bugliani).

Bowls comprise generally open vessels, with a mouth diameter between 130 and 213 mm. They exhibit four variants according to their outline. One variant has a restricted profile with a slightly in-sloping rim (CU1). Another has an unrestricted simple profile with somewhat diverging walls (CU2). A third variant has diverging walls (CU4), and the last one has an unrestricted complex profile with a corner point (CU6).

Some of the jugs have inflected profiles with long everted necks (JA1), whereas others have slightly everted necks (JA2). There are also complex profile jugs with a corner point dividing their short straight necks from their globular bodies (JA3), and one variant has an inflected globular profile and dorsiventral symmetry (JAD1).

Cooking pots are of many different sizes, with mouth diameters between 90 mm and 240 mm. Some pots have a restricted, simple profile and no neck (OL1), whereas others have a slightly restricted and inflected profile, a short neck, and globular body (OL2). A third variant is characterized by an inflected profile without a distinct neck (OL5); pieces belonging to yet another variant present inflected profiles and prominent necks (OL6). One last variant is constituted by a calceiform (shoe-shaped) pot with no neck (OC).

There are jars of many different sizes, but they all belong to a single variant with an inflected profile, globular body, and narrow neck (CA1).

Some pieces in the shape of a beaker/mug with simple unrestricted profiles and vertical walls were also recorded (VA1 or JO1). Finally, we also identified an effigy vessel (VE) modeled in the shape of a *quirquincho* (armadillo) (Figure 4b).

Regarding surface treatment, the pieces show three stages of finishing: smoothing (A1) and polishing with certain variations, uneven polishing with surface undulations and some sections left untreated (Pu1), and uniform polishing on a leveled surface but with polishing marks visible (Pu2). In addition,

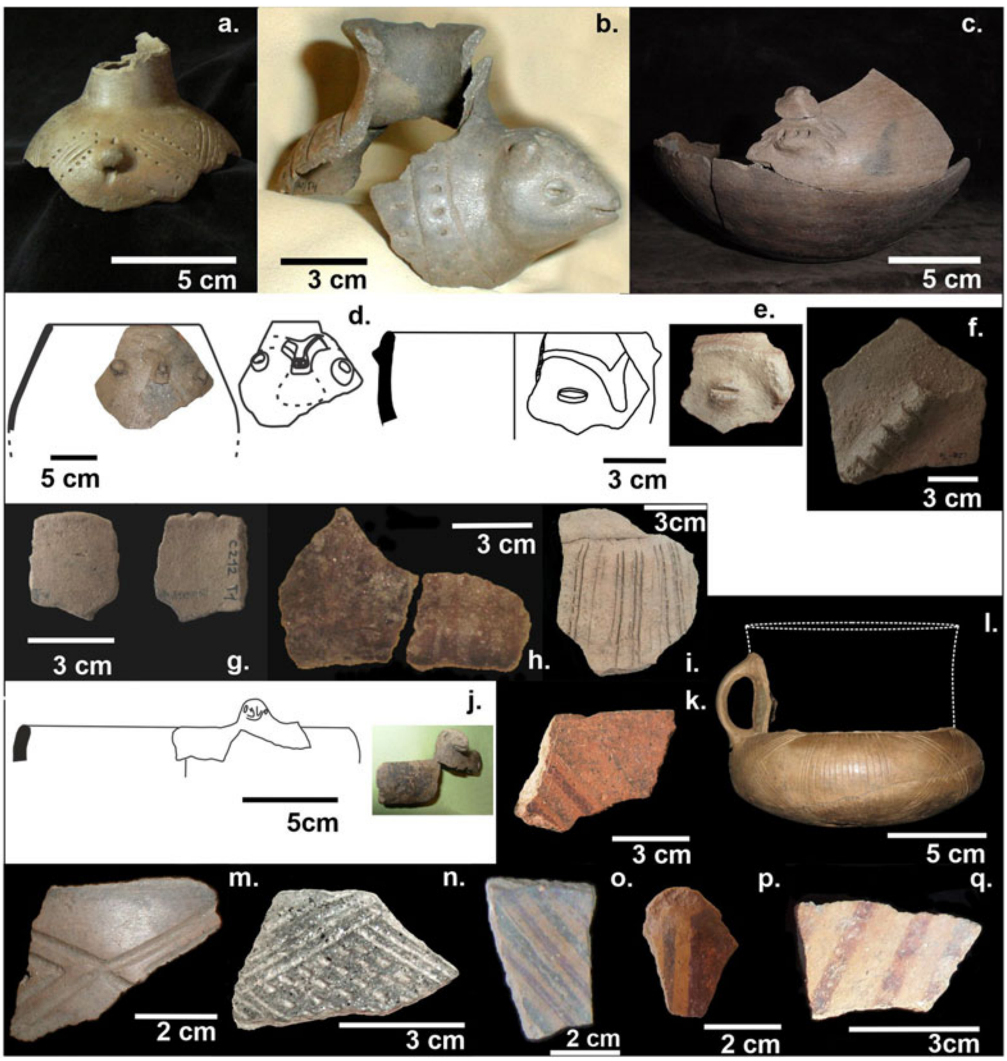

Figure 4. Plastic expressions: (a–c) in Fino sin Atemperante (FSA; samples 17, 42, 41); (d–f) in Grueso Granítico-Cuarzoso (GGC; samples 71, 13, 19); (g–i) in Grueso Granítico-Cuarzoso de Densidad Moderada (GGCM; samples 20, 77, 78); and (j–q) in Medio Cuarzoso-Granítico (MCG; samples 54, 25, 15, 75, 80, 89, 28, 93). (Color online)

https://doi.org/10.1017/laq.2022.99 Published online by Cambridge University Press

red paint (PiR) was used to entirely cover the surface of some vessels, and a red coat (BR) was applied on thick-walled vessels with smooth finishing. Vaquerías-style pieces exhibit a yellowish-white slip (EnB) as background to the design (Bugliani and Pereyra Domingorena 2012; Heredia et al. 1974; Figure 5g, j, o, q, r).

Plastic representations were made using techniques such as incising, painting, modeling, and appliqué. V-shaped incising was used to create geometric designs combining lines and dots on the neck and body of small jars and jugs (Figure 4l, n). In jugs, we observed configurations recognizable as Río Diablo style (González and Cowgill 1975). Incising was also used to cut short transverse grooved lines in a U-shape on bowl rims (Figure 4g).

Modeling and appliqué techniques were employed for zoo- and anthropomorphic designs on the body of some pieces and on effigy and sculpture-like vessels (Figure 5y–z). These techniques were also used to apply wide incised bands to the walls of large vessels.

Paint was used in creating Vaquerías-style polychrome geometric designs, a ceramic style characterized by combinations of multiple lines and flags painted in red, black, or both colors over a yellowish-white slip or over the orange color of the fabric. This style also features red parallel line designs painted over the body of pieces of beige or gray fabric (Figures 4k, o, p, q and Figures 5a–u). Red paint was used to generate line designs in another three samples: on an Ordinario Pintado piece (Figure 4h), on a Condorhuasi Rojo sobre Ante vessel (González 1956; Figure 5v), and on a Rojo sobre Ante piece (Figure 5w). From the reconstructed pieces and families of fragments, we obtained and analyzed 98 thin sections through petrographic examination methods that resulted in the configuration of the 16 fabrics described next (Figure 6; Supplemental Table 3).

