# A STUDY OF MATERIALIZATION, IDENTITY, AND AGENCY USING PXRF ANALYSIS OF CERAMICS FROM INCA PERIOD ECUADOR

by

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# ABSTRACT

MACKENZIE SWEITZER. A Study of Materialization, Identity, and Agency Using pXRF Analysis of Ceramics from Inca Period Ecuador. (Under the direction of DR. DENNIS OGBURN)

When the Inca Empire expanded across large portions of South America, they implemented various strategies to subdue and control their massively ethnically diverse subjects. One way that the Inca ideology and social order was imposed on the masses was through materialization. Objects like textiles and ceramics were produced in distinct styles with sometimes strict rules about how they were to be used and who could use them. Using pXRF analysis on a sample of ceramic sherds from Ecuador, I explore how the people living in this region altered their ceramic habits upon Inca conquest and what that might imply about their political identity and freedoms under the Inca. PXRF allows for the creation of compositional groups, which in ceramic analysis are groups that share the same clay source. Examining where Inca sherds came from and their relationship to local wares provides the hard data about whether Inca production was occurring in this area, while ethnohistorical and historical research provide the detail and context for final interpretations.

# DEDICATION

This thesis is dedicated to my mother and father, my brother, and my grandparents for their constant support and encouragement. They always believed I could accomplish this goal, so this is for them. I also want to dedicate this to my best friend, Jeri Colbert, who I met in my time at UNCC. We have been there for each other as we finished our graduate studies and I can’t wait to see where the future takes us.

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# CHAPTER 1: INTRODUCTION

Ceramics are an excellent form of material culture to use for exploring ties between small communities and the bigger political and economic entities that come into and change their lives (Hunt and Speakman 2015: 1; Livingston Smith 2016: 472; Meddens 2018: 8; Stremtan et al. 2013:  274). This is because they can help us “to identify political boundaries and to gauge sociopolitical change” (Bowser 2000: 219). Ceramics have long held a significant place in the research of archaeologists, but how and why they are studied has evolved along with the disciplines shifting goals and perspectives. Recently, archaeologists have begun to examine the role ceramics have played in the processes of identity formation and the materialization of ideology (Halperin and Foias 2010: 392; Rodriguez-Alegria 2010: 52; Vaughn 2004: 118; Costin 2016: 350). For my research, I examined a collection of ceramic sherds from the Ecuadorian highlands in order to explore the expression of Inca political affiliations and ideologies within the local communities and people living in the study area. Recovered from the Saraguro Canton, the majority of the ceramics were local wares, with only a few sherds showing indications of Inca influence.

The materialization of ideology has been of interest recently within archaeology and much discussion has occurred among scholars as to the political significance of ceramics (Bray 2003, 2018;  Costin 2016; DeMarrais et al. 1996; Quave 2017: 599; Vaughn 2004). All aspects of a ceramic can aid in exploring the part they play in political processes, but for this study, I specifically focused on the elemental composition of the sherds in my collection. This was in order to determine whether Inca related ceramics were being manufactured within local communities, at a centralized location, or from outside the region. Finding the answer to this central question provides me with a foundation on which to make interpretations about whether or not these Ecuadorian communities were utilizing Inca materialized ideology for themselves and/or supplying ceramics to the state, and how they were doing it.

I examined the elemental compositions of the sherds using a portable X-Ray fluorescence (pXRF). By doing this, I was able to identify trends in source materials between the Inca ceramics and the local ceramics. Applying theories of materialization of ideology, identity and agency to the collection of sherds and their resulting chemical signatures, I investigated the level of centralization and organization of Inca ceramic production. This provided insight into whether or not the local population was willing, or made, to integrate Inca culture into their everyday lives or were made to provide the Incas with ceramics (Bray 1992, 2003, 2004; Jennings and Alvarez 2008; Quave 2017). Using Inca cultural materials was a way of expressing affiliation and identification with the Incas, thus producing Inca imitations or hybrids locally has different implications than if they were being brought in from a central, outside location (Acuto and Leibowicz 2018: 6-7, 11, 14, 17; Arnold 2005: 219; Bowser 2000: 219; Costin 2016: 346; Jennings and Alvarez 2008: 132, 146; Livingstone Smith 2016: 473; Meddens and Schreiber 2010: 159).

In order to properly interpret and understand the results of the pXRF analysis, I took into account the known Inca strategies of conquest and control, and the local ethnohistory. Both of these subjects shed light on the nuances of the political situation in this region of Ecuador during the period under study, which contextualizes the raw data from the pXRF analysis. This analysis is a bottom-up approach, meaning I am focusing on the people who make up the lower levels of society, rather than the elites; most of these sherds are utilitarian, lower quality, and simply decorated. I am attempting to view the Inca political system from the lower level perspective and get a better idea of the behaviors and actions that the general population was engaging in within the system.

# CHAPTER 2: HISTORY OF THE INCA

### *Who are the Inca?*

The Inca Empire arose out of the Late Intermediate Period of Peru (ca. 1000-1438 A.D.), a time of regionalization and fragmented political units. Earlier groups living in the Cuzco Basin made the Killke style ceramics, which are characterized by black/black on red geometric designs over buff or white slip (Rowe 1944: 60-61). During this period, the decline of the earlier Wari Empire left several polities competing with each other in the basin. Through either outright conquest or strategic peaceful alliances, the Inca polity formed in this power vacuum and began to spread through the Cuzco Basin and beyond. As they expanded, the Inca created and spread a new and unique style of ceramics, as well as other distinct styles of material culture (Arnold 2005: 219, 225, 227; Bauer and Covey 2002: 846, 851-853, 857; Conlee and Ogburn 2004: 6; Meddens and Pomacanchari 2018: 40). These distinctive material objects were highly significant to the Inca and became one of their main avenues to peaceful political alliances through acts like gifting (Acuto 2008: 851; Acuto and Leibowicz 2018: 14; Costin 2016: 328; Covey 2008: 814-815, 825; DeMarrais et al. 1996: 27-28).

Though the exact dating is being refined, between 1400 and 1532 A.D., the Inca Empire was expanding, consolidating and ruling over vast areas of the South American Andes (Conlee and Ogburn 2004: 6; Marsh et al. 2017: 16; Ogburn 2001: 158; 2012: 228-229). The limits of Tawantinsuyu—the indigenous Quechua name for the Inca Empire—reached from modern-day Ecuador to Argentina and controlled parts of Chile, Bolivia and Columbia (Covey 2008: 810). While Cuzco was the geographical origin of and long-standing center for the ruling and elite classes, towards the end of the Inca reign, sites in Ecuador became centers of political importance, with Inca royalty having children with Ecuadorian elites and a prolonged military and political consolidation in the northernmost regions (Bowser 2000: 224; Bray 1992: 227; Bray and Almeida 2014: 178-179; Cieza de León 1984 [1553]: Chapter LVII; Ogburn 2001: x, 118; Ogburn 2012: 228). However, just like many other areas that underwent Inca conquest, the exact relationship between the local populations in Ecuador and the Inca Empire is still open to investigation.

### *Inca Strategies of Conquest and Consolidation*

The Inca did not use one single tactic for conquering their subjects, but instead used a mosaic of techniques, depending upon the group encountered. The valuable resource(s) controlled by the group, their willingness to submit to the Inca, their historic social and religious significance, and their geographic location were all elements that the Inca would take into consideration when deciding whether to conquer their subjects by diplomacy or military action (Bray 1992: 222, 2014: 192; Jennings and Alvarez 2008: 119; Meddens and Schreiber 2010: 128; Menzel 1959: 127-128; Ogburn 2001: 38; Ogburn and Conlee 2004: 6; Schreiber 1992: 53-63). Thus, not every group under the control of Tawantinsuyu had the same economic, political and social ties to the imperial state and the elite.

The same factors that influenced the conquest strategy also impacted how the Inca would govern the area. Different goals required different materializations of ideology or the physical embodiments of the non-physical ideologies that bind groups together (DeMarrais et al. 1996: 15-17). In other words, groups share a set of ideas and ideologies, which in turn must be made physical in order to maintain and spread the group identity and achieve goals of status and dominance (Bauer and Covey 2002: 848; Bowser 2000: 221-222, 242; Bray 2003: 5; DeMarrais et al. 1996: 15-17; Hall 1984: 262; Halperin and Foias 2010: 393, 396; Livingstone Smith 2016: 472-473, 481, 486; Joyce 2011: 196; Russell 2006: 186; Vaughn 2004: 114). For the Inca, materializations of ideology include items such as particular types of architecture in specific locations or the use of distinctive ceramics in spaces of high political/religious activity (Acuto and Leibowicz 2018: 17; Arnold 2005: 228; Bray 1992: 225, 2014: 184; DeMarrais 1996: 27, 29; Jennings and Alvarez 2008: 129; Meddens and Schreiber 2010: 148; Meddens and Pomacanchari 2018: 49; Quave 2017: 607; Vaughn 2004: 113). Building on previous studies of Inca material culture, examining the Saraguro ceramics will add to this body of knowledge.

Inca use of the materialization of ideology also had a performative element that enhanced the effectiveness of the object's ability to bring individuals and groups into submission. The two most important performative Inca strategies to consider for my research are the practice of feasting and the practice of forced migration, or *mitma*. Both of these strategies involve Inca materialized ideology, and thus play a part in the creation and maintenance of its importance. Feasting as an activity requires the use of ceramics to facilitate cooking, storing, eating, and drinking. After Inca feasts, these ceramics were often gifted to the local elites who were making the alliances or affiliated with the Inca, making these vessels both utilitarian and symbolically important (Acuto and Leibowicz 2018: 14; Halperin and Foias 2010: 406; Jennings and Alvarez 2008: 146; Vaughn 2004: 118).

Aside from making alliances with elites, the Inca are also known for holding large feasts for the parties of workers who were fulfilling their *mit'a*, or labor tax. In these feasts, they used the unique Inca *aribalo*, a tall, narrow-mouth, conical based jar, to present *chicha*, a fermented drink usually made from maize (DeMarrais et al. 1996: 27). *Chicha* is a cherished beverage to most Andeans because of its importance in social, communal and ceremonial gatherings (Bray 2003: 7). The use of *aribalos* to supply mass quantities of this cherished beverage to work parties symbolized the state as provider, solidifying the bonds between the Inca and the provinces (Acuto and Leibowicz 2018: 14; Bowser 2000: 224; Bray 2003: 4, 7, 13, 18; Costin 2016: 328; DeMarrais et al. 1996: 18, 27; DeMarrais 2014: 156; Meddens and Schreiber 2010: 146). Because these activities required ceramics and were political acts, it makes ceramics inherently political (Rodriguez-Alegria 2010: 65).

Forced resettlement was implemented by the Inca in order to maintain peace and keep the decimal administrative system running smoothly by allowing them to control population numbers (Bray 1992: 220; Hu and Shackley 2018: 213; Ogburn 2001: 32, 51). Groups that were forcibly relocated, called *mitmaqkuna*, were either loyal communities who were being brought into undeveloped or rebellious areas, or rebellious communities being taken out of their local areas and into better consolidated regions (Bray 1992: 220; Marsh et al. 2017: 129; Ogburn 2001: 40, 50, 132; Schreiber 1992: 57-62). Thus, the movement of *mitmaqkuna* was often based on political alliances, making it important in our examination of the political implications of the Ecuadorian sherds. If *mitmaqkuna* had possibly been moved into the area of study, that helps to shape interpretations about the ceramics’ political significant to those populations. Being a member of a group of *mitmaqkuna*, and the circumstances of being relocated would have a had large effect on the attitude of the group and thus what people did with their agency in terms of ceramic production and use (Bray 1992: 220, 227; Hu and Shackley 2018: 214; Ogburn 2001: 44, 54, 59).

### *Local Attitudes and Agency*

From a bottom-up perspective, it is also important to consider the freedoms and limitations placed on everyday people by the Inca, which shaped their attitudes towards the empire and their agency within it. In general, the Inca tended not to care what types of material culture people used in their daily lives (Acuto and Leibowicz 2018: 11-12, 17; Conlee and Ogburn 2004: 6; Jennings and Alvarez 2008: 119, 132, 141; Marsh et al. 2017: 125, 134-135). The exception to this is the clothing people wore, which the Inca required be the traditional outfit of a person's original ethnic group. However, this requirement by the Inca allowed the differences between the material cultures of groups to prevail in the face of incorporation into a state. Thus, even though this strategy of mandatory clothing styles was used as a means of alliance prevention and accounting of movements, it is clear that they did not mind when people continued to use some of their local material traditions (Costin 2016: 325, 328, 347; Jennings and Alverez 2008: 141; Meddens and Schreiber 2010: 159; Ogburn 2001: 24).

When groups in the provinces were making an obvious effort to either acquire or copy Inca styles and technologies, they were making a conscious statement about their political and ideological stance. The Inca system allowed a great deal of individual choice when it came to either imitating them or continuing to use traditional materials, methods, and designs, with only a handful of serious restrictions for most provinces, such as the clothing requirements. Some authors and chroniclers describe the Inca system as overly controlling due to the constant threat of punishment, limitations on movements, and even imperial spies ready to tell on people for petty offenses (Guaman Poma de Ayala 1615: 365; Hu and Shackley 2018: 213; Ogburn 2001: 13). However, this was variable by region: not every Inca province was heavily occupied or directly controlled, and there was indeed much room for expression of various material styles (Covey 2008: 823; DeMarrais et al. 1996: 27; Jennings and Alvarez 2008: 129).

Considering Inca imperial ceramics in particular, this variability is an important point to remember. First, the Inca did not distribute the fine imperial ceramics to every commoner in their empire for everyday use (Arnold 2005: 225; Bray 2003: 15; Covey 2008: 822; Meddens and Pomacanchari 2018: 49). Second, there is evidence to suggest that the Inca had specialized, elite based production centers for their state sanctioned ceramics (Bray 2003: 18). This means that fine Inca imperial ceramics may all share a common composition based on a shared source material. Third, based on the distribution of imperial forms between Cuzco and the provinces (Bray 2003: 18; 2004: 366), it seems likely that the Inca were only interested in exporting a few specific forms for common use in the provinces, not their entire assemblage.

The forms from the imperial assemblage that show up routinely in the provinces consist of: the *aribalo*, the pedestal based/footed *olla*, the two handled deep dish/casserole, and the shallow plate. Bray (2003: 18; 2004: 370) believes the *aribalo*, the most frequent form, was used for the massive production, storage and serving of *chicha* that the Inca were involved in. The other three common forms are suggested by Bray (2003: 19; 2004: 369) as examples of the depth of penetration of the Inca ideology into the domestic sphere of people's lives, because all three forms are likely involved in food cooking and serving. However, the two handled casserole, the only cooking vessel, is less frequent than the other two serving forms. That the most common vessels outside of the heartland are serving vessels highlights the fact that the Inca were very concerned with communal feasting in order to communicate and maintain the ideology of the state. All other imperial forms have still been found outside of the heartland, but less frequently than these other types (Bray 2003: 19-21).

This lack of other forms could be due to the difficulty of identifying them from sherds; however, it seems that when there are imperial forms and designs in the provinces, someone was trying to create and maintain a connection to the state (Bray 2003: 15; Covey 2008: 822). Investigating whether they were attempting to make this connection by local production or by obtaining ceramics produced by or for the state can be examined through XRF analysis. By examining a collection for chemical compositions of individual sherds, it would show whether the sherds from various sites have the same composition, and thus sources, or not. XRF analysis would also show whether sites may have been exchanging ceramics, based on the same clustering and grouping of clay compositions. Depending on the distribution of the compositional groups, this will help determine whether Inca influenced ceramics were made locally, either small scale or centralized operations, or were imported from centralized or small scale productions outside the region.

# CHAPTER 3: ECUADOR

## *Setting of the Ecuadorian Highlands*

Ecuador, like many other countries in the Andes, has a vast array of environmental conditions and many natural landscape features such as mountains and lakes. In the northernmost regions of the empire, in Quito, the terrain is mountainous and rough with a temperate climate and fertile soils from the volcanic activity in the area (Bray 2014: 181). The southern Ecuadorian highlands are similar in environment to the northern highlands of Peru although a bit more narrow, making the different vertical zones even closer to each other than they would be in Peru (Ogburn 2001: 80). The Saraguro Canton has a capacity to produce major crops, support camelid herds and has several minable sites for metals, minerals, clays and rocks (Ogburn 2001: 81-90). Geographically, it was in a good area for travel and had several large mountains that were considered great *huacas*, or sacred idols, to the people who lived there (Ogburn 2001: 153-154; Scott 2009: 23). All of these factors made it an attractive location for the Inca, in addition to their need for expansion more generally.

Ecuador has its own chronological framework distinct from the Peruvian chronology often used when discussing the Inca. Like other chronologies in the Andes, Ecuador's is based mostly on ceramics and associated carbon dates. The chronology of Ecuador consists of the preceramic (all sites until 3000 B.C.), Early Formative (3000 to ~1500 B.C.), Late Formative (~1500 to 500 B.C.), Regional Development (500 B.C. to 500 A.D.), and the Integration (500 to  1500 A.D.) periods (Meggers 1966: 25). In the southern highland region, where the sites within this study are located, the period in which Inca presence becomes obvious in the record is ca. 1450 A.D., signaling the end of the Integration Period. The Inca spread and conquest of Ecuador was quick, however, with all of the highlands conquered between ca. 1440 and 1520 A.D.

Prior to the Inca incursion, groups in southern Ecuador were likely not centralized, but made up of chiefdoms of shifting alliances based upon need (Bray and Almeida 2014: 182; Ogburn 2001: 161, 169). The lack of strong centralization made these communities a seemingly easy target for the Inca, who were much more organized and prepared; some communities may have been organized at a low level that would have been of benefit to the Inca. If a group had an established political organization, the Inca could often leave the structure (i.e. the local elite groups with established control) intact, with the addition of a couple of Inca officials and administrative buildings to oversee the group and ensure collection of required tribute (Bray 1992: 220; Jennings and Alvarez 2008: 125, 129; Menzel 1959: 129; Meddens and Schreiber 2010: 159; Ogburn 2001: 21). Thus, the political situation in the Ecuadorian highlands could have easily resulted in the maintenance of the local elite status and relationship with commoners that was in place before the Inca presence.