Grueso Granítico-Cuarzoso (GGC; samples 2, 4, 6, 11, 12, 13, 18, 19, 36, 43, 47, 48, 53, 62, 63, 64, 67, 68, 69, 70, 71, 72, 73, 74, 81). It contains abundant temper (more than 37% of the fabric) of a very wide granulometric range from coarse silt to a small gravel size (0.015–4.0 mm). These inclusions are mainly quartz crystals and fragments of granitic rock. Most of the fabrics have a pseudo-lepidoblastic matrix structure, except for a few cases that present a crypto-phyllitic structure (samples 12, 43); a pseudo-lepidoblastic, somewhat microgranular structure (samples 36, 39); or a crypto-phyllitic, somewhat pseudo-lepidoblastic structure (samples 74, 81; Figure 7a). Different matrix structures would reflect differences in clays used for pottery manufacture and in temperatures reached in the firing process of vessels (Courtois 1976; Cremonte 1996).

Grueso Metamórfico (GM; sample 76). It contains 44.78% of very coarse-grained tempers (granulometry between 0.25 mm and 4.0 mm), mainly including fragments of low-grade metamorphic rock (slate and phyllite), sandstone, and lower proportions of small quartz clasts (0.03–0.125 mm). The structure of the fabric matrix is pseudo-lepidoblastic, somewhat microgranular (Figure 7b).

Grueso Volcánico (GV). It consists of a single sample (7). It is a coarse fabric with 35.67% of temper inclusions, mainly volcanic lithoclasts, quartz, plagioclase, and biotite, whose granulometry varies from coarse silt to very coarse sand (0.03–2.0 mm). The clay matrix has a crypto-phyllitic, somewhat microgranular structure (Figure 7c).

Grueso Granítico-Cuarzoso de Densidad Moderada (GGCM; samples 10, 20, 37, 38, 44, 45, 59, 60, 61, 65, 66, 77, 78). It is characterized by tempers of nonselected size whose granulometry ranges from coarse silt to very coarse sand (0.03–2.0 mm). Temper density varies from 32% to 35%, mainly corresponding to quartz crystals and granitic rock fragments. Most of the samples have pseudo-lepidoblastic matrix structures, except for sample 10 (which as a microgranular, somewhat pseudo-lepidoblastic structure) and sample 59 (with a pseudo-lepidoblastic, somewhat microgranular structure; Figure 7d).

Grueso Pseudomorfo de Muscovita con Densidad Moderada (GPMM). It is only represented by sample 46. It has an intentional inclusion—mainly consisting of altered granitic lithoclasts, muscovite pseudomorphs, and quartz and muscovite clasts, which represent 28.71% of the fabric. The granulometry of these nonplastic elements ranges from coarse silt to very coarse sand (0.03–2.0 mm). The matrix structure is pseudo-lepidoblastic (Figure 7e).

Medio con Inclusiones Seleccionadas Gruesas (MISG; samples 32, 40). It presents inclusions of selected size with a regular granulometry ranging from coarse to very coarse sand (0.5–2.0 mm). Inclusions make up between 22% and 26% of the fabric. The matrix structure is pseudo-lepidoblastic (Figure 8a).

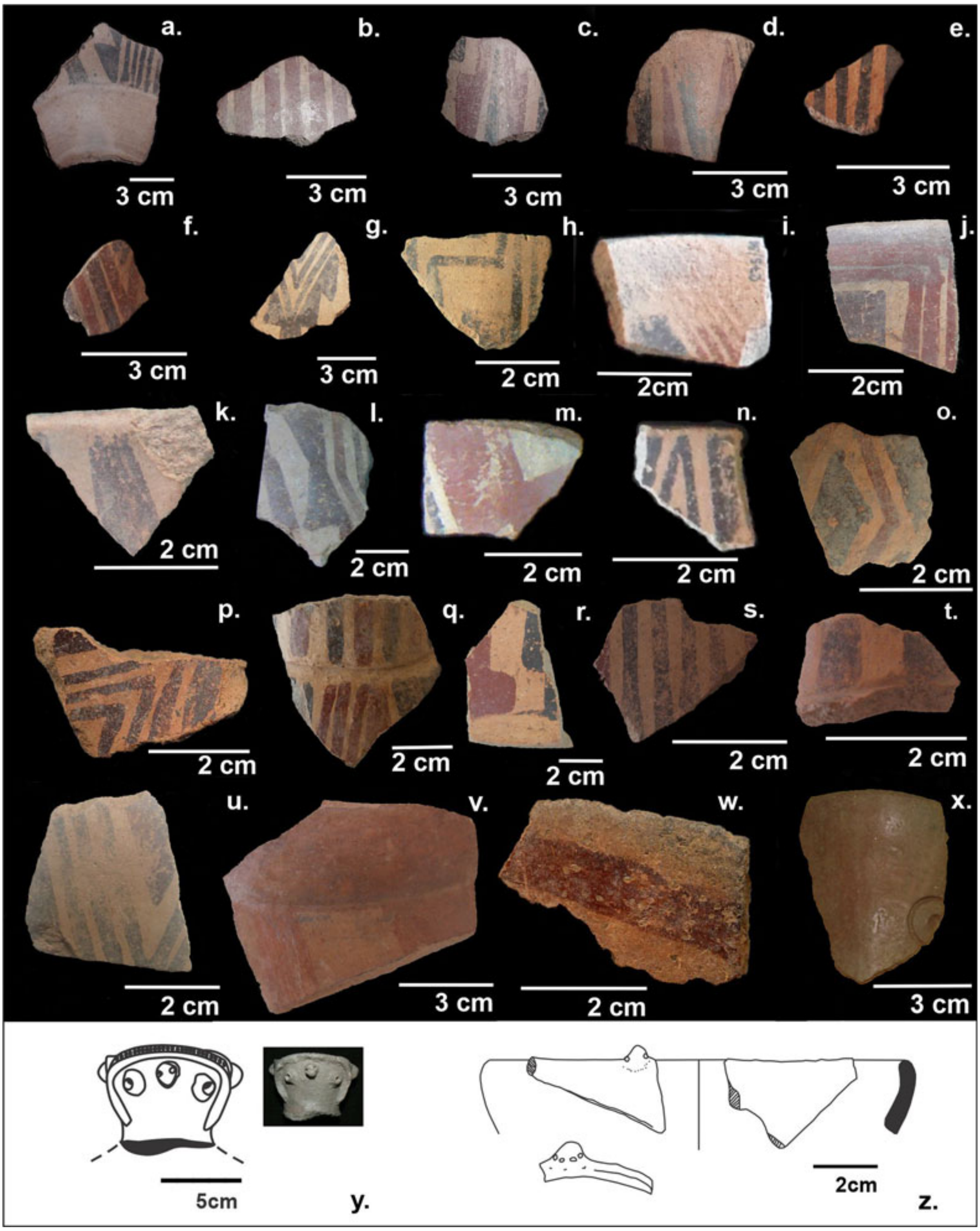

Figure 5. Plastic expressions: (a–q and s) in Medio Metamórfico-Cuarzoso (MMC; samples 21, 22, 23, 24, 26, 27, 29, 30, 84, 85, 86, 88, 92, 96, 90, 98, 97, 94); (t) in Medio con Tiesto Molido (MTM; sample 95); (r and u) in Medio Cuarzoso-Metamórfico (MCM; samples 87, 91); (v) in Fino con Vidrio Volcánico (FVV; sample 83); (w) in Grueso Metamórfico (GM; sample 76); (x) in Fino Denso (FD; sample 52); (y) in Grueso Pseudomorfo de Muscovita con Densidad Moderada (GPMM; sample 46); and (z) in Fino (F; sample 34). (Color online)

Medio Cuarzoso-Granítico (MCG; samples 15, 25, 28, 35, 49, 54, 58, 75, 79, 80, 89, 93). It contains tempers of selected size with a regular granulometry ranging from medium sand to coarse sand (0.25–1.0 mm). Most are quartz crystals and fragments of granitic rock. The amount of inclusions fluctuates between 19% and 27% of the overall fabric, except for sample 58, which contains 13% of temper. The structure of the fabric matrix corresponds to crypto-phyllitic. somewhat pseudo-lepidoblastic (samples 15, 93); pseudo-lepidoblastic (samples 25, 28, 49, 54, 75, 80); pseudo-lepidoblastic, somewhat micro-granular (samples 35, 58, 79) and crypto-phyllitic (sample 89) types (Figure 8b).

https://doi.org/10.1017/laq.2022.99 Published online by Cambridge University Press

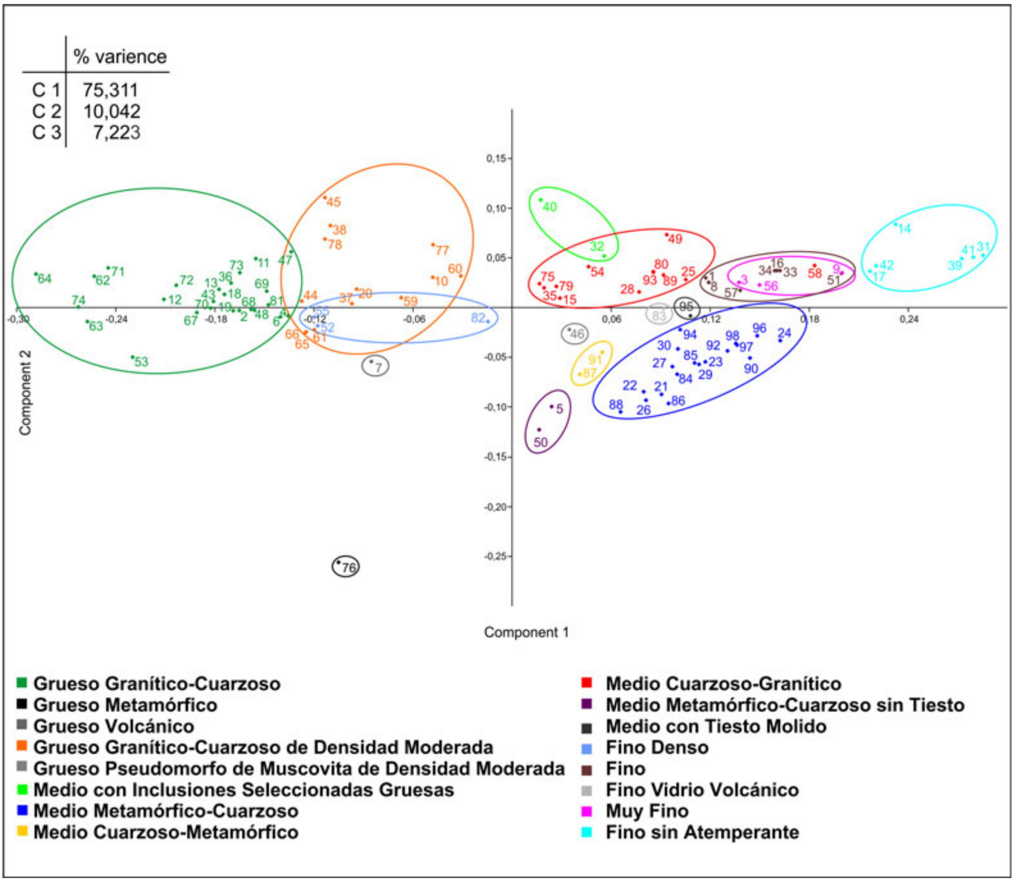

Figure 6. Principal component analysis graph with the distribution of the 98 thin sections analyzed in relation to the 16 registered paste recipes. (Color online)

Medio Metamórfico-Cuarzoso (MMC; samples 21, 22, 23, 24, 26, 27, 29, 30, 84, 85, 86, 88, 90, 92, 94, 96, 97, 98). It presents different proportions of low-grade metamorphic lithoclasts (slate and phyllite), quartz, sandstone, and grog as temper. The granulometry of most inclusions fluctuates between medium sand to very coarse sand (0.25–2.0 mm), making up between 17% and 27% of the fabric. The matrix structure of most fabrics is crypto-phyllitic, somewhat microgranular (samples 21, 22, 23, 24, 88, 94) or crypto-phyllitic (samples 26, 27, 30, 84, 85, 86, 90, 92, 96, 97), although sample 29 presents a pseudo-lepidoblastic, somewhat microgranular matrix structure, and sample 98 has a microgranular, somewhat pseudo-lepidoblastic one (Figure 8c).

Medio Cuarzoso-Metamórfico (MCM; samples 87, 91). It contains between 25% and 27% quartz, slate and phyllite, grog, and sandstone as tempers, with a relative abundance of quartz. The granulometry of inclusions ranges from fine sand to coarse sand (0.125–1.0 mm), with a density fluctuating between 28% and 38%. The structure of the fabric matrix is crypto-phyllitic, somewhat microgranular (sample 87) and pseudo-lepidoblastic (sample 91; Figure 8d).

Medio Metamórfico-Cuarzoso sin Tiesto (MMCST; samples 5, 50). It contains between 29% and 30% slate and phyllite, sandstone, and quartz as tempers and is characterized by an absence of grog. The granulometric range of its inclusions goes from medium sand to very coarse sand (0.25–2.0 mm). The matrix structure of the fabrics is pseudo-lepidoblastic (Figure 8e).

Medio con Tiesto Molido (MTM). It is represented by sample 95, which contains grog and quartz clasts, making up 20% of the fabric. The prevailing granulometry varies from medium sand to very coarse sand (0.25–2.0 mm). The clay matrix is pseudo-lepidoblastic (Figure 8f).