### *Ethnohistory of the Saraguro Canton*

The ceramics used in this project were surface finds collected from a variety of sites in the Southern Ecuadorian highlands, with many having only a general provenance of the site where they were found. Because of this, ethnohistory that is of relevant to the project comes from the northeastern sector of the Provincia de Loja where the community of Saraguro is located, known as the Canton of Saraguro and the adjacent land in the southern part of the Provincia de Azuay. Ethnohistory adds more detail about the politics of the region than can be gained from looking only at modern history or archaeology. In this area, there is very little detailed archaeological or historical information about specific groups and their relationships to each other or to the Inca (Ogburn 2001: 92). Thus, the ethnohistory employed here provides general information to establish the local political context rather than assumed to be factual about particular people, places or events.

Interpreting ethnohistoric documents is difficult, due to the contradictions often found within various accounts. However, examining the contradictions and making comparisons with other accounts can help determine what most likely happened (Ogburn 2001: 92). For the Canton of Saraguro, most ethnohistoric accounts suggest *mitmaqkuna* groups were established here (Ogburn 2001: 130-135). Although the archaeological record is ambiguous, modern people in the region tell stories about their origins as Inca *mitmaqkuna*. Certainly there were Spanish and other native ethnicities that mixed in this area in the years after the fall of the Inca Empire to create the modern day Saraguros, but the people of this area were not as affected as their neighbors by Spanish land policies and remained in control of their lands, even today (Ogburn 2001: 71-72). Thus, it is likely that at least a portion of the ancestral population of Saraguros consisted of groups moved here during the time of Inca presence (Ogburn 2007: 141-142, 148-149). Therefore, it is possible that the strategy of bringing in *mitmaqkuna* was used here.

### *Mitmaqkuna*

The problem with *mitmaqkuna* is that there is no universal model of how they lived. This is also the reason why it is so hard to demonstrate the presence of *mitmaqkuna* in the archaeological record, because the presence or absence of certain types of material cultures is not a reliable indicator. Bray (1992: 227) discovered in the area of País Caranqui, Ecuador, that the local and Inca wares were indistinguishable, based on an examination of local ceramic traditions versus Inca polychrome paste composition. This area was said to have been entirely replaced by *mitmaqkuna*, and the presence of one of the local wares appears to decrease in the areas where the Inca polychromes are present (Bray 1992: 220, 228). Thus, it seems when the Inca came in, the subjects they moved into the area used existing clay resources and discontinued other local traditions.

In the Cotahuasi Valley in modern-day Peru, Jennings and Alvarez (2008: 129-132) work shows that there is historical evidence that the Inca not only moved *mitmaqkuna* into the region but also that the state heavily invested in the Inca presence in the region. This was a successful strategy that resulted in a tight alliance and acceptance of the Inca ideology in this region, as evidenced by the Inca influence on the local Huayllura ceramic tradition and local architecture. Interestingly, though, the authors state that there is a clear difference between the pastes of the local Huayllura types and the imperial style ceramics in the valley (Jennings and Alvarez 2008: 132-134). These and other cases have illustrated to researchers that there is no clear patten of how *mitmaqkuna* dealt with ceramics.

***Cañari***

If people in this area of southern Ecuador were not *mitmaqkuna*, then they would have likely been Cañari, an ethnic group with a complex relationship to the Inca. Some chroniclers, such as Cieza de Leon (2008[1553]: Chapter LVI), discuss how the Cañari were very resistant to the Inca initially, although they eventually surrendered at Saraguro (Ogburn 2001: 99-103; Sarmiento de Gamboa 2007 [1572]: 151). Over time, the Cañari became a prestigious ethnic group within the empire, whose people were chosen to guard the Inca. Many Cañari were moved into the Cuzco heartland and there is evidence of the mixing of Cañari and Inca ceramic traditions found there (Fig. 1; Cieza de León 1985[1553]; Sarmiento de Gamboa 2007 [1572]: 148). In order for them to have received such elite treatment, either the Cañari never actually resisted at all, as in some accounts, or the Inca respected some other aspect of their group and forgave their initial resistance (Garcilaso de la Vega 1966 [1609]:485-486; Ogburn 2001: 107; Sarmiento de Gamboa 2007 [1572]: 182).


Figure 1: Picture of a Cañari-Inca hybrid vessel in the National Museum of Archaeology in Lima. Taken by Dr. Dennis Ogburn. The vessel form is Cañari and the painted design is Inca.

### *Ecuador and the Inca*

Despite the differences in the details about who collaborated or resisted, the chronicles paint a picture of a very resistant Ecuador. From Loja to Quito, there are records of resistance to the Inca's initial attempts at conquest. Even until the arrival of the Spanish, Ecuador was a locale of resistance to the Inca Empire. Also, Tomebamba, a large Inca site in Ecuador, was host to significant attacks by Atahualpa against Huascar's forces in the Inca Civil War occurring when Pizarro arrived (Cieza de León 2008[1553]: Chapter LXXIII; Ogburn 2001: 165; Sarmiento de Gamboa 2007 [1572]: 189, 196). Thus, one might expect that the people who lived in Saraguro would have been opposed to Inca presence, especially if they were Cañari. However, that is not what we find.

In many chronicles, after the Inca conquered the Saraguro region and the Cañari, the Inca found much safety and loyalty in this and neighboring areas (Cieza de León 2008 [1553]: Chapter LVI; Ogburn 2001: 98-99). As mentioned, the Cañari became trusted servants to the Inca, and there are several extravagant administrative centers and palaces built in Ecuador, something that would require a pacified zone with no fighting to create. Also, Inca royalty was born in the area, another sign of the status this region had within the Inca state (Garcilaso de la Vega 1966 [1609]:485-486; Ogburn 2001: 147, 164: Sarmiento de Gamboa 2007 [1572]: 148, 151). Later, however, when the Spanish arrived, the Cañari quickly abandoned the Inca and supported the Spanish. The Cañari had been allied to the Inca until their allegiance to Huascar cost them great punishment at the hands of Atahualpa (Cieza de León 2008 [1553]: Chapter LXXI, Chapter LXXII; Ogburn 2001: 109, 148; Sarmiento de Gamboa 2007[1572]: 199).

Thus, we have both rejection and acceptance of the Inca in the southern highlands of Ecuador. The ceramics of this region are thus especially interesting, as they likely reflect these patterns. We have the likely resistance of groups and subsequent presence of *mitmaqkuna*, coupled with the high probability that the people of this area were treated with respect by the Inca and were loyal, even up into the modern era. The Saraguros still today give more attention and care to the remains of Inca activity than they do to sites and artifacts from earlier times (Ogburn 2001: 74-75). The people of this region may have resisted and harbored resentment toward the Inca, or were brought in from some other area, but by the time the Spanish arrived, they were thoroughly integrated into the Inca system and ideology.

# CHAPTER 4: THEORY

## *Materialization of Ideology*

The materialization of ideology is a concept that started to gain ground in the 1990s, with authors like DeMarrais (1996), Timothy Earle (1997) and others (e.g. Bayman 2002). Essentially, materialization of ideology is a term to describe the process of taking an ideology, or a cultural ideal, a set of non-physical ideas, and making them physical; it is the embodiment of ideas. This concept can apply to any cultural material, such as architecture, clothing, writing systems, or ceramics. I follow a definition of ideology used by DeMarrais (et al. 1996), Vaughn (2004) and others (Russell 2006: 190), that an ideology is an integral part of any cultural system and is a source of social power.

An ideology is a set of ideas that can unite individuals into a cohesive group but can also be manipulated and used by individuals or groups to gain power in various forms. Mann (1986) has described four sources of power (economic, political, military and ideological) but DeMarrais (1996: 16) and others argue that ideological power is not just a separate form but rather it is intertwined into the other three forms of power. Indeed, they are all impossible to separate in the real world. For the purpose of this research, the power and malleability of materialized ideology to influence the three other sectors of power is the focus (DeMarrais 1996: 15-17; Halperin and Foias 2010: 394).

The second part of DeMarrais' (1996: 16) definition of ideology is that it is both metaphysical and material. Some conceptions of ideology see it as only occurring inside the mind, with no physical correlation. This, however, is full of limitations for the archaeologist who has to work with material objects and remains. It is better to understand ideology as being translatable into symbols, meaning that the abstract aspects of ideology can be transformed into a material reality that is not restricted to the creator's own mind but can be seen and shared with others. Thus, ideology is not only in the mind, but can be translated into material objects through symbolism.

### *Identity and Iconography*

To understand how materialization of ideology occurred in the Inca context, it is necessary to discuss identity and influence on the creation and spread of the Inca ideology and, by extension, iconography. The Inca king was, in many ways, symbolically seen as the caregiver of the realm. The empire fed the laborers for their *mit'a* labor, and in doing so, the state utilized vessels with designs analogous to the clothing that the Inca king wore (Acuto and Leibowicz 2018: 14; Bray 2018: 244-251; DeMarrais et al. 1996: 17-18, 27-28; Quave 2017: 599). Because the Inca strictly enforced traditional clothing for their subjects, as part of a monitoring strategy and to perpetuate the existence of ethnic divisions, the significance of this textile-ceramic design parallel would not have gone unnoticed by Inca subjects (Bray 2018: 246-247; Ogburn 2007: 138-139).

Being a member of the Inca polity entailed a large element of performance. Clothing is an external performance of identity (Butler 1988: 527), often tied to gender or other social identifiers. Textiles were clearly important to the Incas as an element of identity creation. In addition to clothing, communal events and rituals are also elements of identity performance (Bray 2018: 244; DeMarrais et al. 1996: 17; DeMarrais 2014). For the Inca, corvée feasts and other large, community gatherings that they enacted (as evidenced by their tendency towards large plazas) were all part of the creation and maintenance of an identity that linked individuals and ethnic groups to the state (Acuto and Leibowicz 2018: 855). By continuously participating in these state sponsored, communal events, people were able to feel part of the whole, which created shared experiences and ideologies amongst multitudes of people that formed the basis of an Inca identity that was largely political in nature (DeMarrais et al. 1996: 28). Inca identity was based on obligations and iconography connected to the state, a political unit, thus differentiating it from other types of identity based in non-political boundaries, such as identities based around geographic origin or age (Jennings and Alvarez 2008: 143; Bowser 2000: 221-222, 231).

The Inca king’s outfit paralleled in ceramic design underlined the idea that the king himself gave sustenance any time an Inca vessel was used. This effect had a particularly powerful impact in the context of the feasts that Inca held for their *mit’a* laborers; you worked for the state and the state in turn provided for you in an arena typically controlled by the local, domestic sphere, including the food and drink, and the vessels they were served in (Bray 2018: 248, 251, 253). In this way, Inca iconography and identity were able to permeate into domestic spaces in life and in some cases become a dominant identity over other, previously held identities (Jennings and Alvarez 2008: 146; Acuto and Leibowicz 2018: 7, 12; Bowser 2000: 231).

Thus, iconography, identity and ideology are all part of complex relationships, where each part influences and strengthens the other (Acuto and Leibowicz 2018: 14; Bray 2018: 247-248; Halperin and Foias 2010: 393). The Inca identity was performed through clothing, tax labor, and state sponsored feasts and events, and extended to other people through a ceramic iconography that built off the symbolism of the established clothing traditions. By extending Inca ideology out to others through this iconography, and specifically in the form of serving ceramics, the Inca established a political identity that was powerful in its ability to sway individuals to adopt it (Acuto and Leibowicz 2018: 7, 14; DeMarrais et al. 1996: 17).

***Power (Structure) versus Agency***

There are many ways to apply the concept of agency and its intellectual roots lie deep in the past. However, theories around agency were popularized in the modern era by authors like Bourdieu (1977), Butler (1997), Giddens (1984) and others of the postmodernist trend in anthropology during the 1980s and 1990s. Agency generally refers to the ability of an individual to enact change in their world. All humans have the option to act in any way that they choose, regardless of what is considered the right or normal choice or behavior in their society. However, the limit to agency is that in reality, there are restrictions placed on behavior and choice by society and culture, which have a huge influence on what can actually be done with individual agency (Halperin and Foias 2010: 394; Knapp 2008: 22; Ortner 2006: 134-136).

As an example, a person can wear whatever clothes they want but if that individual decides to dress completely out of the norm of their dominant culture, then they risk losing their social standing; friends could stop talking to them, job prospects could think they are too unprofessional, strangers could be intimidated by them, etc. Thus, agency is in constant conflict with the structure of society and its power to restrict and control behavior (Bowser 2000: 221-222). Not all societies exert the same or equal types of power, however, so the interplay between agency and power will always be historically and contextually situated (Acuto and Leibowicz 2018: 17; Livingston-Smith 2016: 471; Halperin and Foias 2010: 392).

For my research, the agency of individual potters in the design of their products is the focus. Potters have complete agency in the process of ceramic product if totally unrestricted. They would choose the material, the form, the molding and firing techniques, and the decoration. Most aspects of the ceramic production process would conceivably be under the discretion of the person making it; however, all potters are constantly being influenced by the outside world. Choice of materials can be restricted for a number of factors both natural and human, techniques have to be learned and available, use of decorations and forms can be restricted by social groups, and so on (Bowser 2000: 242; Hall 1984: 262). Thus, culture always impacts a potter's decisions as “a complex and dynamic analytical grid to organize their relationship with the world (Livingstone-Smith 2016: 486).”

Within the Inca Empire, there were some cultural restrictions preventing potters from creating certain forms and designs, but this mainly affected potters whose ceramics were being made at the request of the state. Local, individual potters had much more freedom to choose the forms and designs that they used in ceramic making and tended to continue to use the traditional ceramic productions of their own society. Thus, if local, non-state potters did choose to make Inca related ceramics, they were using their agency to make this choice, likely due to the ability of Inca material culture to increase the social standing of individuals who possessed them (Acuto 2018: 851; Arnold 2005: 12, 17; Bray

2018: 246; Costin 2016: 323, 325, 348, 350; Covey 2008: 822-823; Halperin and Foias 2010: 394; Meddens and Pomacanchari 2018: 49; Quave 2017).

The freedom to alter and adopt designs went both ways in the Inca Empire, meaning local groups took in aspects of material culture from the Inca and the Inca took in aspects of local material cultures. However, the exchange of ideas was usually not equal; throughout the Inca Empire, there were many more local ceramic painted/modeled designs being made on Inca ceramic shapes and forms than there were Inca ceramic painted/modeled designs on local shapes and forms. This likely relates to the ideological and symbolic significance of the Inca painted design system (Costin 2016: 321, 338, 346; Halperin and Foias 2010: 395). Thus, where Inca designs are found on local forms and shapes, it can be seen as a possible sign of imitation in an attempt to associate oneself with the ideology that Inca iconography represents, or a sign of the status that the Inca bestowed upon a particular group.

# CHAPTER 5: CERAMIC COLLECTION

### *Collection Source*

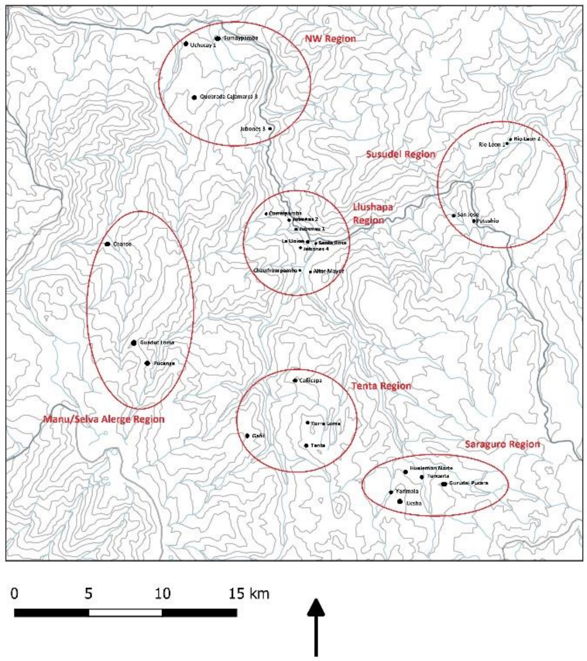


Figure 2: Map of sites, created by me and Dr. Dennis

This collection was provided to me by Dr. Dennis Ogburn. The collection was donated to Dr. Ogburn and UNC Charlotte ca. 2008 by Jim and Linda Belote. The Belotes are cultural anthropologists who have worked in the Saraguro Canton since the 1960s (Fig. 2 and 3). Their main focus was on anthropological research, such as kinship systems and indigenous identity change, however they followed a holistic approach to anthropology and so maintained an interest in the archaeology and history of the region (e.g. Belote 2006; Belote 1984). While working in the region, they did some brief archaeological surface surveys, recording locations and collecting and describing surface remains. The collection of sherds comes from these brief surveys, completed from 1968-1972, and they are all surface finds. Names for many of the sites were given by the

Belotes, but some, such as Sumaypamba and Putushio, are recorded archaeological sites (Belote and Belote 1996). Many of the sites were discovered while the Belotes were doing other research, which is one reason why many site names generate little data in the archaeological literature; the region has also had sparse archaeological research in general (Belote and Belote 1996; Belote 2006).


Figure 3: Screen shot from Google Earth of the Saraguro Canton.

### *The Sites*

The ceramics come from 28 sites in total. Only three of those sites are identified as being constructed by the Inca or occupied during the Inca Period: Santa Rosa (Chamical), Gañil, and Quebrada Cajamarca 3 (Table 1). Gañil and Quebrada Cajamarca 3 both contain Inca style sherds, which means they were occupied or used during the time of the Incas (Ogburn 2001: 193-195). Santa Rosa (Chamical) is one of the few sites surveyed by the Belotes that has been studied by other archaeologists in more depth (Ogburn 2012). It consists of stone structures along the Paquishapa River and it is thought to be an Inca military site built during the initial foray into Ecuador, a fact supported by radiocarbon dates (Ogburn 2012: 225-226, 229). Sumaypamba is potentially Inca related but it is unclear. It is likely that many of the Integration Period sites continued to be occupied during the Inca Period, but these collections did not contain any sherds that were diagnostic of that period (Ogburn 2001: 368-369).