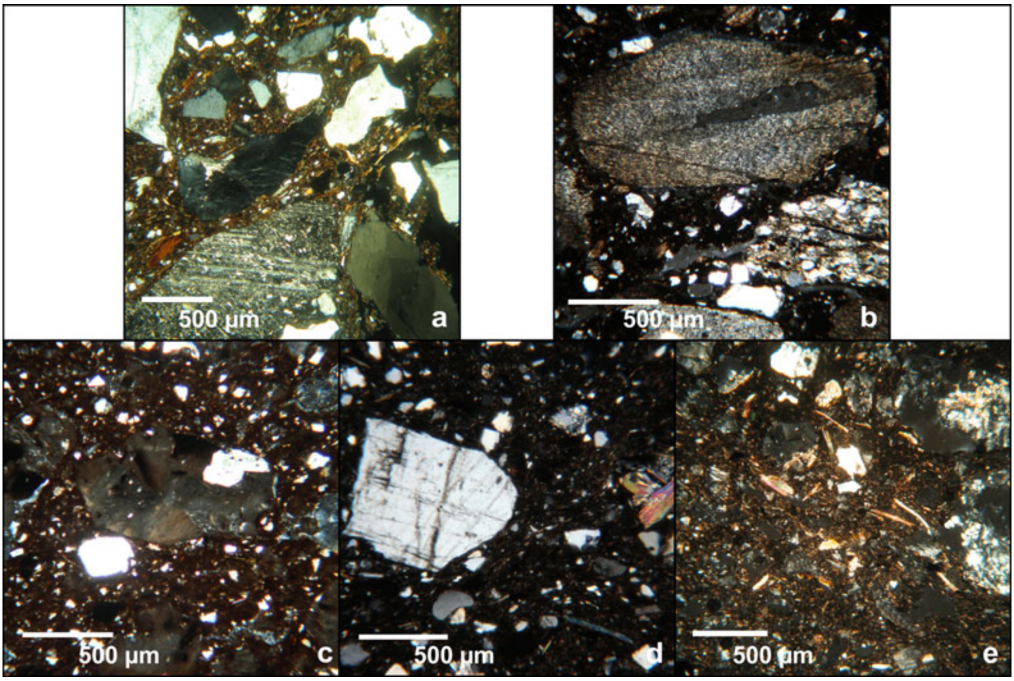

Figure 7. Photomicrographs of coarse paste recipes: (a) Grueso Granítico-Cuarzoso (GGC; sample 47); (b) Grueso Metamórfico (GM; sample 76); (c) Grueso Volcánico (GV; sample 7); (d) Grueso Granítico-Cuarzoso de Densidad Moderada (GGCM; sample 10); and (e) Grueso Pseudomorfo de Muscovita con Densidad Moderada (GPMM; sample 46). (Color online)

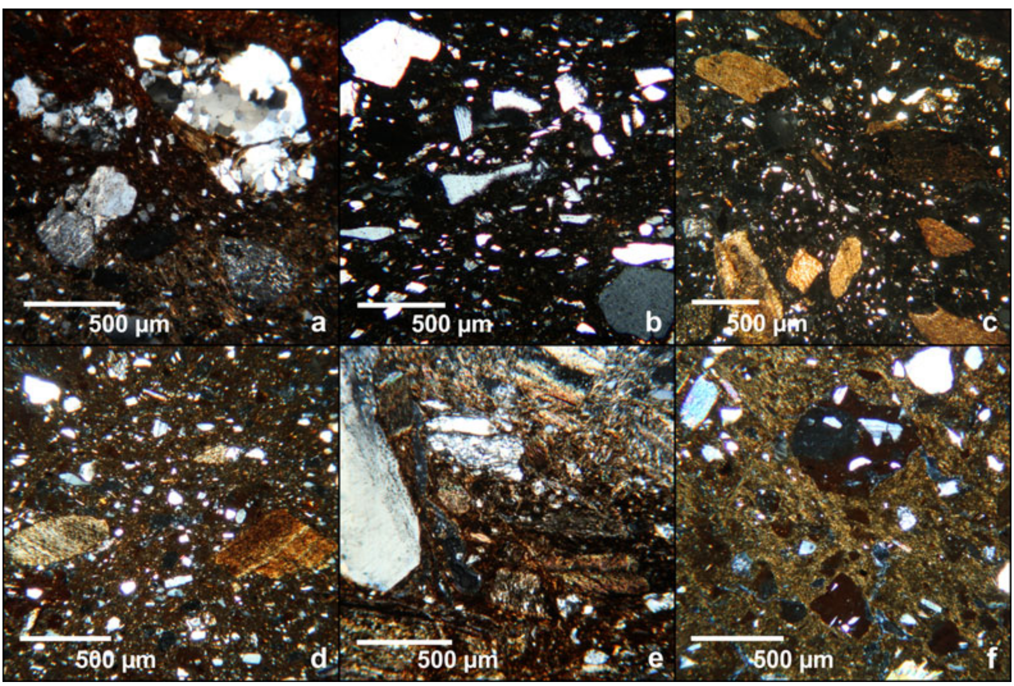

Figure 8. Photomicrographs of medium fabrics: (a) Medio con Inclusiones Seleccionadas Gruesas (MISG; sample 40); (b) Medio Cuarzoso-Granítico (MCG; sample 15); (c) Medio Metamórfico-Cuarzoso (MMC; sample 88); (d) Medio Cuarzoso-Metamórfico (MCM; sample 91); (e) Medio Metamórfico-Cuarzoso sin Tiesto (MMCST; sample 5); and (f) Medio con Tiesto Molido (MTM; sample 95). (Color online)

https://doi.org/10.1017/laq.2022.99 Published online by Cambridge University Press

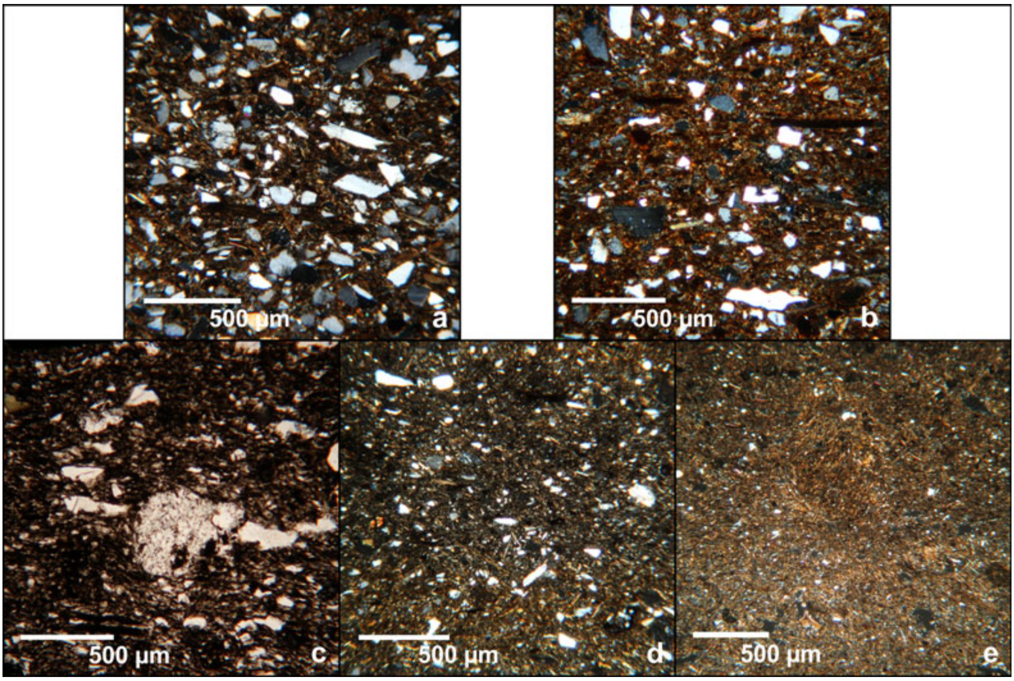

Figure 9. Photomicrographs of fine fabrics: (a) Fino Denso (FD; sample 55); (b) Fino (F; sample 16); (c) Fino con Vidrio Volcánico (FVV; sample 83); (d) Muy Fino (MF; sample 9); and (e) Fino sin Atemperante (FSA; sample 39). (Color online)

Fino Denso (FD; samples 52, 55, 82). It contains clast inclusions, mainly quartz, with a granulometric range varying from coarse silt to fine sand (0.03–0.25 mm) and a density between 28% and 38%. The structure of the fabric matrices is pseudo-lepidoblastic (Figure 9a).

Fino (F; samples 1, 8, 16, 33, 34, 51, 57). It contains clast inclusions, mainly quartz, with a granulometric range varying from coarse silt to fine sand (0.03–0.25 mm), representing between 11% and 24% of the fabric. The structure of the fabric matrix is pseudo-lepidoblastic (Figure 9b).

Fino con Vidrio Volcánico (FVV). It is represented solely by sample 83 and features primarily quartz and glass clast inclusions; its granulometry ranges from coarse silt to fine sand (0.03–0.25 mm), making up 21% of the fabric. The matrix structure of the fabric is pseudo-lepidoblastic, somewhat microgranular (Figure 9c).

Muy Fino (MF; samples 3, 9, 56). It exhibits clast inclusions, mainly quartz, with a granulometry ranging from coarse silt to very fine sand (0.03–0.125 mm), which represents between 12% and 18% of the fabric. Sample 3 has a crypto-phyllitic, somewhat pseudo-lepidoblastic matrix structure, whereas sample 9 presents a pseudo-lepidoblastic structure; the structure of the fabric matrix of sample 56 is pseudo-lepidoblastic, somewhat microgranular (Figure 9d).

Fino sin Atemperante (FSA; samples 14, 17, 31, 39, 41, 42). It presents no intentionally added nonplastic material. The recorded inclusions are thought to be natural clasts present in clay, with a pseudo-lepidoblastic matrix structure (Figure 9c).

Discussion

The materials we studied reflect the variety of ways of doing pottery on a domestic scale in northwestern Argentina during the first centuries AD. In Cardonal and Bordo Marcial, 16 fabrics were used that involved different selections and combinations of sands and clays. The pieces were modeled into six morphological groups with a few variants. Surface treatment was applied to all the vessels with an instrument that gave them a smooth or polished appearance. For plastic representations, a sharp-pointed utensil was used to make incised designs, whereas motifs were painted with thin-line tools.

https://doi.org/10.1017/laq.2022.99 Published online by Cambridge University Press

The appliqués used for the figurative representations were hand modeled. In addition, we observed different matrix structures from which we inferred different ways of handling fire to fire the pots.

Grueso Granítico-Cuarzoso, Grueso Granítico-Cuarzoso de Densidad Moderada, Medio con Inclusiones Seleccionadas Gruesas, Medio Cuarzoso-Granítico, Fino Denso, Fino, Muy Fino, and Fino sin Atemperante paste recipes were the result of technical decisions made by Cardonal and Bordo Marcial potters in relation to the raw materials—clays and inclusions—and their combinations in different proportions. The tempers used were sands composed of quartz clasts and migmatitic granite in various amounts, which in some cases present a wide granulometric range (Grueso Granítico-Cuarzoso and Grueso Granítico-Cuarzoso de Densidad Moderada paste recipes). We also observed the intentional use of selected sands of various sizes (Medio con Inclusiones Seleccionadas Gruesas, Medio Cuarzoso-Granítico, Fino Denso, Fino, and Muy Fino paste recipes). The purposeful addition of inclusions is supported by previous research, which demonstrates textural similarities between archaeological fabrics without temper and the clays collected in the area. In addition, there are textural similarities between fabrics with intentional inclusions and experimental fabrics to which different proportions of sand were incorporated, which were collected in areas near the archaeological sites (Pereyra Domingorena 2012, 2013, 2015).

The presence of inclusions of migmatitic granite lithoclasts and quartz crystalloclasts is consistent with the mineralogy typical of a high-grade metamorphic environment. This phenomenon is characteristic of the Chango Real mountains, at the base of which the sites of Cardonal and Bordo Marcial are located. The Chango Real formation is constituted by migmatitic granite (Turner 1973), which would suggest that local potters chose sediments rich in these clasts that were present in the vicinities of their sites as inclusions for their fabrics. Some of these samples were previously studied by instrumental neutron activation analysis (INAA), which revealed the local manufacture of the pieces. The cluster called Fino sin Atemperante, despite not containing intentional inclusions, was also characterized as locally produced by chemical analysis (Lazzari et al. 2017).

Most vessels present pseudo-lepidoblastic matrix structures. According to an experimental test performed on briquettes (containing various clay and sand combinations) under different firing temperatures (Pereyra Domingorena 2013), the pseudo-lepidoblastic texture of the matrices could be the result of firing temperatures below 650°C. In addition, six fabrics were identified containing inclusions of rocks that were not present in the geology of the area under study.

Grueso Metamórfico, Medio Metamórfico-Cuarzoso, Medio Cuarzoso-Metamórfico, and Medio Metamórfico-cuarzoso sin Tiesto paste recipes, which contain slate, phyllite, and sandstone as tempers, may have been manufactured in Quebrada del Toro or the Lerma Valley or both places (De Feo and Pereyra Domingorena 2018; Pereyra Domingorena et al. 2020). This can be inferred from the presence of these types of rocks in the Puncoviscana Formation lithology (Blasco et al. 1996), which extends along the area, coincident with the Rosario-Lerma Basin (Figure 10). Some of the samples here classified as Medio Metamórfico-Cuarzoso paste recipe were previously subjected to chemical analyses that also indicated their nonlocal manufacture (Lazzari et al. 2017).

The sample of Grueso Volcánico fabric contains inclusions of effusive rocks with a spherulitic texture not identified in the sands collected in the area (Pereyra Domingorena 2013). These rocks were found as an inclusion in the pottery production of the area surrounding Laguna Blanca (Espiro 2008), and of the Antofagasta de la Sierra micro-region (Argentine southern Puna), where they were also recorded in the composition of sandy sediments (Puente 2016). Furthermore, according to the chemical analysis (INAA) carried out on this sample, they are statistically associated with a group of ceramics from the Santa María Valley that were previously interpreted as local production (Lazzari et al. 2017). However, comparison of the sands obtained in Antofagasta de la Sierra with the pottery productions of southern Puna and with the petrography of the fabric described in this study allows us to claim that sample 7 was manufactured in the Puna (Figure 10) and is thus foreign to Cardonal and Bordo Marcial.