Table 1: List of sites, region, and likely period/phase

| Site Name (site label): | Region: | Period/Phase: |
|---|---|---|
| Altar Mayor (AM) | Llushapa | pre-IP |
| Canicapa (C) | Tenta | IP |
| Chanso (Ch) | Manu-Selva Alegre | IP |
| Chauhuarpamba (Chu) | Llushapa | IP |
| Corralpamba (Co) | Llushapa | IP |
| Ganil (G/X) | Tenta | Inca |
| Guanduc Loma (GU) | Manu-Selva Alegre | IP |
| Gurudel Pucara (GP) | Saraguro | IP |
| Huelemon Norte (HL/HU) | Saraguro | IP |
| Jubones 1 (J1) | Llushapa | pre-IP |
| Jubones 2 (J2) | Llushapa | pre-IP |
| Jubones 3 (J3) | NW | pre-IP? |
| Jubones 4 (J4) | Llushapa | pre-IP? |
| La Union (L) | Llushapa | pre-IP/IP? |
| Pucanga (P) | Manu-Selva Alegre | IP |
| Putushio (O) | Susudel | pre-IP/IP |
| Quebrada Cajamarca 3 (Q3) | NW | Inca/IP |
| Rio Leon 1 (RL1) | Susudel | pre-IP |
| Rio Leon 2 (RL2) | Susudel | pre-IP |
| San Jose (SJ) | Susudel | pre-IP |
| Santa Rosa (LU) | Llushapa | Inca |
| Sumaypamba (S) | NW | pre-IP |
| Tenta (TA) | Tenta | ? |
| Torre Loma (TL) | Tenta | pre-IP/IP |
| Tuncarta (T) | Saraguro | IP |
| Uchucay 1 (UC1) | NW | IP |
| Ucsha (U) | Saraguro | IP |
| Yarimala (Y) | Saraguro | IP |

There at least four site locations for Sumaypamba: three separate but close stone structures, one each found by Uhle (1923), Verneau and Rivet (1912), and Collier and Murra (1943); and a ridge about 1.5km south of these structures, where the Belotes collected the Sumaypamba pieces for this collection. Uhle (1923) and Verneau and Rivet (1912: 106-113) believed the structures they each found to be Inca, while Collier and Murra (1943: 30) stated there was no Inca ceramic influence around their structure. Because of this uncertainty and the 1.5km distance from the possible Inca structures, it is possible the Belotes' Sumaypamba was occupied during earlier periods, while the Sumaypamba region containing all four sites is multi-component. The sherds within the Belotes' Sumaypamba collection indicate that their Sumaypamba site was likely used during earlier periods as well.

La Union is another interesting site. Though there is no research, literature, or ceramic sherds to confirm it was an Inca site, it does contain evidence of various housing structures, has abundant sherd cover on the ground, and is located directly across the Paquishapa River from Santa Rosa. The north side of the site contains rectangular housing remains, while the south side structures are circular, possibly indicating a shift in occupation of the site over time (Belote and Belote 1996). Unfortunately, sherds from the north and south were intermixed, so any knowledge about how the change in housing structure related to ceramics is lost. The Belotes (1996) suggest that the site should be excavated, but it seems this still has not been accomplished, despite the presence of structures, proximity to Santa Rosa (Chamical) and the amount of ceramics.

The remaining sites are mostly Integration Period/Saraguro Ware sites. The Belotes (1996) briefly describe each site in an unpublished report they created from their surveys, and this was the main resource I used to assign dates or cultural affiliations to sites. Any time the Belotes stated that most sherds were Saraguro wares, the site was considered Integration Period (IP). This is 10 of the 28 sites: Cañicapa, Chaurhuarpamba, Guanduc Loma, Gurudel Pucara, Huelemon Norte, Pucanga, Tuncarta, Uchucay 1, Ucsha, and Yarimala (Belote and Belote 1996). The rest of the sites were given little information or no clear distinction in the Belote's report, so a visual analysis of the pieces in those sites was needed to make determination. The remaining sites break down into seven pre-IP sites and two possible pre-IP; two more IP sites; three pre-IP/IP mixed sites; and one still unknown site (Table 1).

Each site was also placed with a region, which was decided upon and named by me. Looking at the site map provided by the Belotes, sites can easy be grouped into six regions. Region names were chosen based on nearby large towns/settlements or by their relative location to the rest of the sites on the map. The NW Region consists of Sumaypamba, Uchucay 1, Quebrada Cajamarca 3, and Jubones 3; the Manu/Selva Alegre Region consists of Chanso, Guanduc Loma, and Pucanga; the Susudel Region consists of Rio Leon 1, Rio Leon 2, Putushio, and San Jose; the Llushapa Region consists of Corralpamba, Chauhuarpamba, Altar Mayor, Jubones 1, Jubones 2, Jubones 4, La Union, and Santa Rosa; the Tenta Region consists of Cañicapa, Torre Loma, Tenta, and Gañil; and the Saraguro Region consists of Tuncarta, Huelemon Norte, Gurudel Pucara, Yarimala, and Ucsha.

### ***The Ceramics***

The collection contains no intact ceramics, only sherds. Therefore, my categorization of forms and ware type is often an educated guess rather than a concrete assessment. For several sites, the Belotes had assigned time periods or ceramic styles already; the rest were decided based upon what was in their report and a visual analysis of the pieces with the aid of Dr. Ogburn's (2001: 236-303) dissertation, which includes descriptions of ceramics of this region. The majority of the ceramics are Integration Period/Saraguro wares and pre-Integration Period wares. Saraguro and IP wares tend to be thicker, coarse, red slipped, wide or flared mouthed, and often tri-pod or ring based; sites with ceramics lacking these characteristics deemed pre-IP (Ogburn 2001: 238, 246). However, due to the fragmentary nature of the collection, I did not assign phases to every individual piece with the primary exception of Inca related sherds but did assign them to each site. There are only six pieces that are distinctly Inca related (Fig. 4-9). These Inca style pieces come from three sites: Quebrada Cajamarca 3 with one piece; Gañil with two pieces; and Santa Rosa with three pieces.

Figure 4: G/X-2

Figure 5: G/X-5

Gañil and Quebrada Cajamarca 3 both contain rope nubbins, a distinctly Inca ceramic feature designed to make carrying *aribalos* long distances more manageable

(Costin 2016: 328). The rope nubbin from Gañil (G/X-5) has incised lines in the vague pattern of a face, is bigger, and has remnants of red slip on it. Quebrada Cajamarca 3's nubbin, on the other hand, is plain and smaller. G/X-2 is a thin, nicely fired, burnished rim piece of some type of pot form; its' high quality and rim form are what differentiates it as Inca. The three Inca pieces from Santa Rosa

Figure 6: Q3-

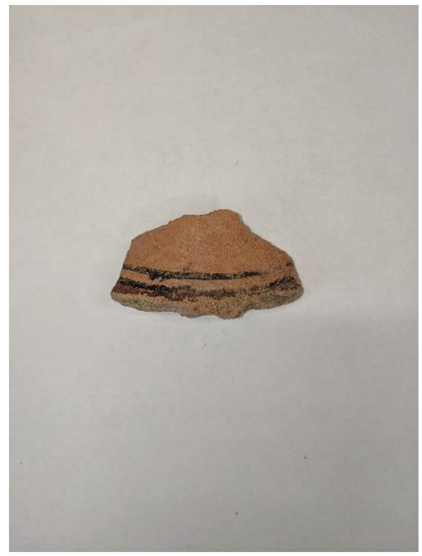

Figure 7: LU-2

Figure 8: LU-4

Figure 9: LU-

consist of a small handle piece (LU-5), a body fragment (LU-4), and a fragment of the neck of an *aribalo* (LU-2). The handle and body pieces are distinguishable due to their style; they are thin, even, burnished, and well fired, unlike non-Inca IP wares. The *aribalo* piece is large enough to distinguish that it is the base of the neck of an *aribalo* form, but it also has a slip design that links it to the Inca: the two parallel black lines on the base of the neck are reminiscent of the banded necks of Cuzco Inca *aribalos* (Fig. 10).

Figure 10: Inca *aribalo* from Peru; located in the Art Institute of Chicago

# CHAPTER 6: METHODS

## *PXRF: What is it and how does it work?*

In order to investigate the composition of the sherds, I used a portable X-ray fluorescence spectrometer, or a pXRF. As the name indicates, this machine is a portable version of stationary X-ray fluorescence spectrometers. With XRF analysis, the sample is exposed to X-rays, which then react with the electrons of the sample to produce fluorescent (secondary) X-rays with measurable energy levels that correspond to particular elements (Shackley 2011: 8; Rice 1987: 393). In EDXRF, these fluorescent X-rays must pass through a semiconductor detector, usually made of a silicon microchip, in order to be interpreted by the machine (Shackley 2011: 31). The results are presented as a graph showing the peaks of intensity of the secondary X-rays emitted from the elements within the sample (Rice 1987: 393). These results are then converted into a list of measurements of the composition of the sample based on a selected set of discriminatory elements, given as a percentage in parts per million, or ppm.

## *Limitations of pXRF on ceramics*

Although pXRF is very valuable and useful, it has some limitations. First, XRF can only detect a limited number of elements (Shackley 2011: 10). In general, it is best with the mid-Z (atomic number) elements, or those with an atomic number greater than 16. The EPA (2015: 12) Method 6200 for Field Portable X-Ray Fluorescence Spectrometry guidelines indicate that 26 elements can be detected with pXRF, but some of the lower Z elements require more work to record. Therefore, it is best to avoid using the lower and higher Z elements in XRF analysis. According to Shackley (2011: 10), the range of elements with the best detection are Ti to Nb, so a selection of elements within this range is going to best for the final statistical analysis.

A second issue with XRF analysis, especially pXRF, is the effect of a vacuum on the results. There are elements in the air that would skew the results of an XRF analysis, thus creating a vacuum, or at least creating the minimal amount of air between the sample and the machine, is optimal (Shackley 2011: 28). Some XRF's have the ability to form a vacuum and others do not; pXRF's typically cannot form a vacuum (Hunt and Speakman 2015: 627, 637). The UNCC Department of Anthropology's pXRF does not have the ability to create a vacuum. The skewing effect of air can impact elements lighter than Ti and not having a vacuum is most apparent for Mg, so measurements of this element should be used with caution. Elements lighter than Mg cannot be measured with pXRF. Lastly, XRF is not suitable for provenance studies of all types of materials; such is the case when studying ceramics from areas where geological samples have not been studies, as is the case with the Saraguro region of Ecuador (Hunt and Speakman 2015: 637-638). In those cases, XRF is much better suited for discerning compositional groups within a set of samples, with the implication that ceramics in the same group come from a common production center using the same clays and other raw materials.

Lastly, Shugar and Mass (2012: 18, 21-27) discuss their issues with the current state of pXRF research: cultural heritage objects which have heterogeneous make-ups are often left out of the discussion of pXRF studies when in fact a pXRF is perfectly capable of giving useful information on these items. The problem is that, as Shugar and Mass (2012: 18-19) argue, too many pXRF researchers begin the projects not knowing much about how the technology works and therefore make methodological and interpretive mistakes when it comes to layered materials. Once you understand how the X-ray interacts with the object and how the device processes and analyzes data, you can better set up your research questions and methods and avoid misunderstanding the data.

***Applications of pXRF for ceramics***

XRF (including pXRF) analyses of the composition of ceramics have contributed important data to archaeological knowledge. Stremtan et al. (2013: 274) in their work with Barbar ceramics from Failaka Island, a Kuwaiti island in the Persian Gulf, use pXRF to study the elemental composition of the ceramics in order to examine the sources of ceramics, and thus indirectly the interactions between groups in the region. By double checking their pXRF data with inductively coupled mass spectrometry data, Stremtan et al. (2013: 278) were able to assert that pXRF data is accurate enough to be valuable as a tool for defining the elemental make-up of a ceramic in order to detect groups of similar composition within a heterogeneous collection.

Aimers et al (2012: 424) investigated Maya ceramics using pXRF to determine compositional groups within the ceramic types to illuminate trade and exchange during the Postclassic period. Maya ceramics had a standardized form over a large area, so it is assumed that they were produced by many people in several production areas. By examining these ceramics for intra-group compositional difference, the authors were able to test this assumption about Maya ceramics and also show that pXRF is just as good as benchtop XRF for this task (Aimers et al. 2012: 431, 440, 443) . Although the authors did prepare glass beads for their analysis, they also used surface abraded sherds for examination of trace elements. This study shares much with my approach and shows promise for the results of a compositional analysis using pXRF for discriminating intratype groups that will shed light on how ceramics were produced and moved around a society (Aimers et al. 2012: 425-427, 433, 438).

In a similar study, Tanasi et al. (2017: 224, 226) examined sherds of Maltese and Sicilian type wares in order to determine if the Maltese types were being imported or made locally. The Maltese types consisted of Thermi Ware and Borġ in-Nadur wares, while the local styles were Castelluccian Ware and Thapsos wares. All sherds studied were excavated at a site on an inlet near Sicily, so the presence of the Maltese wares signaled some type of connection and trade, but using pXRF allowed the researchers to find out if the local inhabitants of this inlet were making Maltese ceramics themselves. The authors do find that some Maltese wares were made locally in Sicily, but Tanasi et al (2017: 230, 232) were mainly concerned with the implications for trade and exchange. However, they could also have easily gone a step further and investigated what this local production of foreign wares meant for the political and ideological context in Sicily at the time.

Lastly, Frahm (2018: 16-17) completed an extensive experiment and study on the effects of temper volume and particle size on pXRF analysis of ceramics. The second part of Frahm's (2018: 15-16, 22) study was to use what was learned from the pXRF experiment to determine if the classifications of wares as local, imports and imitations was accurate at the site of Tell Mozan. The method of preparing and analyzing the ceramic samples was very similar to what I did, with a surface being freshly abraded and taking multiple measurements (Frahm 2018: 23). The significant finding for Frahm (2018: 27-29) was that the ware that was considered a local imitation of an imported ware, based on the presence or absence of a clinking sound and differences in temper volume and fineness, was in fact not a local imitation but rather shared the same source as the imported wares. Furthermore, both clearly did not originate in Tell Mozan based on comparisons to the known local wares and knowledge of the geology of the area.

Though Frahm (2018: 35), like the other authors discussed, does not focus on understanding ideology and identity in Tell Mozan better, he does bring it up and discusses how pXRF data can be used to better study these questions than with visual analysis and classification alone. Frahm and the other authors mentioned are included in a long and ever growing list of researchers using pXRF to study ceramics for various purposes, creating a foundation of literature on which this work can add to (Ceccarelli et al. 2016; Frankel and Webb 2012; McCormick and Wells 2014; Mitchell et al. 2012). Though for a long time the use of this technology for the purpose of examining ceramics was looked upon with skepticism and caution, today there are more than enough examples to show that as long as one understands the technology and takes issues like calibration, dilution, appropriate sample preparation, and so on into account, then pXRF is reliable for this type of work (Aimers et al. 2012: 429-430, 443; Frahm 2018: 13; Shugar and Mass 2012: 18).

***Sherd Data***

There are several other traits of the sherds that are worth recording to aid in categorization and providing a more in depth examination of the collection than can be done by pXRF analysis alone. First, all decoration was recorded: whether it was slip, painted, or incised decoration, the colors, and what the design was. A Munsell color was assigned to all slips and/or ceramic pastes using a digital Munsell reader, aided with a physical Munsell book in cases of difficult identification. Next, sherd type and possible form was recorded, followed by rim or base measurements completed in centimeters using a rim/base chart, if the sherd allowed for it. Wall thickness was also measured in millimeters using a set of digital calipers. Lastly, a visual examination of firing quality and paste coarse/fineness was recorded by way of a brief description.

The data was collected by site and as all data was recorded, each piece was photographed and given a sherd label. Sherd labels consisted of the site abbreviation followed by a number which was assigned in sequence as sherds came up in the pile for their site. Lastly, a column for the estimated time period of sherd was created, however not all sherds have this information due to uncertainty; mainly those pieces which are identifiably from the Inca Period or Integration Period have a label in this column. Rice's (1987) *Pottery Analysis: A Sourcebook* was a helpful guide to deciding which additional aspects, aside from the pXRF analysis, to record and for determining the proper techniques to do so. When coupled with the completed pXRF analysis, this additional information refines and brings nuance to the results by shedding light on other differences or similarities between groups of similar elemental composition.

### ***Preparation of Sherds***

There are several different potential methods of preparing a ceramic sample for analysis in an XRF. First, there is the pellet/bead method, in which you remove a small sample of the interior core of a ceramic, avoiding any coating on the outside that is not part of the actual ceramic, and grind this sample into a fine powder and create a pellet or bead out of it, depending on the medium you mix it with. Because XRF beams can only penetrate 20-200 micrometers beneath the surface and are easily hampered by matrix effects, grinding the sample into a powder helps to reduce these limitations (Hunt and

Speakman 2015: 634-636; Liritzis and Zacharias 2011: 136; Shackley 2011: 21; Shugar and Mass 2012: 18). With this method, you are guaranteed to get results about the make-up of the clay material rather than any slip, glaze or paint on the exterior, and the chances of accuracy being skewed by grain size, heterogeneity or mineralogical effects are lowered.

However, this method has several drawbacks. First, it is the most destructive. Second, for making glass beads, this requires flux and the process of fusing them into beads; clearly, this is a labor and supplies intensive method of preparing XRF samples. Also, even though some authors state that the making of pressed pellets is "simple and inexpensive", it certainly is less simple and more expensive than a non-destructive, or much less destructive, method (Aimers et al. 2012: 433). Thus, this method, even though it is the most methodologically thorough and reliable, is unsuitable for my collection and my funding and time restrictions.

The completely non-destructive method is another potential option. However, this option has many limitations and negatives as well. In this approach, the ceramic sample is taken as it is and analyzed with the pXRF. Issues with this approach include the interference of slips, which, if not removed from the ceramic before analysis, will skew the results. Not only will the slip itself be analyzed in the pXRF and affect the data, but it will also lessen the distance that the X-rays penetrate into the ceramic, making the data even less useful (Liritzis and Zacharias 2011: 112). Also, pXRF works better on flat surfaces, especially if the material is heterogeneous like ceramics, so that the X-rays refract in the proper way (Shugar and Mass 2012: 19). Therefore, going completely non-destructive and doing nothing to the sample was not appropriate for this study.

The approach chosen for preparing samples is surface abrasion. This technique is destructive, but it is much less damaging than the glass bead or pressed pellet methods. Surface abrasion is done by sanding away the outer layers of the sample, removing surface corrosion, contamination and any slips, glazes, paints or any other decorative coating, and creating a small, flat area for the pXRF measurement (Aimers et al. 2012: 438; Frahm 2018: 23; Shugar and Mass 2012: 19, 29, 34; Tanasi et al. 2017: 227). It is also important to clean the sherds before analysis to ensure that there are no contaminants (Aimers et al. 2012: 432). This method of preparing the sherds should make it so that the pXRF has a more accurate analysis of the clay paste with little interference from dirt, grime or surface coatings.

For each sherd I analyzed, two small areas were sanded using a series of increasingly finer grades of sandpaper, starting with 80 grit and going to 220. A smooth, flat surface was the goal on each section, however this was not always possible to achieve. Some of the sherds with coarser paste compositions could not be sanded entirely smooth due to the chunking off of pieces as sanding was done. Also, other sherds had shapes that made it difficult to get a flat surface, as well as areas where the unevenness was too great to sand completely without massive erosion of the piece. Each sherd was sanded with its own fresh pieces of sandpaper, so as not to contaminate other sherds with dust from the previous sherds. Sherds were then dusted off gently with an air duster before going into the pXRF stand for analysis.

***Matrix Matching and Calibration***

An XRF must be calibrated in order to give the most accurate results. For those wishing to make sure their work is viable, they calibrate their instruments with a reliable method, such as using international standard pressed powder pellets. One question is whether it is necessary to match matrixes between the sample and the powdered standard. Shackley (2011: 13, 21) has demonstrated that this is not a problem, at least for obsidian analysis, and it should not be a problem that I calibrated the pXRF with a powdered standard in order to analyze my whole sherds (Shugar and Mass 2012: 28; Aimers et al. 2012: 435, 438). The Olympus pXRF on campus is currently calibrated by Dr. Ogburn with a set of 13 geostandards. Each time the pXRF starts a new session, an energy calibration is done using a metal disk provided by the manufacturer; at the end of each session a geostandard labeled QLO-1 was tested to ensure the accuracy of the rest of the days measurements.

### ***Testing the Sherds***

Next, the method of analyzing the prepared sample was decided upon. With pellets or glass beads, the method is to create the sample then examine it. Being that the pellet or bead is going to be small, it should be able to be examined by an XRF in its entirety, giving you accurate information about the composition of the clay with one round of X-rays. However, since I did not turn my sherds into pellets or beads and I did not plan on breaking any parts of them off for this analysis, I needed to do an XRF analysis on multiple parts of the sherd. I aimed for two measurements: an inner or outer surface measurement, and an edge of the sherd. When this could not be achieved, due to difficult angles or edges that were too thin, then any two areas that were easily accessible and some distance apart were used (Frahm 2018: 32; Stremtan et al. 2013: 276; Tanasi et al. 2017: 227). The results from the two measurements are then compared together to account for possible inclusions that were hit during the reading and to give more accurate information on the heterogeneous matrix than one measurement alone can provide.

### *Schedule of Work*

Analysis with pXRF on the sherds began in the late summer and continued through the fall semester of 2019, being completed at the beginning of December. The pXRF is located on campus within the Department of Anthropology at UNCC; I was instructed in the use of the machine by Dr. Dennis Ogburn, who supervised the analysis. Preparing the sherds was the first task completed and took several sessions over a period of weeks to complete. Sherds were laid out on trays in groups based on the site they were found at and then examined to gather the non-pXRF data for each piece (paste composition, decoration, etc.). Next, the sanding of each piece began. The sorting and prepping of the sherds was done by me and did not require any special techniques or materials to complete, aside from sandpaper. The machine was used as if in the field (stand-alone) attached to the protective test stand.

# CHAPTER 7: ANALYSIS

## *Data Prep and Analysis Method*

The last step in the project was the analysis and interpretation of the data from the pXRF. Bivariate plots and principal components analysis seem to be the most commonly used methods for determining compositional groups when using pXRF. For this project, I used bivariate plots for the analysis (Frahm 2018: 31; Liritzis and Zacharias 2011: 118; Tanasi et al. 2017: 227). This was an easily accessible method that required no special software. The plots were created in Microsoft Excel using the data from the pXRF converted into a spreadsheet (Appendix 1). This spreadsheet included the time, date, number of the measurement, and all the elements measured for each sherd. Additional columns for site name, sherd label, time period, and area measured were added by me to aid in choosing data to analyze. The pXRF measured many elements, but I decided to only focus on those elements that are measured the most reliably and are best suited for ceramic analysis.

## *Elements of Interest*

The first step in beginning an XRF analysis is determining the elements that would be of most use in differentiating groups within this particular collection. The objective is to identify elements that show different, distinct ranges for different source groups, i.e. compositional groups. I first looked within the Ti-Nb range suggested by Shackley (2011) as the optimum range of XRF for those elements with the best potential. Next, Dr. Ogburn and I analyzed the data to find those elements that were not well-measured and pieces that were outliers. Elements calcium (Ca), iron (Fe), zinc (Zn), gallium (Ga), rubidium (Rb), strontium (Sr), yttrium (Y), zirconium (Zr), niobium (Nb), and barium (Ba) all showed variance in between sites and individual pieces, so I chose from these elements to make the bivariate plots (Appendix 1). I made plots in several element combinations: Sr v Zr, Sr v Rb, Nb v Y, Fe v Ba, and Fe v Rb. In the end, Sr v Zr and Fe v Rb were the most useful in discerning compositional groups; these compositional groups also showed consistency in concentrations of additional elements.

***Making the Bivariate Plots***

Numerous bivariate scatter plots were made in Excel with the pXRF data (Appendix 2). I made plots using sites and individual pieces, and combinations of the two. All sites were placed into a single plot for pinpointing pieces unique to the sample as a whole (Appendix 2.1). Plots were made for each region that was designated earlier for determining whether sites close to each other had ceramics of similar composition (implying use of similar clay sources), or if some pieces were compositionally distinct, suggesting they came from outside the closest surrounding sites. Other plots focused on individual Inca pieces, Inca Period sites, and other individual sites.

Inca pieces were always highlighted separately in the graphs so that they would always be easily visible for comparison. All sites were put into a single graph to examine the overall trends of the collection (Appendix 2.1). Graphs of the individual sites were used to examine the number of possible sources of ceramics at a site. Graphs of regions were used to estimate whether sherds were local to the site and region they were found, with the assumption that sites within the same region would have been utilizing the same or similar raw materials. Sites with sherds that seemed non-local based on being compositionally distinct from most other sherds from their region were compared with other regions to attempt to find the more likely sources. This was done in order to reveal any possible connections and ties between sites and regions.

# CHAPTER 8: RESULTS

## *General Results*

The results of the Sr versus Zr graph for all sites shows that the entire collection has a narrow and low range of zirconium, except for four pieces from Santa Rosa (Appendix 2.1). These four Santa Rosa sherds do not obviously show Inca influence. Iron versus rubidium is much more varied across the collection although there is still a large cluster representing a majority of the sherds (Appendix 2.1). The four outlying Santa Rosa pieces fall to the edge of the rest of the sherds and still cluster together within Fe v Rb, but they are not as obviously distinct as they were in their zirconium content. Because of these results, combined with the fact that the site was briefly Inca occupied during the initial conquest of Ecuador, I argue that these four pieces were produced outside the areas contained within this collection. The graphs of all sites also show clearly that the six Inca related pieces are divided into two groups, but they do not stand out in any significant way from the rest of the collection, and are thus more likely to have been produced within the region.

The plots including only the Inca pieces and Inca Period sites confirmed this assessment (Appendix 2.2 and 2.3). In both element combinations of only the Inca style sherds, the two rope nubbins and the Gañil rim sherd are clustered together and the three Inca pieces from Santa Rosa are clustered together. This means that the Inca pieces across the region came from two distinct production centers. Interestingly, this pattern also shows up with the rest of the pieces from Inca related sites as well; there are two distinct and groups, with an added cluster of Santa Rosa outliers. Thus we have: Group 1, consisting of the four outlying sherds from Santa Rosa (LU-1, LU-3, LU-6, LU-7); Group 2, consisting of the three Santa Rosa Inca sherds (LU-2, LU-4, LU-5) and one nondescript Santa Rosa sherd (LU-9); and Group 3, consisting of two nondescript Santa Rosa sherds (LU-8, LU-10), the Gañil sherds, and the Quebrada Cajamarca 3 sherd. The results combined show that some not distinctly Inca ceramics from Santa Rosa (an Inca imperial site) were being imported from outside the region, while the Inca style sherds from that site and two others sites (Quebrada Cajamarca 3 and Gañil) were being locally produced with at least two different material sources.

***Quebrada Cajamarca 3 and Gañil***

Graphs of the Gañil and Q3 sherds indicate that the two rope nubbins (G/X-5, Q3-1), the Gañil Inca rim (G/X-4) and a spindle whorl (G/X-1) from Gañil are similar in composition and likely share a source (Appendix 2.4). When plotted with the rest of the Tenta region, these same sherds continue to cluster together (Appendix 2.5). In Appendix 2.5, particularly the Fe v Rb plot, it is clear that these four sherds do not fit as closely with the rest of the sherds from the region, which consists of Torre Loma, Tenta, Cañicapa and the remaining Gañil sherds (G/X-3, G/X-4) and thus were unlikely to have been produced there. The next question then becomes which site/region is the likely source of the Inca sherds from Gañil and Q3, and specifically, whether they match the composition of any of the other ceramics within this collection. The similarity in composition of the Gañil Inca sherds to the Quebrada Cajamarca 3 rope nubbin provided the starting point to investigate this question.

Comparison between Gañil's region and Q3's region provided interesting results (Appendix 2.6). Quebrada Cajamarca 3 is located in what I designated the NW region

(Q3, Sumaypamba, Uchucay 1, Jubones 3), while Gañil is located in the Tenta region (Tenta, Cañicapa, Gañil, Torre Loma). These regions are quite far apart, separated by a large cluster of sites along the Rio Paquishapa (Llushapa region). Despite this distance, the results show that Gañil's Inca style sherds, along with a spindle whorl (G/X-1), are similar to the Q3 nubbin and to 6 out of 15 (40%) of the sherds from Sumaypamba The Sumaypamba sherds that cluster with the Gañil Inca style sherds and the Q3 rope nubbin are S-1, S-3, S-6, S-7, S-9, and S-11; these sherds are a mix of two higher quality rim sherds (S-1, S-3) that look similar to G/X-2 and four sherds that appear to be IP, based on their thickness, coarseness, and paste and slip colors. Also, two sherds from Uchucay 1 (UC1-1, UC1-2) cluster with the 40% from Sumaypamba and the Inca style sherds; UC1-1 is another spindle whorl and UC1-2 is a thick and coarse rim sherd, likely dating to the Integration Period (IP).

The other half of the Uchucay 1 sherds, the remaining 60% of the Sumaypamba sherds, and the Jubones 3 sherds all cluster together and visually seem more likely to be pre-IP. Thus, it appears that the NW Region was occupied from the pre-IP through the Inca Period, with IP and Inca ceramic production differing noticeably in the material sources from the pre-IP ceramics. It can be seen in the Tenta and NW Regions plots (Appendix 2.6) and the All Sites plots (Appendix 2.1) that the pre-IP sherds from the NW Region fit closer to the Tenta Region and the majority of the collection overall. Therefore, it appears that during the pre-IP periods, communities in the NW Region shared clay sources similar to those that the vast majority of the southern communities in this study used and continued to use into the IP and Inca Period. The NW Region communities during the IP and Inca Period, however, saw a change in ceramic source materials; the results show a compositional difference significant enough to argue that the NW Region began using sources outside of the immediate study area, but not so far removed as to be completely different compositionally like the four sherds from Santa Rosa.

***Santa Rosa***

The site of Santa Rosa, also called Chamical, is considered to be an Inca military site with an early, brief occupation during the initial conquest of Ecuador, c.a. 1450 A.D. Results of the plots containing all sherds within Santa Rosa reveal three distinct groups (Appendix 2.7). Group 1 consists of the 4 outlying sherds (LU-1, LU-3, LU-6, LU-7); Group 2 contains the three distinctly Inca style (LU-2, LU-4, LU-5) pieces and one non-Inca pieces (LU-9); and Group 3 contains the remaining two Santa Rosa sherds (LU-8, LU-10), which match the Gañil and Quebrada Cajamarca 3 Inca sherds (G/X-2, G/X-5, Q3-1). It is also clear from these graphs that Groups 2 and 3 are more similar to each other than either one is to Group 1. These results show up in both the Sr v Zr plot and the Fe v Rb plot.

Next, I plotted the Llushapa Region to see how Santa Rosa fit with the sites that surrounded it and whether or not any of its three compositional groups possibly share a source with ceramics from nearby sites, particularly the La Union site (Appendix 2.8). The sherds of Group 1 stand apart from the rest of the region. Group 2, which contains the Inca style Santa Rosa sherds, appears to be the composition group that is local to the Llushapa Region: 5 of the 10 (40%) Santa Rosa sherds, around 32-34 of the 37 (~86-91%) La Union sherds, 6 of the 12 (50%) Chauhuarpamba sherds, 4 of the 6 (~67%) of the Corralpamba sherds, the two Altar Mayor sherds, and the Jubones 1 sherd are clustered with this group, which is 52 out of 72 sherds (~72%). The remaining ~28% of the Llushapa Region sherds cluster with Group 3, which contains the rope nubbins, the Gañil Inca style rim, and the remaining two non-Inca style sherds from Santa Rosa, LU-8 and LU-10.

Because Group 3 contains the Gañil Inca style sherds and the Q3 rope nubbin, this again suggests a connection to Sumaypamba and the NW Region. I plotted Sumaypamba with the Llushapa Region to explore this connection; comparing the Sr v Zr and Fe v Rb plots shows that the sherds that make up Group 3 cluster with around 4-6 of the 15 Sumaypamba sherds (Appendix 2.9). These are the same six sherds that indicated IP and possible Inca ties from the investigation of the Gañil and Quebrada Cajamarca 3 sites. The remaining pre-IP sherds from Sumaypamba fit with Group 2, which clusters with the majority of the collection in the All Sites plots (Appendix 2.1). Lastly, I plotted the Llushapa and NW Regions together with the sites colored by region, with the exception of Santa Rosa and the individual Inca style sherds (Appendix 2.10). These graphs show clearly that there is a split is source materials between the two regions, but also that the Llushapa Region has a decent amount of ceramics from NW Region sources, mainly in the pre-IP sites.

# CHAPTER 9: DISCUSSION

Although this region of Ecuador has not been studied in any great depth and this collection of sherds was small and had only site-level provenience, by combining multiple avenues of research and evidence, quite a bit of information can be gathered about the Saraguro Canton during the transition to Inca control. Identifying compositional groups, a common methodological approach to ceramics and XRF, is useful on its own but by combining it with the additional analysis of ceramic traits, the historical information about how the Inca Empire operated, and the ethnohistoric data about some of the contextual details of Inca expansion, more detailed interpretations can be made.

Going chronologically, the data shows that there was a shift in the NW Region during the transition from pre-IP type wares to IP and Inca type wares. Sherds that visually appear to be pre-IP in the NW region fit with the majority of the more southern sites in the study area, while the IP and Inca type sherds from this region are made of a material that stands out from those southern regions. Whether this shift in material sources for ceramics was caused by the Inca is unclear. Since Inca presence and control does not mean that all other IP wares would cease to be produced, the IP and Inca sherds could have been produced contemporaneously or in succession (Ogburn 2001: 24). As for the shift in sources itself, history and ethnohistory can provide some direction in attempting to answer why.

One possibility is that the Cañari subgroup that resided in this area of the Loja Province may have needed to begin using a different source for their ceramic materials (possibly a more northern source where the majority of their ethnic groups lived) during the IP/Inca Period after the Paltas submitted to the Inca and *mitmaqkuna* were brought into the area (Ogburn 2001: 94-96). Once the Cañari became integrated into the Inca Empire themselves, the Inca continued to utilize this NW source to make *aribalos* and other Inca food serving/cooking vessels. On the other hand, it is also said that the southern Cañari groups in the Loja Province may have allied with the Paltas, becoming lumped in with them and forcibly relocated after their initial resistance to the Inca and subsequent defeat; this could account for the shift in ceramic material sources as well (Ogburn 2008: 293, 296). If it was only the Northern Cañari groups left in that region during the IP/Inca Period, or the new incoming *mitmaqkuna* being placed in the NW were unfamiliar with local sources and/or placed in a new administrative unit that placed them outside of the old sources, it could account for this difference in sources in the NW Region over time.

What can be said for certain is that this NW source was used to produce some Inca style wares in the Saraguro Canton and that some of those ceramics were obtained by various local communities. Of the six Inca style sherds in the collection, three of them are similar in composition to this IP material source in the NW Region. First, there is the plain rope nubbin from Quebrada Cajamarca 3, which is within the NW Region itself, although it is a little over 5km from Sumaypamba and Uchucay 1. Then there are two sherds from Gañil, a finely made rim sherd and another rope nubbin that is larger and decorated. The Inca rim from Gañil visually looks to be the same vessel form as two rim sherds from Sumaypamba that also have the same source material. Also, though not distinctly Inca related, there are two sherds from Santa Rosa (LU-8, LU-10) that share this NW Region source. Since Santa Rosa was only occupied by the Inca, this supports the idea that the Inca took control over the NW Region source and established a production center for ceramics there (Ogburn 2012).