Most of the vessels classified as Medio Metamórfico-Cuarzoso fabric and the piece corresponding to the Grueso Volcánico paste recipe exhibit crypto-phyllitic or crypto-phyllitic, somewhat microgranular matrix structures. This trait present in the structure of the fabric matrix would suggest

https://doi.org/10.1017/laq.2022.99 Published online by Cambridge University Press

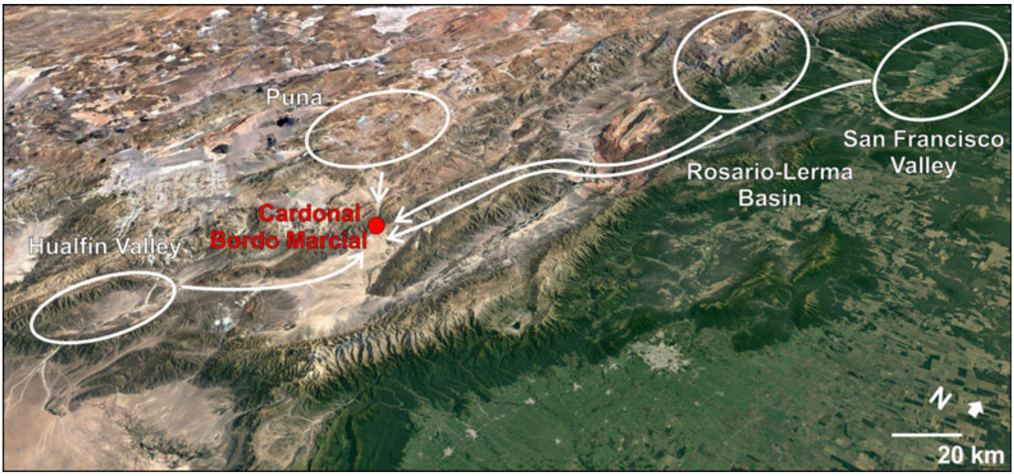

Figure 10. Possible areas of origin of the allochthonous ceramics (base image Google Earth 2021). (Color online)

that the pieces were fired at temperatures above 800°C, as demonstrated in a comparison between the clay matrix of archaeological ceramics and experimental briquettes (Cremonte 1996).

Moreover, the Grueso Pseudomorfo de Muscovita con Densidad Moderada paste recipe contains inclusions of altered granitic rocks and clasts of muscovite pseudomorphs, elements not found in the sands gathered in the area (Pereyra Domingorena 2013). These types of rocks and clasts were classified as inclusions in the pottery found in the sites of Tebenquiche Chico and Las Escondidas (Gasparotti 2019), located in the Catamarca province in the Puna region. The results of the analyses performed on the ceramic fabric, the data from experimental tests, and the comparison with pottery pieces made in other areas suggest that the piece constructed using this paste type was manufactured in the Puna region (Figure 10) and is therefore foreign to Cardonal and Bordo Marcial.

Finally, two other pieces might be considered nonlocal productions because of the tempers used. The Medio con Tiesto Molido fabric contains inclusions of grog, which has not been identified in the local productions made by potters. Conversely, the addition of grog is a technical practice recorded in the San Francisco pottery tradition (Pereyra Domingorena and Cremonte 2017). For that reason, it is presumed that the piece corresponding to the Medio con Tiesto Molido paste recipe was not manufactured in the villages studied (Figure 10). The sample characterized as Fino con Vidrio Volcánico fabric presents quartz and volcanic glass inclusions, which were recorded in the pottery identified as locally produced in the Hualfín Valley (Baldini et al. 2005; Pereyra Domingorena and Puente 2018; Zagorodny and Balesta 2005). Therefore, we propose that this fabric also belongs to a nonlocal pottery production (Figure 10).

Fabric, morphology, and plastic design are three dimensions that behaved independently in the sample studied, yet there were a few cases in which we observed a correlation among them. For example, in the pieces identified as Río Diablo style, we found that a particular local paste recipe (Medio Cuarzoso-Granítico) is associated with cylindrical-necked jars and panels with characteristic incised geometric designs combining lines, rhombus, and dots (Figure 4l). Another example of correlation between shape and design is provided by simple-profile bowls with an ornitomorphic appendix attached to the rim. In addition, several Vaquerías-style pieces exhibit a correspondence between vessel shape, geometric designs, and the section of the piece where these designs were painted (Bugliani and Pereyra Domingorena 2012, Pereyra Domingorena et al. 2020).

The morphological repertoire of vessel types comprises a wide variety of shapes that reflect the diversity of activities for which they were used, particularly for the preparation, storage, and consumption of food in the household. For cooking pots, different variants of coarse fabrics were used, with locally found quartzose-granitic inclusions of nonselected size (GGC and GGCM paste recipes). These restricted, globular-shaped pieces had very thick walls and smoothed surfaces that show

https://doi.org/10.1017/laq.2022.99 Published online by Cambridge University Press

evidence of having been exposed to fire; namely, soot and burn marks indicative of open-fire cooking. Other smaller pots, with very thin walls and polished surfaces, were manufactured with fine fabrics with and without temper (F and FSA paste recipes).

The jugs and jars were also constructed with a wide selection of fabrics. Large vessels used for storing liquids were made with coarse and medium fabrics and were given a smooth finish (GGC, GGCM, GPMM, MCG, MMCST fabrics). There is also a set of jugs and jars produced with fine fabrics and finished to a polished surface (F, FD, MF paste recipes).

The bowls used for service have a polished finish, whether they were manufactured with coarse, medium, or fine fabrics (GGC, GGCM, GV, MMC, MCG, FD, F, MF, FSA paste recipes); we observed the same with mugs and beakers.

In the set used for service (bowls, little jugs, jars, and small cooking pots), there is a greater number of plastic resources and designs. This is to be expected considering that service ware was widely used and exhibited in several social situations. The most frequent designs are incised stripes on continuous panels around the piece, simple line designs or complex geometric ones painted in one or two colors, and modeling and appliqués to represent zoomorphic and anthropomorphic figures.

Although most of the pieces used for carrying and serving food were manufactured with fabrics of local origin, small transportable vessels made with nonlocal fabrics were included in this set. Among the pieces of nonlocal manufacture, Grueso Volcánico fabric (GV) was only recorded in a gray polished bowl (sample 7). The Medio Metamórfico-Cuarzoso sin Tiesto paste recipe (MMCST) was found in two small gray jugs with a polished finish (samples 5, 50). Grueso Pseudomorfo de Muscovita con Densidad Moderada fabric (GPMM) occurs in a small jug with zoomorphic designs on the neck (sample 46), similar to others found in Tebenquiche and Laguna Blanca. Grueso Metamórfico paste recipe (GM) and Fino con Vidrio Volcánico fabric (FVV) are recorded in restricted pieces (samples 76 and 83, respectively). The latter presents geometric designs painted in red on the beige background of the fabric, which resemble productions from Condorhuasi.

Medio Metamórfico-Cuarzoso, Medio Cuarzoso-Metamórfico, and Medio con Tiesto Molido fabrics were used to manufacture most Vaquerías-style painted pieces, but this ceramic type was also locally produced with the Medio Cuarzoso-Granítico paste recipe. Thus, Vaquerías style was manufactured with four separate paste recipes, three of them foreign and one of local origin. These distinct manufacturing types can be observed in the petrographic differences among the fabrics but are neither visible in the iconography of the vessels nor in the manufacturing techniques. This may be an instance of emulation in which a foreign style, Vaquerías, was also produced locally and used interchangeably in the same social contexts.