Although all these sherds seem to have come from the same place, what type of sherd it is and where it ended up are also important factors in determining what these ceramics might have meant to people as an item of materialized ideology. The sherds at Gañil are the farthest away geographically from the likely source of the raw material, but they are also the highest quality Inca sherds to come from that source. The rope nubbin was part of an *aribalo*, used for *chicha* transport by the Inca; the rim may be some form like the beaker shaped olla that Bingham (1915: 260) describes, which is a common Inca cooking vessel (Bray 2003: 15). There was also a spindle whorl from Gañil that shared the same composition as the rope nubbin and the rim. All three of these ceramic types were part of the domestic sphere (food and textiles) that the Inca brought into the public space through their strategies of ethnic division, labor tax, and feasting. This is the pattern for most of the material ideology that the Incas shared with the masses because it helped establish Inca superiority and dominance in all aspects of life (Bray 2003: 4-5, 15, 18; Quave 2017: 603). Gañil is not mentioned in any ethnohistorical or historical accounts of the area and it is not a site that has ever been studied in any great anthropological or archaeological depth, but it is around 10km to the NW of Saraguro, a community that is known to have been loyal to the Inca.

Perhaps these Inca ceramics were gifts to the local elites who lived near Gañil for their cooperation or a bribe for their submission. Or, if we assume that the ethnohistory is correct and that this area was largely replaced with incoming Cuzco/Lake Titicaca *mitmaqkuna*, then perhaps these ceramics were brought back from a labor assignment in the NW. That the ceramics were locally made at what appears to be a production locus for Inca ceramics suggests that they are state sponsored ceramics as well. The fact that probable state sponsored ceramics were found so far from any major Inca imperial sites and from the supposed source of the raw material says that whoever was using these ceramics was making an effort to integrate Inca material ideology into the lives of people living there by going some distance to obtain Inca style ceramics. As is known from studying the Inca Empire, Inca ceramics were not forced upon people and higher quality pieces were not handed out to just anyone (Bray 2003). Lastly, that these ceramics were all related to the domestic sphere (food and textiles) yet mainly used in public spaces also supports that idea that Gañil inhabitants had an interest in presenting an Inca political identity even in the home. The symbology of Inca *aribalos* that links them to the body of the Inca king also points to the fact that people living at Gañil accepted and integrated the ideology of the Inca state as provider into their lives, or were acting as they accepted this ideology.

On the other hand, there is the rope nubbin from Quebrada Cajamarca 3. Because this sherd was the only piece collected from that site, there is a limited amount that can be said about it. It is clearly from an *aribalo*, although it is a very plain, utilitarian, and small *aribalo* compared to the one from Gañil. Being found in Q3, it is closer to the supposed source material, which means that it did not take as much effort to get it where it ended up, which according the Belotes (1996) is a ridgetop. From just this information, I suggest that this piece was produced and used by someone who was living locally (not necessarily a local themselves), wanted to be identified as someone affiliated with the Inca, and appreciated the role of the Inca state as a provider. This is because *aribalos* with rope nubbins are a form of materialized ideology that was highly symbolic of a connection to the king and an appreciation of the prominence of the state in providing for the population (Bray 2003). This rope nubbin is also not a high quality or fancy ceramic and looks more like something for everyday usage, an even more powerful indication that whoever used it held an Inca political identity that was significant in their life.

The last bit of information that we can examine to understand the political situation in the Canton of Saraguro during the Inca Period is the complex situation that unfolded in Santa Rosa. As I mentioned previously, there are two sherds (LU-8, LU-10) that fit with the NW Region source, but they look like IP wares, not Inca related ceramics. Next, there are the three sherds that are Inca style and one IP style that cluster together from Santa Rosa. Sherds LU-4 (a body sherd) and LU-5 (a handle fragment) are the higher quality of the two, while LU-5 (the *aribalo* neck sherd) is somewhat lower quality. These ceramics have a chemical composition similar to ceramics from sites south of the Llushapa Region, therefore I think they are locally made, most likely from La Union, the site across the River Paquishapa. The final sherds from Santa Rosa are those four outliers, LU-1, LU-3, LU-6, and LU-7. This group contains at least two different styles; LU-3 could be Inca based on its' quality and slip but it is not certain; and the rest of the sherds look to be a higher quality ware that used orange/reddish slip with thin white stripes.

Based on information from the research of Dr. Ogburn (2012) that this was a briefly occupied Inca military site, it is assumed that all the sherds found there were brought there by or for imperial Incas. The clearest and most easily interpreted segment of the sherds are the four outliers. When the Incas arrived at the site ca.1450 A.D., they likely brought ceramics with them from whatever place they came from, as the Inca army was made up of people from numerous ethnic groups across the empire as well as ethnic Incas or Incas by privilege (Ogburn 2008: 291-292; Ogburn 2012: 228). These ceramics could have also been imported there during the occupation of the site. The orange/red wares with thin white stripes resemble Cañari wares and could have been brought to Santa Rosa as tribute, making this another, even more northern Ecuadorian source rather than a source from Peru to the south, but again the typology is not certain (Fig. 11 & 12). The end result is that the individuals responsible for their presence at the site are connected to the Inca state. The remaining sherds from this site are all locally made and this has implications for what the social and political transition to being incorporated into the Inca Empire looked like.

Figure 11: Cañari style compotera; taken by Dr. Dennis Ogburn in Cañar Province

Figure 12: Cañari style pots; taken by Dr. Dennis Ogburn in Cañar Province

Because it was so briefly occupied and was a military site likely used as one of the Inca's initial footholds in the area, it is interesting that Inca type wares were being produced nearby. This could imply a couple of scenarios. The site directly across the Paquishapa River from Santa Rosa, La Union, is said by the Belotes (1996) to be covered with sherds and has two different styles of stone structures. The Inca style sherds from Santa Rosa fit closely in composition with the sherds of La Union, which has the majority of its' sherds in a tight compositional cluster, so I can see one of two situations (Appendix 2.8). Either the community that was already at La Union welcomed the Inca and gave them access to raw materials or perhaps helped them produce them; or the Inca took over the site of La Union and forced the locals to produce for them or used the local sources to produce ceramics for themselves.

The latter scenario is what I lean toward, however, because the ethnohistory does imply that there was some initial fighting and resistance rather than passive acceptance (Ogburn 2012: 228). It is also unlikely that the producers would be *mitmaqkuna* because this site was occupied right at the start of the Inca conquest of the region. Therefore, in the case of these Inca sherds from Santa Rosa, it is likely that there was very little agency available to the producers of these ceramics in terms of style choice due to the domination of the local social and political structure by the Inca Empire that was being imposed during that time. However, those last two Santa Rosa sherds that seem to come from the NW Region, and the fact that many NW Region source sherds (both Inca and IP) end up across the study area, particularly in Gañil where they likely passed through the Llushapa Region, suggests that at some point the conflict and tension was eased and that perhaps the Inca established a centralized production area near Sumaypamba.

There is also support for this from the ethnohistory, which tells us that *mitmaqkuna* probably did eventually replace the locals and that this region was loyal to the Inca until the fall of the Empire under the Spanish (Ogburn 2001: 193; Ogburn 2008: 296, 304). *Mitmaqkuna* groups being responsible for the NW Region source productions could also explain why there is a mix of high and low quality Inca styles, since relocated groups probably produced ceramics both for the state and for their own personal use. The *mitmaqkuna* groups in this area are said to have come from the Cuzco/Lake Titicaca region, so potentially they used utilitarian Inca wares, like the Q3 rope nubbin.

Based on all this evidence, I have come to a couple final conclusions about what was occurring in the Saraguro Canton during the Inca Period. Upon their initial arrival, the Inca army dominated local groups. The locally made Inca sherds from Santa Rosa are not of imperial quality and seem to come from the already inhabited site of La Union, which leads me to believe that they were made by natives for their Inca conquerors. The Inca also established some sort of ceramic production center in the NW region, likely at or near the various stone structures labeled Sumaypamba over the years (Belote and Belote 1996). In both regions, *aribalos* and other cooking/serving related ceramics were being produced, which all helped to establish and/or maintain in this region important Inca ideologies about how the world operated under their rule.

However, the makers of the NW Region ceramics may have had more freedom to choose the type of pottery they created, which we can see through the mix of styles (IP and Inca) and qualities (G/X-5 versus Q3). Whoever was producing these wares in the NW Region and then moving them around the region, be they *mitmaqkuna* or natives who were left behind, were actively choosing to be affiliated with Inca political identity and to show an acceptance of Inca ideology into their everyday lives. The possibility that the four outliers from Santa Rosa are Cañari would also imply some sort of acceptance or submission to the Inca by the people of this region. All signs point to the fact that here, like a lot of places the Inca conquered, people were trying their best to maneuver in the new social order the Incas had imposed rather to simply resist or rebel.

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# APPENDIX 1: RAW DATA

**1.** pXRF data recorded in part per million (ppm)

| Site | Sherd Label | Area of Measure | Ca | Fe | Zn | Ga | Rb | Sr | Y | Zr | Nb | Ba |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Altar Mayor | ***AM-1*** | exterior | 31942 | 42356 | 91 | 54 | 25 | 482 | 6 | 116 | 8 | 865 |
| Altar Mayor | ***AM-1*** | edge | 22841 | 42656 | 129 | 107 | 20 | 427 | 6 | 109 | 7 | 656 |
| Altar Mayor | ***AM-2*** | slip side | 20586 | 43921 | 171 | 74 | 29 | 378 | 11 | 114 | 9 | 858 |
| Altar Mayor | ***AM-2*** | edge | 17825 | 47262 | 259 | 97 | 34 | 365 | 10 | 130 | 11 | 895 |
| Canicapa | ***C-1*** | attachment area | 9155 | 48554 | 77 | 79 | 30 | 275 | 5 | 119 | 8 | 401 |
| Canicapa | ***C-1*** | side of leg | 9017 | 49274 | 113 | 64 | 34 | 287 | 8 | 126 | 9 | 386 |
| Canicapa | ***C-2*** | sharpie area | 17571 | 33927 | 215 | 49 | 37 | 331 | 9 | 113 | 9 | 802 |
| Canicapa | ***C-2*** | attachment area | 12978 | 50266 | 153 | 81 | 44 | 321 | 11 | 123 | 9 | 810 |
| Canicapa | ***C-3*** | sharpie side | 12596 | 45648 | 216 | 78 | 28 | 345 | 6 | 109 | 6 | 581 |
| Canicapa | ***C-3*** | edge | 13812 | 38471 | 201 | 79 | 29 | 316 | 7 | 119 | 6 | 616 |
| Chanso | ***Ch-1*** | rim | 51271 | 53375 | 106 | 105 | 22 | 452 | 9 | 103 | 6 | 1095 |
| Chanso | ***Ch-1*** | edge | 39455 | 60095 | 118 | 73 | 24 | 407 | 9 | 114 | 5 | 838 |
| Chanso | ***Ch-2*** | edge | 21128 | 47592 | 99 | 59 | 41 | 207 | 13 | 116 | 8 | 1043 |
| Chanso | ***Ch-2*** | exterior | 16486 | 48254 | 341 | 71 | 40 | 199 | 13 | 117 | 9 | 1002 |
| Chanso | ***Ch-3*** | small area | 28632 | 35007 | 756 | 46 | 31 | 515 | 7 | 125 | 8 | 1618 |
| Chanso | ***Ch-3*** | larger area | 21920 | 37584 | 502 | 50 | 29 | 474 | 6 | 129 | 9 | 1803 |
| Chanso | ***Ch-4*** | leg base | 19772 | 56559 | 74 | 55 | 38 | 327 | 14 | 107 | 10 | 1407 |
| Chanso | ***Ch-4*** | leg body | 58585 | 48840 | 168 | 50 | 33 | 329 | 15 | 93 | 6 | 1402 |
| Chanso | ***Ch-5*** | flat rim | 26915 | 50363 | 130 | 85 | 52 | 462 | 12 | 187 | 11 | 956 |
| Chanso | ***Ch-5*** | edge | 24315 | 44904 | 53 | <LOD | 44 | 405 | 12 | 132 | 10 | 767 |
| Chanso | ***Ch-6*** | flat rim | 7369 | 53265 | 135 | 69 | 56 | 211 | 12 | 133 | 10 | 1780 |
| Chanso | ***Ch-6*** | flat body | 11787 | 49297 | 107 | 49 | 51 | 229 | 10 | 120 | 10 | 1492 |
| Chanso | ***Ch-7*** | incised edge | 33557 | 29409 | 136 | 66 | 13 | 769 | 7 | 161 | 6 | 2403 |
| Chanso | ***Ch-7*** | edge | 36515 | 32306 | 232 | 88 | 13 | 840 | 5 | 163 | 6 | 2237 |
| Chauhuarpamba | ***Chu-1*** | body | 30021 | 43695 | 196 | 87 | 22 | 540 | 12 | 147 | 6 | 1261 |
| Chauhuarpamba | ***Chu-1*** | rim | 28111 | 44245 | 160 | 96 | 23 | 605 | 9 | 128 | 6 | 1329 |
| Chauhuarpamba | ***Chu-2*** | body | 16863 | 54289 | 111 | 63 | 76 | 223 | 16 | 155 | 10 | 1435 |
| Chauhuarpamba | ***Chu-2*** | rim | 19831 | 48408 | 319 | 58 | 67 | 214 | 16 | 130 | 11 | 1419 |
| Chauhuarpamba | ***Chu-3*** | incised side | 18377 | 55957 | 171 | 79 | 86 | 209 | 23 | 168 | 13 | 1317 |

| Site | Sherd Label | Area of Measure | Ca | Fe | Zn | Ga | Rb | Sr | Y | Zr | Nb | Ba |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Chauhuarpamba | ***Chu-3*** | sharpie | 15825 | 56905 | 129 | 68 | 86 | 180 | 22 | 161 | 11 | 1176 |
| Chauhuarpamba | ***Chu-4*** | sharpie side | 31712 | 38518 | 562 | 93 | 19 | 557 | 10 | 107 | 6 | 1086 |
| Chauhuarpamba | ***Chu-4*** | rim | 30517 | 44278 | 129 | 94 | 19 | 557 | 12 | 119 | 8 | 1312 |
| Chauhuarpamba | ***Chu-5*** | other side | 15307 | 59079 | 316 | 92 | 94 | 208 | 24 | 151 | 12 | 1615 |
| Chauhuarpamba | ***Chu-5*** | sharpie side | 14272 | 59393 | 120 | 91 | 99 | 210 | 24 | 157 | 13 | 1622 |
| Chauhuarpamba | ***Chu-6*** | rim | 34139 | 38875 | 241 | 77 | 20 | 572 | 8 | 114 | 7 | 1163 |
| Chauhuarpamba | ***Chu-6*** | edge | 30662 | 42689 | 226 | 53 | 22 | 577 | 7 | 118 | 8 | 970 |
| Chauhuarpamba | ***Chu-7*** | edge | 19091 | 76617 | 149 | 111 | 55 | 321 | 12 | 225 | 20 | 569 |
| Chauhuarpamba | ***Chu-7*** | body | 15026 | 61065 | 221 | 74 | 40 | 310 | 9 | 197 | 16 | 590 |
| Chauhuarpamba | ***Chu-8*** | incised side | 33437 | 39748 | 87 | 119 | 18 | 632 | 7 | 126 | 8 | 968 |
| Chauhuarpamba | ***Chu-8*** | edge | 27761 | 41834 | 238 | 97 | 16 | 567 | 9 | 132 | 7 | 937 |
| Chauhuarpamba | ***Chu-9*** | slip side | 14780 | 53622 | 181 | 56 | 68 | 297 | 21 | 241 | 15 | 1190 |
| Chauhuarpamba | ***Chu-9*** | back side | 13112 | 54905 | 98 | 85 | 64 | 296 | 20 | 237 | 16 | 1096 |
| Chauhuarpamba | ***Chu-10*** | edge | 12450 | 58716 | 650 | 68 | 83 | 151 | 22 | 163 | 10 | 1144 |
| Chauhuarpamba | ***Chu-10*** | sharpie side | 11709 | 62867 | 74 | 70 | 91 | 149 | 21 | 161 | 12 | 1042 |
| Chauhuarpamba | ***Chu-11*** | incised side | 32377 | 36426 | 85 | 105 | 21 | 555 | 9 | 130 | 8 | 1415 |
| Chauhuarpamba | ***Chu-11*** | edge | 36293 | 34674 | 807 | 68 | 21 | 513 | 8 | 123 | 6 | 1599 |
| Chauhuarpamba | ***Chu-12*** | rim | 23990 | 40079 | 250 | 54 | 30 | 384 | 10 | 141 | 10 | 788 |
| Chauhuarpamba | ***Chu-12*** | sharpie side | 17811 | 42857 | 89 | 71 | 36 | 366 | 9 | 172 | 12 | 943 |
| Corralpamba | ***Co-1*** | slip side | 25566 | 28297 | 114 | 74 | 25 | 608 | 4 | 161 | 8 | 1024 |
| Corralpamba | ***Co-1*** | edge | 24782 | 30428 | 68 | 106 | 25 | 615 | 6 | 170 | 8 | 1188 |
| Corralpamba | ***Co-2*** | slip side | 32110 | 28098 | 224 | 80 | 33 | 668 | 5 | 132 | 7 | 792 |
| Corralpamba | ***Co-2*** | non-slip side | 30142 | 33293 | 82 | 58 | 32 | 628 | <LOD | 135 | 5 | 695 |
| Corralpamba | ***Co-3*** | incised side | 17197 | 35914 | 207 | 50 | 43 | 188 | 19 | 200 | 14 | 941 |
| Corralpamba | ***Co-3*** | back side | 15218 | 34832 | 284 | 50 | 48 | 167 | 17 | 156 | 17 | 898 |
| Corralpamba | ***Co-4*** | slip side | 14904 | 24600 | 285 | 55 | 76 | 160 | 18 | 181 | 10 | 1402 |
| Corralpamba | ***Co-4*** | edge | 12492 | 28460 | 43 | 61 | 80 | 157 | 14 | 170 | 9 | 1464 |
| Corralpamba | ***Co-5*** | slip side | 28084 | 22427 | 73 | 55 | 19 | 601 | 5 | 133 | 6 | 1216 |
| Corralpamba | ***Co-5*** | edge | 28097 | 26584 | 78 | 80 | 23 | 567 | 5 | 117 | 7 | 1395 |
| Corralpamba | ***Co-5*** | edge | 27939 | 26401 | 90 | 75 | 21 | 570 | 4 | 121 | 8 | 1367 |
| Corralpamba | ***Co-6*** | slip side | 33683 | 38396 | 158 | 98 | 17 | 588 | 6 | 109 | 7 | 1031 |
| Corralpamba | ***Co-6*** | edge | 26225 | 37980 | 112 | 109 | 21 | 562 | 6 | 127 | 8 | 1261 |
| Gañil | ***G/X-1*** | sharpie side | 11901 | 56161 | 182 | 67 | 45 | 225 | 12 | 128 | 10 | 894 |

| Site | Sherd Label | Area of Measure | Ca | Fe | Zn | Ga | Rb | Sr | Y | Zr | Nb | Ba |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Gañil | ***G/X-1*** | other side | 10935 | 60139 | 226 | 84 | 40 | 218 | 21 | 129 | 9 | 863 |
| Gañil | ***G/X-2*** | body | 7873 | 70416 | 189 | 67 | 86 | 242 | 24 | 253 | 20 | 568 |
| Gañil | ***G/X-2*** | rim | 6542 | 58199 | 138 | 56 | 63 | 198 | 20 | 201 | 18 | 621 |
| Gañil | ***G/X-3*** | base | 10370 | 41414 | 183 | 61 | 30 | 312 | 7 | 657 | 9 | 453 |
| Gañil | ***G/X-3*** | rim | 9912 | 51008 | 75 | 69 | 26 | 326 | 10 | 151 | 10 | 467 |
| Gañil | ***G/X-4*** | body | 12513 | 38623 | 127 | 56 | 14 | 349 | 4 | 126 | 7 | 307 |
| Gañil | ***G/X-4*** | rim | 11750 | 35111 | 39 | 66 | 16 | 356 | 4 | 117 | 8 | 372 |
| Gañil | ***G/X-5*** | sharpie side | 7311 | 65156 | 117 | 59 | 54 | 143 | 15 | 139 | 9 | 539 |
| Gañil | ***G/X-5*** | edge | 5567 | 66629 | 211 | 77 | 52 | 146 | 12 | 129 | 13 | 564 |
| Guanduc Loma | ***GU-1*** | exterior | 6702 | 62358 | 375 | 51 | 43 | 134 | 11 | 132 | 9 | 746 |
| Guanduc Loma | ***GU-1*** | edge | 7128 | 60131 | 188 | 81 | 41 | 169 | 12 | 132 | 8 | 622 |
| Gurudel Pucara | ***GP-1*** | sharpie side | 11799 | 40726 | 76 | <LOD | 44 | 288 | 10 | 134 | 13 | 676 |
| Gurudel Pucara | ***GP-1*** | other side | 11369 | 43377 | 57 | <LOD | 38 | 287 | 10 | 130 | 12 | 774 |
| Gurudel Pucara | ***GP-2*** | sharpie side | 8566 | 31509 | 64 | 63 | 50 | 214 | 9 | 165 | 16 | 860 |
| Gurudel Pucara | ***GP-2*** | rim | 7922 | 36582 | 44 | 72 | 50 | 239 | 10 | 169 | 19 | 990 |
| Huelemon Norte | ***HL/HU -1*** | black area | 12190 | 50410 | 53 | 77 | 29 | 357 | 8 | 113 | 6 | 441 |
| Huelemon Norte | ***HL/HU -1*** | side of leg | 14438 | 53539 | 81 | 130 | 43 | 457 | 8 | 148 | 11 | 450 |
| Huelemon Norte | ***HL/HU -2*** | below label | 12023 | 50896 | 50 | 83 | 24 | 371 | 5 | 116 | 8 | 672 |
| Huelemon Norte | ***HL/HU -2*** | right of label | 11601 | 48307 | 72 | 73 | 23 | 374 | 6 | 117 | 7 | 735 |
| Huelemon Norte | ***HL/HU -3*** | left of label | 16517 | 41347 | 327 | 92 | 30 | 360 | 6 | 122 | 6 | 542 |
| Huelemon Norte | ***HL/HU -3*** | right of label | 14768 | 54051 | 112 | 88 | 27 | 382 | 6 | 119 | 8 | 511 |
| Jubones 1 | ***J1-1*** | slip side | 23343 | 44331 | 500 | 121 | 30 | 533 | 9 | 151 | 9 | 1900 |
| Jubones 1 | ***J1-1*** | back side | 21302 | 40829 | 68 | 103 | 33 | 511 | 4 | 145 | 11 | 2034 |
| Jubones 2 | ***J2-1*** | rim side | 17572 | 73901 | 115 | 71 | 66 | 169 | 26 | 130 | 9 | 628 |
| Jubones 2 | ***J2-1*** | interior | 17203 | 58814 | 439 | 55 | 57 | 141 | 20 | 117 | 9 | 572 |
| Jubones 2 | ***J2-2*** | slip side | 42884 | 45570 | 181 | 56 | 70 | 160 | 13 | 137 | 12 | 647 |
| Jubones 2 | ***J2-2*** | edge | 24892 | 62000 | 45 | 72 | 84 | 146 | 15 | 156 | 15 | 651 |
| Jubones 2 | ***J2-3*** | edge | 34458 | 60601 | 67 | 102 | 14 | 630 | 11 | 145 | 12 | 646 |
| Jubones 2 | ***J2-3*** | exterior | 41365 | 66249 | 135 | 103 | 18 | 670 | 12 | 165 | 13 | 625 |
| Jubones 3 | ***J3-2*** | rim | 29040 | 28008 | 239 | 69 | 15 | 682 | 4 | 179 | 7 | 2382 |
| Jubones 3 | ***J3-2*** | edge | 24380 | 38861 | 394 | 80 | 17 | 716 | 7 | 180 | 7 | 2413 |
| Jubones 3 | ***J3-1*** | red slip side | 34098 | 47969 | 673 | 119 | 18 | 628 | 9 | 168 | 7 | 1140 |
| Jubones 3 | ***J3-1*** | buff slip side | 29852 | 48743 | 308 | 131 | 24 | 635 | 4 | 158 | 9 | 1361 |

| Site | Sherd Label | Area of Measure | Ca | Fe | Zn | Ga | Rb | Sr | Y | Zr | Nb | Ba |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Jubones 4 | ***J4-1*** | exterior | 14539 | 44865 | 138 | 47 | 88 | 252 | 20 | 158 | 13 | 1632 |
| Jubones 4 | ***J4-1*** | edge | 17660 | 43980 | 57 | 74 | 86 | 230 | 16 | 164 | 13 | 1691 |
| La Union | ***L-1*** | exterior | 15042 | 64387 | 175 | 59 | 80 | 214 | 30 | 141 | 12 | 691 |
| La Union | ***L-1*** | bottom edge | 20691 | 61905 | 208 | 97 | 83 | 189 | 21 | 172 | 14 | 711 |
| La Union | ***L-2*** | interior flat side | 10841 | 37439 | 155 | 54 | 60 | 293 | 16 | 202 | 16 | 1109 |
| La Union | ***L-2*** | exterior rim | 27504 | 49428 | 646 | <LOD | 52 | 227 | 14 | 169 | 14 | 917 |
| La Union | ***L-3*** | exterior rim | 29235 | 41410 | 515 | 79 | 21 | 598 | 7 | 108 | 7 | 759 |
| La Union | ***L-3*** | edge | 26611 | 43800 | 101 | 112 | 23 | 641 | 6 | 120 | 7 | 1047 |
| La Union | ***L-4*** | back side | 22373 | 35181 | 64 | 55 | 13 | 568 | 5 | 199 | 8 | 742 |
| La Union | ***L-4*** | edge | 27490 | 36653 | 85 | <LOD | 11 | 654 | 5 | 219 | 7 | 700 |
| La Union | ***L-5*** | slip side rim | 22914 | 37421 | 258 | 91 | 31 | 521 | 10 | 170 | 9 | 1514 |
| La Union | ***L-5*** | edge | 17977 | 37749 | 66 | 69 | 29 | 477 | 11 | 164 | 9 | 1458 |
| La Union | ***L-6*** | slip side | 35712 | 31052 | 488 | 91 | 16 | 732 | 9 | 141 | 5 | 846 |
| La Union | ***L-6*** | back side | 32182 | 28508 | 317 | 93 | 15 | 700 | 8 | 127 | 7 | 863 |
| La Union | ***L-7*** | back side | 32335 | 45307 | 152 | 130 | 26 | 672 | 8 | 132 | 8 | 721 |
| La Union | ***L-7*** | edge | 26160 | 45003 | 110 | 132 | 25 | 623 | 6 | 142 | 7 | 864 |
| La Union | ***L-8*** | back side | 22556 | 45238 | 100 | 84 | 27 | 540 | 5 | 121 | 8 | 740 |
| La Union | ***L-8*** | edge | 26675 | 47096 | 108 | 108 | 28 | 568 | 6 | 123 | 8 | 1216 |
| La Union | ***L-9*** | back side | 20993 | 37237 | 70 | 54 | 17 | 404 | 6 | 148 | 7 | 564 |
| La Union | ***L-9*** | edge | 21544 | 36647 | 369 | 81 | 19 | 388 | 6 | 154 | 10 | 612 |
| La Union | ***L-10*** | slip side | 25881 | 25311 | 291 | 98 | 17 | 596 | 4 | 133 | 7 | 738 |
| La Union | ***L-10*** | edge | 23800 | 26340 | 62 | 81 | 16 | 546 | 5 | 133 | 5 | 1029 |
| La Union | ***L-11*** | slip side | 35156 | 50646 | 118 | 124 | 25 | 723 | 10 | 137 | 8 | 625 |
| La Union | ***L-11*** | back side | 36160 | 40598 | 105 | 95 | 21 | 723 | 7 | 146 | 8 | 606 |
| La Union | ***L-12*** | back side | 28503 | 43890 | 845 | 72 | 31 | 617 | 15 | 140 | 11 | 1884 |
| La Union | ***L-12*** | edge | 26569 | 48634 | 77 | 88 | 26 | 613 | 14 | 130 | 10 | 1960 |
| La Union | ***L-13*** | back side | 27178 | 36682 | 262 | 90 | 23 | 560 | 6 | 136 | 7 | 1041 |
| La Union | ***L-13*** | edge | 20701 | 38138 | 76 | 98 | 28 | 547 | 6 | 137 | 8 | 1077 |
| La Union | ***L-14*** | slip side | 34070 | 28878 | 418 | 57 | 23 | 511 | 6 | 132 | 9 | 1044 |
| La Union | ***L-14*** | edge | 24172 | 31786 | 112 | 131 | 24 | 541 | 6 | 162 | 9 | 1107 |
| La Union | ***L-15*** | back side | 21082 | 27796 | 61 | 96 | 31 | 529 | <LOD | 123 | 7 | 1035 |
| La Union | ***L-15*** | edge | 22340 | 27206 | 95 | 76 | 29 | 506 | 5 | 114 | 8 | 1178 |
| La Union | ***L-16*** | slip side | 33180 | 49418 | 98 | 102 | 29 | 726 | 5 | 152 | 8 | 1097 |

| Site | Sherd Label | Area of Measure | Ca | Fe | Zn | Ga | Rb | Sr | Y | Zr | Nb | Ba |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| La Union | ***L-16*** | back side | 32369 | 57677 | 118 | 136 | 42 | 715 | 6 | 145 | 8 | 941 |
| La Union | ***L-17*** | rim area | 24219 | 37433 | 886 | 60 | 20 | 416 | 7 | 126 | 8 | 882 |
| La Union | ***L-17*** | body area | 26084 | 44690 | 189 | 86 | 25 | 540 | 6 | 146 | 9 | 915 |
| La Union | ***L-18*** | slip side | 29865 | 50933 | 367 | 137 | 45 | 564 | 22 | 199 | 14 | 1429 |
| La Union | ***L-18*** | back side | 27879 | 46527 | 271 | 96 | 44 | 554 | 20 | 199 | 15 | 1668 |
| La Union | ***L-19*** | back side | 12296 | 33285 | 117 | 68 | 45 | 340 | 7 | 153 | 12 | 936 |
| La Union | ***L-19*** | edge | 13969 | 34412 | 340 | 86 | 46 | 334 | 5 | 149 | 10 | 983 |
| La Union | ***L-20*** | slip side | 24265 | 29247 | 114 | 111 | 33 | 567 | 6 | 145 | 10 | 726 |
| La Union | ***L-20*** | back side | 22495 | 33746 | 84 | 89 | 39 | 593 | 6 | 147 | 9 | 807 |
| La Union | ***L-21*** | back side | 24646 | 23965 | 113 | 84 | 37 | 617 | 3 | 150 | 9 | 1145 |
| La Union | ***L-21*** | edge | 21612 | 21279 | 73 | 80 | 31 | 515 | 4 | 126 | 6 | 1192 |
| La Union | ***L-22*** | burnt side | 24322 | 37695 | 357 | 90 | 24 | 468 | 9 | 164 | 10 | 2120 |
| La Union | ***L-22*** | edge | 20508 | 40096 | 75 | 113 | 23 | 468 | 6 | 155 | 9 | 1339 |
| La Union | ***L-23*** | back side | 22066 | 26943 | 139 | 86 | 30 | 554 | 4 | 117 | 8 | 1301 |
| La Union | ***L-23*** | edge | 19585 | 26633 | 60 | 85 | 28 | 503 | 4 | 110 | 7 | 1336 |
| La Union | ***L-24*** | back side | 27895 | 32112 | 165 | 84 | 23 | 638 | 5 | 123 | 6 | 1018 |
| La Union | ***L-24*** | edge | 28871 | 26376 | 236 | 80 | 21 | 581 | 5 | 98 | 6 | 1024 |
| La Union | ***L-25*** | edge | 28518 | 26040 | 508 | 89 | 12 | 596 | 4 | 144 | 7 | 1041 |
| La Union | ***L-25*** | slip side | 28971 | 22960 | 259 | 75 | 12 | 607 | 3 | 124 | 6 | 838 |
| La Union | ***L-26*** | incised side | 32475 | 51485 | 286 | 99 | 25 | 687 | 9 | 135 | 9 | 1019 |
| La Union | ***L-26*** | back side | 32669 | 45644 | 280 | 95 | 24 | 686 | 8 | 133 | 7 | 978 |
| La Union | ***L-27*** | edge | 28202 | 31978 | 1054 | 79 | 17 | 539 | 6 | 112 | 8 | 2214 |
| La Union | ***L-27*** | flat edge | 38417 | 42393 | 100 | 79 | 23 | 729 | 8 | 121 | 6 | 2918 |
| La Union | ***L-28*** | body | 30720 | 51628 | 242 | 77 | 31 | 480 | 13 | 155 | 13 | 1044 |
| La Union | ***L-28*** | edge | 25664 | 52788 | 49 | 51 | 25 | 466 | 10 | 158 | 12 | 1318 |
| La Union | ***L-29*** | back side | 23087 | 31364 | 88 | 85 | 38 | 603 | 8 | 154 | 10 | 1619 |
| La Union | ***L-29*** | edge | 18029 | 25858 | 154 | 77 | 30 | 502 | 4 | 134 | 9 | 1630 |
| La Union | ***L-30*** | edge | 20059 | 32152 | 63 | 74 | 18 | 535 | 8 | 111 | 6 | 1111 |
| La Union | ***L-30*** | back side | 24937 | 31815 | 138 | 71 | 22 | 557 | 7 | 115 | 6 | 935 |
| La Union | ***L-31*** | slip side | 33695 | 54398 | 69 | 72 | 31 | 540 | 13 | 151 | 13 | 990 |
| La Union | ***L-31*** | edge | 31608 | 60644 | 70 | <LOD | 30 | 578 | 16 | 176 | 13 | 1065 |
| La Union | ***L-32*** | exterior | 27157 | 42267 | 92 | 63 | 20 | 576 | 9 | 184 | 12 | 1521 |
| La Union | ***L-32*** | edge | 28332 | 39989 | 67 | 70 | 18 | 541 | 9 | 184 | 12 | 1716 |