Final Considerations

Our study of the production, distribution, and consumption of ceramics allows us to trace links between objects, people, and places, improving understanding of the dynamic and collective construction of the landscape that gave meaning to social processes in the villages of Cardonal and Bordo Marcial. We can suggest at least two types of circulation: (1) the transport of objects as evidenced by the presence of pieces made in other areas and (2) the circulation of ideas, manifested in the imitation of foreign shapes and designs in locally manufactured pottery. No differences were detected in the manufacture or consumption of ceramic pieces and styles between the two villages. Thus, we claim that the village social landscape was common to the inhabitants of both Cardonal and Bordo Marcial, with potters from both villages partaking in the same learning methods and technical expertise.

The integration of foreign pottery into the domestic activities identified within households reflects a strong interaction with other regions and shows the interplay between self-sufficient local economies and the regional exchange system shaping the landscape shared by these village societies of the first centuries AD (De Feo and Pereyra Domingorena 2018; Pereyra Domingorena et al. 2020; Scattolin et al. 2015). Good trade networks connected Cardonal and Bordo Marcial with other ecological environments, such as southern Puna to the west, the Hualfín Valley to the south, the Rosario-Lerma Basin to the north, and the San Francisco River valley to the northwest. The pottery pieces found in both villages constitute an example of the materialization of these relations and illustrate the extent and configuration of these social landscapes.

https://doi.org/10.1017/laq.2022.99 Published online by Cambridge University Press

Acknowledgments. We are especially grateful to the La Quebrada community in the Cajón Valley for their collaboration and hospitality, as well as to the authorities of San José and Santa María (Catamarca, Argentina).

Funding Statement. This research was supported by the Agencia Nacional de Promoción Científica y Tecnológica (PICT Raíces 2016-343) and the Consejo Nacional de Investigaciones Científicas y Técnicas (CONICET-PUE 2017-0002).

Data Availability Statement. The materials analyzed in this article are located in the UE-IDECU, UBA-CONICET, Ciudad Autónoma de Buenos Aires, Argentina. The data can be requested from the authors. The technical reports can be requested from the digital repository: https://www.conicet.gov.ar/new_scp/detalle.php?keywords=&id=34784&inf_tecnico=yes&detalles=yes&inf_tecnico_id=9958694.

Competing Interests. The authors declare none.

Supplemental Material. For supplemental material accompanying this article, visit www.journals.cambridge.org/.

Supplemental Table 1. Synthesis of the results.

Supplemental Table 2. Morphological data of vessels.

Supplemental Table 3. Petrographic study data measured in percentages (%). M (matrix), V (voids), Qtz (quartz), Kfs (potassium feldspar), Pl (plagioclases), Mc (microcline), Bt (biotite), Ms (muscovite), Msp (muscovite pseudomorph), Tur (tourmaline), Grt (garnet), Am-Px (anphibole and pyroxene), Gs (granitic stones), Ags (altered granite stone), Sh (shale), Qtzt (quartzite), Sd (sandstone), Sl-Ph (slate and phyllite), Clst (claystone), Vs (volcanic stones), Vg (volcanic glass), Op (opaque minerals), Gg (grog).

References Cited

Adams, Anthony E., William S. Mackenzie, and Cyril Guilford. 1997. *Atlas de rocas sedimentarias*. Masson, Barcelona.

Aschero, Carlos A. 2007. Comentarios. Mesa 1: Interacciones surandinas: Aspectos económicos, políticos e ideológicos. In *Sociedades precolombinas surandinas: Temporalidad, interacción y dinámica cultural del NOA en el ámbito de los Andes Centro-Sur*, edited by Verónica Williams, Beatriz Ventura, Adriana Callegari, and Hugo Yacobaccio, pp. 99–108. Instituto de Arqueología, Universidad de Buenos Aires, Buenos Aires.

Baldini, Marta I., María Beatriz Cremonte, Irma Lía Botto, and María Alba Díaz. 2005. De felinos, pastas y pigmentos: La cerámica de Choya 68 desde una perspectiva arqueométrica. In *La Cultura de la Aguada y sus expresiones regionales*, edited by Sergio Martín and María E. Gonaldi, pp. 87–105. EUDELAR, SECyT, Universidad Nacional de La Rioja, La Rioja, Argentina.

Balfet, Hélène, Marie-France Fauvet-Berthelot, and Susana Monzón. 1983. *Pour la normalisation de la description des poteries*. Centre National de la Recherche Scientifique, Paris.

Blasco, Graciela, Eduardo O. Zappettini, and Fernando Hongn. 1996. *Hoja geológica 2566-I, San Antonio de los Cobres*. Bulletin No. 217. Secretaría de Minería de la Nación, Buenos Aires.

Bugliani, María Fabiana. 2008. *Consumo y representación en el sur de los valles Calchaquíes (Noroeste argentino): Los conjuntos cerámicos de las aldeas del primer milenio A.D*. BAR International Series 1774. British Archaeological Reports, Oxford.

Bugliani, María Fabiana, and Lucas Pereyra Domingorena. 2012. Una aproximación estilístico-tecnológica a la cerámica polícroma Vaquerías del Noroeste Argentino. *Estudios Atacameños* 43:121–138.

Courtois, Liliane. 1976. *Examen au microscope pétrographique des céramiques archéologiques*. Notes et Monographies Techniques No. 8. Centre National de la Recherche Scientifique, Paris.

Cremonte, María Beatriz. 1996. Investigaciones arqueológicas en la quebrada de La Ciénega (Dpto. de Tafí, Tucumán). PhD dissertation, Facultad de Ciencias Naturales y Museo, Universidad Nacional de La Plata, La Plata, Argentina.

De Feo, María Eugenia, and Lucas Pereyra Domingorena. 2018. Producción y circulación alfarera en la Quebrada del Toro durante el periodo Formativo: Una mirada desde el análisis petrográfico de la cerámica. *Arqueología Iberoamericana* 40:65–80.

Druc, Isabelle C. 1998. Production et distribution de céramiques dans la sphère d'influence Chavin (Pérou): Résultats des analyses chimiques et pétrographiques. *Revue d'Archéométrie* 22:57–64.

Espiro, Valeria E. 2008. Características del proceso de manufactura de las alfarerías de la aldea Piedra Negra, correspondientes al primer milenio de nuestra era, Distrito Laguna Blanca, Departamento Belén, Provincia de Catamarca. *La Zaranda de Ideas* 4:9–25.

Gasparotti, Leticia. 2019. Tecnología cerámica en la Puna meridional argentina (Antofagasta de la Sierra, Catamarca): Cambios y continuidades en los modos de hacer a lo largo del tiempo (ca. 2000–500 aP). *Latin American Antiquity* 30:686–706.

González, Alberto R. 1956. La cultura Condorhuasi del Noroeste argentino (apuntes preliminares para su estudio). *Runa* 7:37–85.

González, Alberto R., and George L. Cowgill. 1975. Cronología arqueológica del valle de Hualfín, provincia de Catamarca, Argentina: Obtenida mediante el uso de computadoras. In *Actas y trabajos del primer congreso de arqueología argentina*, edited by Antonio Austral, María D. Arena, and Alberto R. González, pp. 383–404. Artes Gráficas, Buenos Aires.

Gosselain, Olivier P. 2008. Thoughts and Adjustments in the Potter's Backyard. In *Breaking the Mould: Challenging the Past through Pottery*, edited by Ina Berg, pp. 67–79. Archaeopress, Oxford.

Hammer, Øyvind, David A. T. Harper, and Paul D. Ryan. 2001. PAST: Paleontological Statistics Software Package for Education and Data Analysis. *Palaeontologia Electronica* 4:1–9.

Heredia, Osvaldo, José A. Pérez, and Alberto R. González. 1974. La antigüedad de la cerámica polícroma en el Noroeste argentino. *Revista del Instituto de Antropología* 5:133–151.

Jernigan, E. Wesley. 1986. A Non-Hierarchical Approach to Ceramic Decoration Analysis: A Southwestern Example. *American Antiquity* 51:3–20.

Kerr, Paul F. 1965. *Mineralogía óptica*. McGraw-Hill, New York.

Lazzari, Marisa. 2005. The Texture of Things: Objects, People and Landscape in Northwestern Argentina (First Millennium A.D.). In *Archaeologies of Materiality*, edited by Lynn Meskell, pp. 126–161. Blackwell, Oxford.

Lazzari, Marisa, Lucas Pereyra Domingorena, Wesley D. Stoner, María Cristina Scattolin, María Alejandra Korstanje, and Micheal D. Glascock. 2017. New Compositional Data Supports a Decentralized Model of Artefact Production and Circulation in the Pre-Columbian Andes. *PNAS* 114:E3917–3926.

López Campeny, Sara M. L., Andrés S. Romano, M. Fernanda Rodríguez, Álvaro R. Martel, and Mariano H. Corbalán. 2014. De aquí y de allá: Análisis integral de un contexto funerario. Vínculos e interacciones sociales entre Puna meridional y Tierras Bajas orientales. *Intersecciones en Antropología* 15:201–218.

Middleton, Andrew P., Morven N. Leese, and Michael R. Cowell. 1991. Computer Assisted Approaches to the Grouping of Ceramic Fabrics. In *Recent Developments in Ceramic Petrology*, edited by Andrew P. Middleton and Ian Freestone, pp. 265–276. Occasional Paper No. 81. British Museum, London.

Nielsen, Axel E. 2013. Circulating Objects and the Constitution of South Andean Society (500 BC–1500 AD). In *Merchants, Markets, and Exchange in the Pre-Columbian World*, edited by Kenneth G. Hirth, and Joanne Pillsbury, pp. 389–418. Dumbarton Oaks, Washington, DC.

Núñez, Lautaro, and Tom Dillehay. 1995. *Movilidad giratoria, armonía social y desarrollo en los Andes meridionales: Patrones de tráfico e interacción económica* (Ensayo). Universidad del Norte, Antofagasta, Chile.

Orton, Clive, Paul Tyers, and Alan Vince. 1997. *La cerámica en arqueología*. Crítica, Barcelona.

Pereyra Domingorena, Lucas. 2012. Manufacturas alfareras al sur de los valles Calchaquíes entre el siglo primero al quinto DC. *Relaciones de la Sociedad Argentina de Antropología* 37:387–412.

Pereyra Domingorena, Lucas. 2013. Cerámica experimental con materias primas del sur de los valles Calchaquíes (Noroeste argentino). *Intersecciones en Antropología* 14:239–250.

Pereyra Domingorena, Lucas. 2015. Estudio petrográfico de la cerámica arqueológica del primer milenio d.C. al sur de los valles Calchaquíes (noroeste argentino). *Chungara* 47:415–428.

Pereyra Domingorena, Lucas, and María Fabiana Bugliani. 2019. Las vasijas de Bordo Marcial: Una caracterización integradora de un conjunto alfarero del período Formativo en el Noroeste Argentino. *Intersecciones en Antropología* 20:255–266.

Pereyra Domingorena, Lucas, and María Beatriz Cremonte. 2017. The Same Way of Doing Pottery: San Francisco Ceramic Fabrics from Tumbaya (Quebrada de Humahuaca) and San Pedro (San Francisco River Basin). In *Pre-Inca and Inca Pottery: Quebrada de Humahuaca, Argentina*, edited by Agustina Scaro, Clarisa Otero, and María Beatriz Cremonte, pp. 1–27. Springer, Cham, Switzerland.

Pereyra Domingorena, Lucas, María Eugenia De Feo, and María Fabiana Bugliani. 2020. Vaquerías: A Techno-Stylistic Study regarding the Earliest Polychrome Pottery in the Argentine Northwest. *Antiquity* 94:62–75.

Pereyra Domingorena, Lucas, and Verónica Puente. 2018. Una aproximación petrográfica a los modos de hacer y la circulación alfarera en el área valliserrana del Noroeste argentino durante los últimos siglos del primer milenio d.C. *Comechingonia* 22(1):211–247.

Puente, Verónica. 2016. Delineando prácticas de producción y consumo de alfarería en Antofagasta de la Sierra: La cerámica de Peñas Coloradas 3, ca. 1000–1600 d.C. (Catamarca, Argentina). *Revista Española de Antropología Americana* 46:241–263.

Quinn, Patrick S. 2013. *Ceramic Petrography: The Interpretation of Archaeological Pottery & Related Artefacts Thin Section*. Archaeopress, Oxford.

Scattolin, María Cristina, María Fabiana Bugliani, Lucas Pereyra Domingorena, Leticia Inés Cortés, Marisa Lazzari, Andrés Darío Izeta, and Cristina Marilin Calo. 2015. Habitar, circular, hacer: El punto de vista de La Quebrada. In *Crónicas materiales precolombinas: Arqueología de los primeros poblados del Noroeste argentino*, edited by M. Alejandra Korstanje, Marisa Lazzari, Mara Basile, María Fabiana Bugliani, Verónica Lema, Lucas Pereyra Domingorena, and Marcos Quesada, pp. 427–464. Sociedad Argentina de Antropología, Buenos Aires.

Scattolin, María Cristina, Leticia Inés Cortés, María Fabiana Bugliani, C. Marilin Calo, Lucas Pereyra Domingorena, Andrés D. Izeta, and Marisa Lazzari. 2009. Built Landscapes of Everyday Life: A House in an Early Agricultural Village of North-Western Argentina. *World Archaeology* 41:396–414.

Sprovieri, Marina. 2014. La circulación interregional en el valle Calchaquí (Provincia de Salta, Noroeste argentino): Una visión integral desde nuevas y viejas evidencias. *Revista Española de Antropología Americana* 44:337–366.

Tarragó, Myriam. 1984. La historia de los pueblos circumpuneños en relación con el altiplano y los Andes Meridionales. *Estudios Atacameños* 7:93–104.

Turner, Juan C. M. 1973. *Descripción geológica de la hoja 11d, Laguna Blanca*. Bulletin No. 142. Servicio Nacional Minero Geológico, Buenos Aires.

Zagorodny, Nora, and Bárbara Balesta. 2005. Estudio multidimensional de la alfarería de La Ciénaga. In *Azampay: Presente y pasado de un pueblito catamarqueño*, edited by María Carlota Sempé, Susana Salceda, and Marta Maffia, pp. 267–288. Ediciones Al Margen, La Plata, Argentina.

Cite this article: Bugliani, María Fabiana, and Lucas Pereyra Domingorena. 2024. "Ways of Doing" Pottery in the Cajón Valley (Argentine Northwest) during the First Centuries AD. *Latin American Antiquity* **35**, 39–54. https://doi.org/10.1017/laq.2022.99.