| Site | Sherd Label | Area of Measure | Ca | Fe | Zn | Ga | Rb | Sr | Y | Zr | Nb | Ba |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| La Union | ***L-33*** | slip side | 29338 | 42388 | 251 | <LOD | 23 | 633 | 8 | 170 | 12 | 1465 |
| La Union | ***L-33*** | edge | 28799 | 42601 | 131 | 71 | 19 | 621 | 8 | 160 | 12 | 1535 |
| La Union | ***L-34*** | back side | 21491 | 25725 | 63 | 59 | 29 | 542 | 5 | 153 | 7 | 1431 |
| La Union | ***L-34*** | edge | 17715 | 29265 | 98 | 75 | 36 | 528 | 5 | 144 | 8 | 1309 |
| La Union | ***L-35*** | incised side | 31595 | 26409 | 514 | 69 | 19 | 857 | 3 | 217 | 9 | 2286 |
| La Union | ***L-35*** | edge | 29531 | 25166 | 75 | 73 | 17 | 842 | 6 | 186 | 7 | 1931 |
| La Union | ***L-36*** | back side | 23982 | 25352 | 224 | 78 | 42 | 618 | 5 | 107 | 8 | 1392 |
| La Union | ***L-36*** | edge | 26843 | 27899 | 664 | 92 | 44 | 629 | 5 | 175 | 5 | 1433 |
| La Union | ***L-37*** | back side | 27524 | 48522 | 128 | 89 | 28 | 578 | 8 | 134 | 10 | 826 |
| La Union | ***L-37*** | edge | 31269 | 49859 | 116 | 123 | 22 | 624 | 8 | 135 | 7 | 788 |
| Pucanga | ***P-1*** | straight leg | 2457 | 45562 | 150 | 73 | 48 | 123 | 10 | 116 | 10 | 570 |
| Pucanga | ***P-1*** | edge | 2059 | 50575 | 178 | 45 | 51 | 131 | 10 | 126 | 10 | 595 |
| Pucanga | ***P-2*** | flat side | 10435 | 55072 | 121 | 81 | 18 | 345 | 9 | 119 | 6 | 454 |
| Pucanga | ***P-2*** | edge | 9210 | 58521 | 79 | 95 | 20 | 354 | 9 | 121 | 8 | 435 |
| Putushio | ***O-1*** | edge | 10585 | 33814 | 113 | 132 | 35 | 502 | 6 | 107 | 7 | 625 |
| Putushio | ***O-1*** | rim | 19796 | 28642 | 747 | 70 | 30 | 565 | 5 | 94 | 5 | 609 |
| Putushio | ***O-2*** | rim | 26327 | 27279 | 447 | 77 | 25 | 619 | 8 | 150 | 6 | 669 |
| Putushio | ***O-2*** | edge | 21846 | 31617 | 74 | 103 | 30 | 629 | 6 | 153 | 8 | 638 |
| Putushio | ***O-3*** | black side | 18251 | 64940 | 115 | 75 | 38 | 285 | 13 | 160 | 10 | 525 |
| Putushio | ***O-3*** | edge | 21009 | 69737 | 285 | 86 | 50 | 309 | 13 | 182 | 16 | 707 |
| Putushio | ***O-4*** | edge | 25320 | 39524 | 143 | 107 | 30 | 618 | 8 | 144 | 8 | 746 |
| Putushio | ***O-4*** | buff side | 19613 | 34724 | 75 | 97 | 32 | 545 | 6 | 135 | 8 | 763 |
| Putushio | ***O-5*** | interior | 29816 | 24331 | 256 | 90 | 31 | 721 | 4 | 165 | 8 | 970 |
| Putushio | ***O-5*** | ring base | 25914 | 24752 | 34 | 109 | 26 | 669 | 7 | 152 | 6 | 710 |
| Putushio | ***O-6*** | edge | 25006 | 45997 | 257 | 70 | 44 | 484 | 9 | 124 | 8 | 833 |
| Putushio | ***O-6*** | rim | 28352 | 33959 | 480 | <LOD | 32 | 475 | 7 | 115 | 9 | 905 |
| Putushio | ***O-7*** | edge | 20496 | 42668 | 112 | 73 | 41 | 588 | 9 | 236 | 15 | 784 |
| Putushio | ***O-7*** | exterior | 19605 | 36573 | 716 | 79 | 36 | 526 | 10 | 220 | 13 | 668 |
| Putushio | ***O-8*** | sharpie side | 21945 | 38637 | 168 | 86 | 30 | 417 | 8 | 173 | 10 | 697 |
| Putushio | ***O-8*** | edge | 21411 | 40565 | 89 | 74 | 35 | 451 | 9 | 164 | 10 | 793 |
| Putushio | ***O-9*** | orange side | 18371 | 48004 | 109 | 89 | 34 | 386 | 6 | 138 | 10 | 863 |
| Putushio | ***O-9*** | edge | 14146 | 45173 | 91 | 113 | 35 | 393 | 8 | 127 | 11 | 1025 |
| Putushio | ***O-10*** | stripe side | 10442 | 46493 | 82 | 49 | 45 | 333 | 11 | 178 | 13 | 1362 |

| Site | Sherd Label | Area of Measure | Ca | Fe | Zn | Ga | Rb | Sr | Y | Zr | Nb | Ba |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Putushio | ***O-10*** | edge | 9731 | 47044 | 120 | 48 | 43 | 305 | 8 | 181 | 13 | 1313 |
| Putushio | ***O-11*** | slip side | 18237 | 37741 | 142 | 66 | 25 | 436 | 7 | 134 | 6 | 1247 |
| Putushio | ***O-11*** | edge | 29607 | 37928 | 59 | 103 | 33 | 544 | 10 | 143 | 10 | 1865 |
| Putushio | ***O-12*** | flat bottom | 21661 | 34622 | 439 | 114 | 26 | 495 | 7 | 253 | 14 | 603 |
| Putushio | ***O-12*** | edge | 20862 | 33190 | 318 | 107 | 27 | 484 | 6 | 265 | 12 | 591 |
| Putushio | ***O-13*** | edge | 19280 | 60187 | 85 | 56 | 51 | 418 | 11 | 140 | 12 | 1696 |
| Putushio | ***O-13*** | rim | 19848 | 52026 | 492 | 94 | 48 | 387 | 11 | 134 | 13 | 1512 |
| Putushio | ***O-14*** | rim | 26382 | 26897 | 257 | 97 | 23 | 531 | 10 | 133 | 8 | 1195 |
| Putushio | ***O-14*** | edge | 24651 | 29202 | 218 | 107 | 24 | 562 | 9 | 142 | 9 | 1231 |
| Putushio | ***O-15*** | rim | 25009 | 32114 | 288 | 58 | 31 | 485 | 7 | 106 | 8 | 1146 |
| Putushio | ***O-15*** | edge | 27522 | 40015 | 133 | 80 | 36 | 588 | 10 | 133 | 6 | 1155 |
| Putushio | ***O-16*** | rim | 30163 | 26924 | 487 | 102 | 24 | 577 | 5 | 141 | 7 | 1022 |
| Putushio | ***O-16*** | edge | 28249 | 30448 | 110 | 75 | 27 | 613 | 7 | 143 | 7 | 1044 |
| Putushio | ***O-17*** | edge | 21234 | 27469 | 62 | 67 | 32 | 617 | 8 | 137 | 7 | 956 |
| Putushio | ***O-17*** | back side | 24229 | 24708 | 128 | 71 | 37 | 617 | 7 | 146 | 9 | 885 |
| Putushio | ***O-18*** | slip side | 28157 | 44436 | 108 | 92 | 28 | 556 | 6 | 124 | 7 | 1033 |
| Putushio | ***O-18*** | edge | 26964 | 49096 | 103 | 124 | 33 | 561 | 6 | 132 | 12 | 1121 |
| Putushio | ***O-19*** | flat rim side | 13825 | 35933 | 110 | 77 | 29 | 453 | 9 | 225 | 12 | 933 |
| Putushio | ***O-19*** | edge | 16660 | 36089 | 255 | 67 | 37 | 408 | 9 | 228 | 10 | 871 |
| Putushio | ***O-20*** | rim | 20733 | 34961 | 431 | 74 | 38 | 644 | 4 | 140 | 10 | 1470 |
| Putushio | ***O-20*** | edge | 23202 | 36564 | 407 | 86 | 45 | 761 | 6 | 160 | 9 | 1701 |
| Putushio | ***O-21*** | rim side | 18946 | 34289 | 453 | 52 | 25 | 389 | 7 | 158 | 8 | 1236 |
| Putushio | ***O-21*** | flat side | 20233 | 37943 | 191 | 66 | 26 | 446 | 6 | 156 | 9 | 1134 |
| Putushio | ***O-22*** | slip side | 24102 | 39223 | 126 | 104 | 43 | 527 | 9 | 143 | 9 | 847 |
| Putushio | ***O-22*** | edge | 26893 | 41668 | 77 | 111 | 43 | 553 | 7 | 131 | 9 | 862 |
| Putushio | ***O-23*** | slip side | 21504 | 26440 | 176 | 106 | 30 | 789 | 6 | 120 | 8 | 1153 |
| Putushio | ***O-23*** | edge | 30760 | 26103 | 591 | 88 | 34 | 669 | 6 | 112 | 7 | 1115 |
| Putushio | ***O-24*** | slip side | 32714 | 32463 | 108 | 76 | 23 | 764 | 6 | 119 | 8 | 1715 |
| Putushio | ***O-24*** | edge | 27896 | 36673 | 111 | 81 | 31 | 767 | 8 | 130 | 11 | 1949 |
| Putushio | ***O-25*** | exterior | 8390 | 36315 | 54 | 44 | 51 | 270 | 10 | 199 | 20 | 1023 |
| Putushio | ***O-25*** | edge | 9530 | 35373 | 257 | 72 | 49 | 262 | 10 | 181 | 16 | 1005 |
| Putushio | ***O-26*** | exterior | 7795 | 34329 | 187 | 65 | 51 | 269 | 9 | 183 | 16 | 1081 |
| Putushio | ***O-26*** | edge | 6516 | 35816 | 32 | 62 | 45 | 265 | 12 | 200 | 19 | 1107 |

| Site | Sherd Label | Area of Measure | Ca | Fe | Zn | Ga | Rb | Sr | Y | Zr | Nb | Ba |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Quebrada Cajamarca 3 | ***Q3-1*** | face | 25608 | 69119 | 157 | 89 | 29 | 275 | 15 | 118 | 8 | 687 |
| Quebrada Cajamarca 3 | ***Q3-1*** | edge of face | 26975 | 66219 | 652 | <LOD | 25 | 294 | 16 | 130 | 6 | 709 |
| Rio Leon 1 | ***RL1-1*** | big edge | 24867 | 30871 | 71 | 76 | 35 | 797 | 6 | 140 | 7 | 1311 |
| Rio Leon 1 | ***RL1-1*** | skinny edge | 35158 | 29702 | 935 | 77 | 30 | 763 | 4 | 145 | 7 | 1131 |
| Rio Leon 1 | ***RL1-2*** | incised side | 9015 | 66947 | 471 | 93 | 153 | 144 | 22 | 144 | 14 | 791 |
| Rio Leon 1 | ***RL1-2*** | back side | 5442 | 71857 | 304 | 48 | 191 | 170 | 21 | 160 | 13 | 838 |
| Rio Leon 1 | ***RL1-3*** | sharpie side | 33292 | 38040 | 251 | 93 | 19 | 824 | 6 | 172 | 8 | 758 |
| Rio Leon 1 | ***RL1-3*** | other side | 30446 | 38324 | 73 | 61 | 19 | 799 | 5 | 185 | 10 | 751 |
| Rio Leon 1 | ***RL1-4*** | rim | 25287 | 36206 | 1053 | 53 | 22 | 527 | 7 | 171 | 9 | 961 |
| Rio Leon 1 | ***RL1-4*** | incised side | 22748 | 40215 | 141 | 94 | 24 | 563 | 5 | 176 | 10 | 949 |
| Rio Leon 1 | ***RL1-5*** | bottom of base | 26796 | 39138 | 143 | 81 | 43 | 733 | 9 | 196 | 11 | 972 |
| Rio Leon 1 | ***RL1-5*** | inner edge | 27464 | 42640 | <LOD | 118 | 49 | 750 | <LOD | 185 | 11 | 924 |
| Rio Leon 2 | ***RL2-1*** | incised side | 27191 | 33199 | 87 | 97 | 20 | 607 | 4 | 179 | 8 | 1376 |
| Rio Leon 2 | ***RL2-1*** | back side | 27907 | 30067 | 231 | 50 | 20 | 567 | 5 | 157 | 8 | 1739 |
| San Jose | ***SJ-1*** | slip side | 22422 | 40060 | 521 | 78 | 32 | 494 | 8 | 132 | 9 | 1318 |
| San Jose | ***SJ-1*** | back side | 20363 | 44423 | 133 | 103 | 25 | 590 | 11 | 148 | 8 | 1314 |
| San Jose | ***SJ-2*** | rim | 25327 | 38499 | 369 | 96 | 29 | 563 | 4 | 109 | 6 | 1272 |
| San Jose | ***SJ-2*** | edge | 23872 | 46615 | 235 | 91 | 29 | 623 | 10 | 136 | 10 | 1346 |
| San Jose | ***SJ-3*** | rim | 20225 | 35292 | 563 | 60 | 19 | 468 | 11 | 137 | 8 | 1107 |
| San Jose | ***SJ-3*** | edge | 16983 | 30503 | 59 | 67 | 21 | 478 | 6 | 127 | 7 | 1262 |
| San Jose | ***SJ-4*** | body | 26814 | 31032 | 217 | 77 | 30 | 584 | 4 | 143 | 6 | 1218 |
| San Jose | ***SJ-4*** | edge | 25057 | 32473 | 59 | 104 | 32 | 595 | 6 | 135 | 7 | 1528 |
| San Jose | ***SJ-5*** | slip side | 19583 | 31631 | 191 | 78 | 25 | 546 | 10 | 170 | 8 | 1551 |
| San Jose | ***SJ-5*** | back side | 18715 | 29541 | 71 | 68 | 27 | 552 | 11 | 146 | 8 | 1843 |
| San Jose | ***SJ-6*** | slip side | 33677 | 36421 | 136 | 114 | 42 | 722 | 8 | 119 | 7 | 1107 |
| San Jose | ***SJ-6*** | back side | 34501 | 29540 | 438 | 85 | 39 | 659 | 5 | 118 | 6 | 1237 |
| San Jose | ***SJ-7*** | body | 11031 | 59220 | 115 | 50 | 90 | 206 | 15 | 174 | 14 | 2019 |
| San Jose | ***SJ-7*** | edge | 15231 | 51718 | 541 | 56 | 77 | 194 | 17 | 145 | 12 | 2028 |
| San Jose | ***SJ-8*** | edge | 24188 | 30993 | 382 | 87 | 21 | 584 | 8 | 165 | 5 | 2378 |
| San Jose | ***SJ-8*** | rim | 22537 | 34243 | 93 | 75 | 19 | 563 | 7 | 124 | 7 | 1947 |
| San Jose | ***SJ-9*** | slip side | 26846 | 32571 | 149 | 107 | 20 | 630 | 6 | 156 | 6 | 1051 |
| San Jose | ***SJ-9*** | back side | 19018 | 26879 | 45 | 96 | 16 | 555 | 3 | 119 | 5 | 1370 |
| San Jose | ***SJ-10*** | rim | 25228 | 35910 | 490 | 89 | 14 | 604 | 6 | 184 | 7 | 1586 |

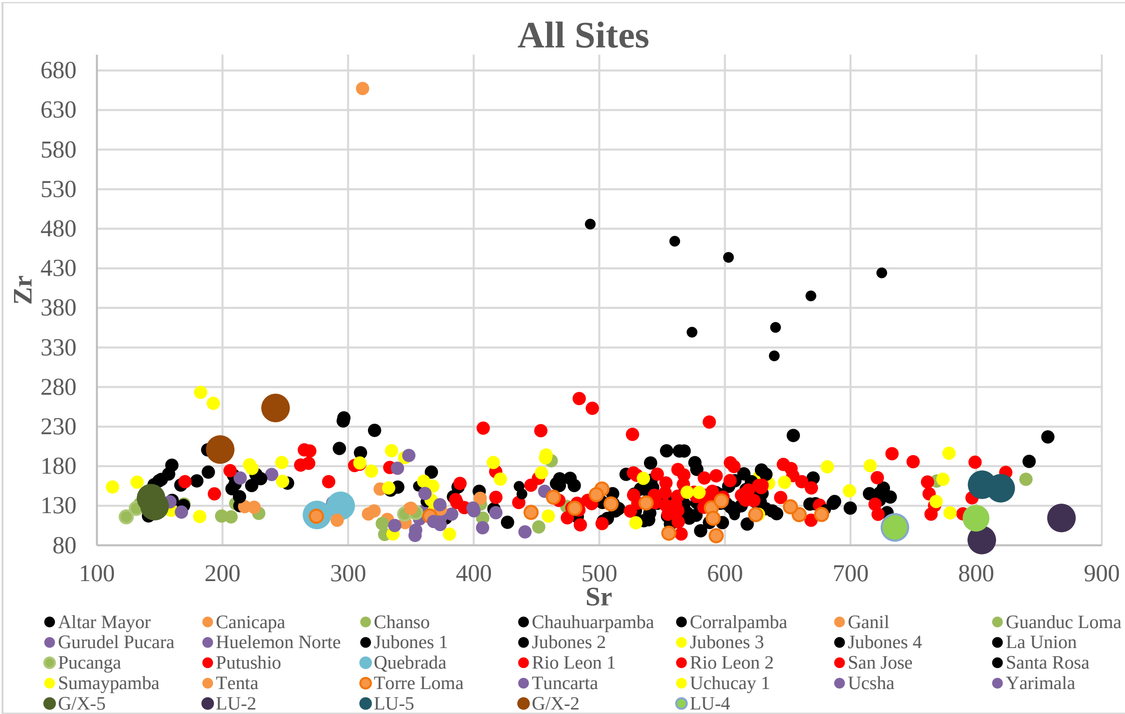
| Site | Sherd Label | Area of Measure | Ca | Fe | Zn | Ga | Rb | Sr | Y | Zr | Nb | Ba |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| San Jose | ***SJ-10*** | edge | 20195 | 34965 | 66 | 70 | 19 | 627 | 7 | 155 | 8 | 2269 |
| San Jose | ***SJ-11*** | slip side | 20469 | 36694 | 173 | 113 | 26 | 567 | 9 | 169 | 10 | 1566 |
| San Jose | ***SJ-11*** | back side | 18418 | 28868 | 258 | 87 | 26 | 530 | 8 | 168 | 10 | 1748 |
| San Jose | ***SJ-12*** | slip side | 30232 | 29529 | 163 | 67 | 18 | 661 | 4 | 160 | 7 | 1194 |
| San Jose | ***SJ-12*** | back side | 25554 | 29966 | 120 | 98 | 24 | 654 | 5 | 168 | 7 | 1239 |
| San Jose | ***SJ-13*** | back side | 25658 | 29089 | 182 | 87 | 20 | 591 | 4 | 132 | 6 | 1511 |
| San Jose | ***SJ-13*** | edge | 26786 | 29921 | 103 | 128 | 21 | 583 | 3 | 128 | 7 | 1476 |
| San Jose | ***SJ-14*** | exterior | 20745 | 24173 | 848 | 67 | 24 | 525 | 7 | 123 | 8 | 2621 |
| San Jose | ***SJ-14*** | edge | 14437 | 24203 | 73 | 94 | 27 | 599 | 6 | 141 | 9 | 2616 |
| San Jose | ***SJ-15*** | edge | 14736 | 35198 | 139 | 99 | 25 | 491 | 13 | 137 | 9 | 2133 |
| San Jose | ***SJ-15*** | exterior | 18317 | 29417 | 452 | 98 | 23 | 482 | 27 | 133 | 17 | 2288 |
| San Jose | ***SJ-16*** | slip side | 31497 | 31496 | 147 | 76 | 18 | 647 | 5 | 182 | 8 | 1327 |
| San Jose | ***SJ-16*** | back side | 28938 | 33163 | 166 | 87 | 17 | 653 | 5 | 177 | 7 | 1352 |
| San Jose | ***SJ-17*** | back side | 22570 | 37114 | 249 | 93 | 21 | 553 | 4 | 159 | 11 | 1180 |
| San Jose | ***SJ-17*** | edge | 20888 | 35137 | 49 | 83 | 20 | 544 | 3 | 134 | 9 | 1273 |
| San Jose | ***SJ-18*** | slip side | 36534 | 45011 | 412 | 87 | 30 | 720 | 7 | 132 | 9 | 1728 |
| San Jose | ***SJ-18*** | back side | 30895 | 41641 | 622 | 123 | 24 | 675 | 7 | 131 | 7 | 1494 |
| San Jose | ***SJ-19*** | slip side | 23987 | 34425 | 70 | 103 | 27 | 616 | 8 | 138 | 8 | 853 |
| San Jose | ***SJ-19*** | back side | 23948 | 24635 | 221 | 73 | 26 | 593 | 6 | 168 | 8 | 1122 |
| San Jose | ***SJ-20*** | incised side | 26008 | 30797 | 223 | 105 | 26 | 604 | 5 | 162 | 10 | 1427 |
| San Jose | ***SJ-20*** | back side | 27996 | 30326 | 377 | 64 | 23 | 575 | 4 | 147 | 9 | 1360 |
| Santa Rosa | ***LU-8*** | slip side | 23325 | 66310 | 215 | 88 | 30 | 356 | 10 | 155 | 12 | 441 |
| Santa Rosa | ***LU-8*** | interior | 30560 | 55743 | 378 | 73 | 27 | 362 | 9 | 135 | 12 | 500 |
| Santa Rosa | ***LU-1*** | handle | 19047 | 53409 | 141 | 89 | 7 | 574 | 8 | 349 | 15 | 417 |
| Santa Rosa | ***LU-1*** | interior | 25785 | 50583 | 62 | 114 | 8 | 668 | 8 | 395 | 13 | 427 |
| Santa Rosa | ***LU-2*** | slip side | 28653 | 44293 | 361 | 81 | 49 | 868 | 6 | 114 | 8 | 1520 |
| Santa Rosa | ***LU-2*** | edge | 32191 | 28247 | 92 | <LOD | 39 | 804 | 8 | 87 | 5 | 1529 |
| Santa Rosa | ***LU-3*** | slip side | 24430 | 52002 | 333 | 54 | 9 | 639 | 9 | 319 | 11 | 530 |
| Santa Rosa | ***LU-3*** | edge | 28548 | 48538 | 179 | 86 | 11 | 640 | 6 | 355 | 15 | 629 |
| Santa Rosa | ***LU-7*** | interior | 21734 | 55693 | 78 | 107 | 13 | 560 | 9 | 464 | 19 | 656 |
| Santa Rosa | ***LU-7*** | edge | 15981 | 53739 | 108 | 92 | 11 | 493 | 10 | 486 | 18 | 658 |
| Santa Rosa | ***LU-10*** | slip side | 17466 | 47070 | 267 | 93 | 32 | 436 | 11 | 155 | 11 | 617 |
| Santa Rosa | ***LU-10*** | edge | 43151 | 47127 | 952 | 70 | 29 | 438 | 13 | 145 | 8 | 657 |

| Site | Sherd Label | Area of Measure | Ca | Fe | Zn | Ga | Rb | Sr | Y | Zr | Nb | Ba |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Santa Rosa | ***LU-4*** | exterior | 31283 | 37401 | 186 | 75 | 43 | 800 | 9 | 114 | 11 | 1115 |
| Santa Rosa | ***LU-4*** | edge | 61883 | 28831 | 2322 | 86 | 39 | 735 | 8 | 103 | 11 | 897 |
| Santa Rosa | ***LU-5*** | no sharpie side | 25568 | 46888 | 109 | 128 | 37 | 820 | 8 | 152 | 7 | 1162 |
| Santa Rosa | ***LU-5*** | edge | 59755 | 43839 | 66 | 90 | 38 | 805 | 6 | 156 | 10 | 1160 |
| Santa Rosa | ***LU-6*** | slip side | 23140 | 60093 | 591 | 68 | 16 | 603 | 7 | 444 | 17 | 385 |
| Santa Rosa | ***LU-6*** | sharpie side | 31461 | 49227 | 166 | 86 | 7 | 725 | 9 | 424 | 14 | 385 |
| Santa Rosa | ***LU-9*** | exterior side | 20460 | 40707 | 95 | 83 | 36 | 608 | 8 | 118 | 8 | 909 |
| Santa Rosa | ***LU-9*** | sharpie side | 33152 | 41248 | 532 | 85 | 42 | 680 | 7 | 125 | 9 | 926 |
| Sumaypamba | ***S-1*** | red side | 31095 | 53102 | 195 | 84 | 20 | 336 | 9 | 94 | 5 | 400 |
| Sumaypamba | ***S-1*** | sharpie side | 35628 | 59403 | 201 | 83 | 24 | 381 | 7 | 94 | 7 | 435 |
| Sumaypamba | ***S-2*** | sharpie side | 55239 | 38877 | 458 | 102 | 11 | 459 | 6 | 117 | 6 | 422 |
| Sumaypamba | ***S-2*** | label area | 72892 | 39150 | 194 | 85 | 11 | 529 | 7 | 108 | 6 | 429 |
| Sumaypamba | ***S-3*** | sharpie side | 30229 | 74338 | 218 | 63 | 30 | 366 | 15 | 137 | 9 | 649 |
| Sumaypamba | ***S-3*** | other side | 33438 | 70545 | 135 | 69 | 31 | 369 | 15 | 125 | 9 | 693 |
| Sumaypamba | ***S-4*** | right side | 20153 | 54718 | 294 | 78 | 40 | 458 | 21 | 194 | 17 | 1937 |
| Sumaypamba | ***S-4*** | left side | 25742 | 53494 | 858 | 86 | 39 | 457 | 20 | 190 | 13 | 1707 |
| Sumaypamba | ***S-5*** | stripe side | 19011 | 50221 | 177 | 52 | 40 | 421 | 15 | 163 | 16 | 1812 |
| Sumaypamba | ***S-5*** | edge | 19711 | 48874 | 626 | 69 | 35 | 360 | 12 | 161 | 17 | 1753 |
| Sumaypamba | ***S-6*** | body | 13217 | 50470 | 128 | 98 | 65 | 309 | 19 | 184 | 17 | 2027 |
| Sumaypamba | ***S-6*** | rim | 18890 | 41313 | 722 | 56 | 59 | 332 | 15 | 152 | 15 | 2153 |
| Sumaypamba | ***S-7*** | rim side | 10317 | 69084 | 104 | 87 | 40 | 159 | 10 | 124 | 14 | 1150 |
| Sumaypamba | ***S-7*** | other side | 9997 | 67942 | 191 | 79 | 44 | 182 | 13 | 116 | 12 | 1222 |
| Sumaypamba | ***S-8*** | slip side | 17219 | 31059 | 70 | 93 | 35 | 319 | 16 | 174 | 11 | 941 |
| Sumaypamba | ***S-8*** | sharpie side | 16825 | 28223 | 184 | 78 | 47 | 368 | 12 | 154 | 8 | 1344 |
| Sumaypamba | ***S-9*** | left side | 17803 | 65038 | 255 | 83 | 83 | 248 | 18 | 161 | 12 | 997 |
| Sumaypamba | ***S-9*** | right side | 17870 | 73799 | 251 | 79 | 105 | 247 | 19 | 185 | 15 | 1001 |
| Sumaypamba | ***S-10*** | slip side | 20294 | 43599 | 100 | 69 | 29 | 416 | 10 | 184 | 9 | 1286 |
| Sumaypamba | ***S-10*** | sharpie side | 23914 | 38262 | 308 | 64 | 30 | 454 | 6 | 171 | 10 | 1304 |
| Sumaypamba | ***S-11*** | sharpie side | 12533 | 69840 | 325 | 116 | 64 | 132 | 14 | 160 | 10 | 1292 |
| Sumaypamba | ***S-11*** | other side | 3957 | 76789 | 134 | 103 | 68 | 113 | 16 | 154 | 9 | 1151 |
| Sumaypamba | ***S-12*** | sharpie side | 32561 | 44131 | 109 | 79 | 26 | 699 | 13 | 149 | 11 | 1475 |
| Sumaypamba | ***S-12*** | other side | 31978 | 44666 | 109 | 79 | 25 | 647 | 11 | 159 | 9 | 1508 |
| Sumaypamba | ***S-13*** | rim base | 26159 | 40173 | 75 | 48 | 41 | 570 | 11 | 147 | 10 | 1892 |

| Site | Sherd Label | Area of Measure | Ca | Fe | Zn | Ga | Rb | Sr | Y | Zr | Nb | Ba |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sumaypamba | ***S-13*** | rim area | 29311 | 41765 | 83 | 96 | 39 | 627 | 14 | 119 | 10 | 1722 |
| Sumaypamba | ***S-14*** | slip side | 16822 | 52053 | 190 | <LOD | 38 | 345 | 12 | 190 | 18 | 1295 |
| Sumaypamba | ***S-14*** | sharpie side | 20591 | 42902 | 183 | 87 | 40 | 335 | 12 | 199 | 18 | 1315 |
| Sumaypamba | ***S-15*** | sharpie side | 37820 | 37336 | 66 | 87 | 12 | 778 | 5 | 196 | 7 | 2343 |
| Sumaypamba | ***S-15*** | other side | 30386 | 32744 | 77 | 89 | 14 | 774 | 4 | 163 | 7 | 2550 |
| Tenta | ***TA-1*** | attachment area | 4122 | 36971 | <LOD | 94 | 31 | 374 | 5 | 126 | 8 | 392 |
| Tenta | ***TA-1*** | side | 5594 | 36963 | 41 | 94 | 29 | 350 | 4 | 127 | 9 | 312 |
| Tenta | ***TA-2*** | attachment area | 5837 | 38611 | 38 | 88 | 29 | 405 | 8 | 139 | 7 | 391 |
| Tenta | ***TA-2*** | side | 3733 | 35267 | <LOD | 95 | 26 | 291 | 6 | 112 | 7 | 297 |
| Torre Loma | ***TL-1*** | rim | 16888 | 47699 | 593 | 144 | 30 | 502 | 4 | 151 | 11 | 536 |
| Torre Loma | ***TL-1*** | body | 15152 | 43460 | 90 | 111 | 20 | 464 | 4 | 141 | 8 | 564 |
| Torre Loma | ***TL-2*** | flat base | 13958 | 45997 | 142 | 81 | 44 | 365 | 9 | 117 | 8 | 689 |
| Torre Loma | ***TL-2*** | edge | 9534 | 44639 | 229 | 66 | 32 | 275 | 7 | 116 | 8 | 596 |
| Torre Loma | ***TL-3*** | rim side | 11343 | 59208 | 173 | 87 | 21 | 481 | 23 | 127 | 9 | 1509 |
| Torre Loma | ***TL-3*** | sharpie side | 13397 | 49121 | 108 | 98 | 23 | 446 | 8 | 121 | 9 | 1655 |
| Torre Loma | ***TL-4*** | bevel side | 22412 | 50490 | 227 | 108 | 36 | 537 | 10 | 133 | 9 | 642 |
| Torre Loma | ***TL-4*** | sharpie side | 21359 | 52878 | 200 | 117 | 37 | 509 | 7 | 132 | 8 | 596 |
| Torre Loma | ***TL-5*** | slip side | 20369 | 45999 | 99 | 83 | 16 | 659 | 6 | 118 | 7 | 1039 |
| Torre Loma | ***TL-5*** | sharpie side | 18009 | 47268 | 83 | 103 | 14 | 589 | 5 | 127 | 8 | 954 |
| Torre Loma | ***TL-6*** | slip side | 19631 | 48071 | 175 | 115 | 19 | 597 | 6 | 136 | 10 | 649 |
| Torre Loma | ***TL-6*** | sharpie side | 21930 | 45962 | 97 | 100 | 15 | 625 | 7 | 119 | 6 | 601 |
| Torre Loma | ***TL-7*** | slip side | 15748 | 51097 | 115 | 103 | 15 | 498 | 9 | 144 | 6 | 1034 |
| Torre Loma | ***TL-7*** | sharpie side | 19295 | 46673 | 98 | 84 | 21 | 652 | 5 | 128 | 8 | 1380 |
| Torre Loma | ***TL-8*** | black side | 17518 | 49363 | 169 | 86 | 26 | 591 | 6 | 114 | 8 | 1026 |
| Torre Loma | ***TL-8*** | slip side | 24484 | 48461 | 432 | 109 | 33 | 677 | 7 | 119 | 6 | 893 |
| Torre Loma | ***TL-9*** | sharpie side | 19516 | 49138 | 107 | 86 | 14 | 555 | 5 | 95 | 4 | 1233 |
| Torre Loma | ***TL-9*** | edge | 20499 | 48854 | 111 | 106 | 14 | 593 | 6 | 92 | 6 | 1494 |
| Tuncarta | ***T-1*** | T side | 13861 | 43119 | 136 | 49 | 27 | 373 | 8 | 131 | 9 | 883 |
| Tuncarta | ***T-1*** | t side | 14891 | 41878 | 85 | 81 | 32 | 361 | 8 | 145 | 11 | 959 |
| Uchucay 1 | ***UC1-1*** | other side | 16740 | 44708 | 539 | <LOD | 49 | 183 | 18 | 273 | 16 | 1522 |
| Uchucay 1 | ***UC1-1*** | sharpie side | 15007 | 48781 | 121 | 61 | 57 | 193 | 17 | 259 | 19 | 1781 |
| Uchucay 1 | ***UC1-2*** | incised side | 19366 | 55417 | 178 | 44 | 60 | 223 | 22 | 177 | 16 | 1682 |
| Uchucay 1 | ***UC1-2*** | sharpie side | 8650 | 52487 | 156 | 68 | 62 | 222 | 19 | 182 | 16 | 2134 |

| **Site** | **Sherd Label** | **Area of Measure** | **Ca** | **Fe** | **Zn** | **Ga** | **Rb** | **Sr** | **Y** | **Zr** | **Nb** | **Ba** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Uchucay 1 | ***UC1-3*** | incised side | 24030 | 45512 | 408 | 96 | 25 | 535 | 9 | 165 | 9 | 2186 |
| Uchucay 1 | ***UC1-3*** | sharpie side | 24057 | 44453 | 87 | 93 | 19 | 579 | 6 | 147 | 10 | 2500 |
| Uchucay 1 | ***UC1-4*** | buff slip area | 26001 | 41824 | 62 | 79 | 24 | 779 | 5 | 121 | 6 | 2489 |
| Uchucay 1 | ***UC1-4*** | red slip area | 23627 | 45832 | 199 | 74 | 24 | 768 | 10 | 135 | 8 | 2068 |
| Ucsha | ***U-3*** | flat side | 13671 | 47074 | 59 | 75 | 22 | 407 | 7 | 102 | 10 | 368 |
| Ucsha | ***U-3*** | sharpie side | 12236 | 52813 | 90 | 84 | 29 | 400 | 7 | 124 | 8 | 407 |
| Ucsha | ***U-1*** | big area | 10395 | 37815 | 46 | 51 | 18 | 348 | 7 | 193 | 10 | 301 |
| Ucsha | ***U-1*** | small area | 8777 | 42804 | 116 | 54 | 19 | 339 | 7 | 177 | 13 | 302 |
| Ucsha | ***U-2*** | interior | 12424 | 42075 | 49 | 65 | 21 | 368 | 7 | 110 | 7 | 303 |
| Ucsha | ***U-2*** | base | 12146 | 34631 | 52 | 89 | 21 | 337 | 4 | 105 | 7 | 337 |
| Yarimala | ***Y-1*** | rim area | 7900 | 58026 | 153 | 73 | 45 | 167 | 14 | 122 | 9 | 818 |
| Yarimala | ***Y-1*** | sharpie area | 6841 | 56806 | 114 | 81 | 46 | 158 | 11 | 135 | 11 | 840 |
| Yarimala | ***Y-2*** | body area | 14354 | 40392 | 38 | <LOD | 16 | 399 | 7 | 127 | 8 | 414 |
| Yarimala | ***Y-2*** | rim area | 14112 | 34677 | 53 | 82 | 15 | 373 | 4 | 106 | 9 | 451 |
| Yarimala | ***Y-3*** | handle | 21084 | 48086 | 269 | 93 | 22 | 441 | 7 | 97 | 8 | 445 |
| Yarimala | ***Y-3*** | burnt side | 19213 | 47798 | 142 | 103 | 25 | 418 | 8 | 121 | 9 | 487 |
| Yarimala | ***Y-4*** | interior | 13709 | 33192 | 39 | 57 | 17 | 353 | 6 | 92 | 6 | 429 |
| Yarimala | ***Y-4*** | base | 13638 | 32912 | 45 | 57 | 16 | 354 | 5 | 99 | 9 | 375 |

# APPENDIX 2: BIVARIATE PLOTS



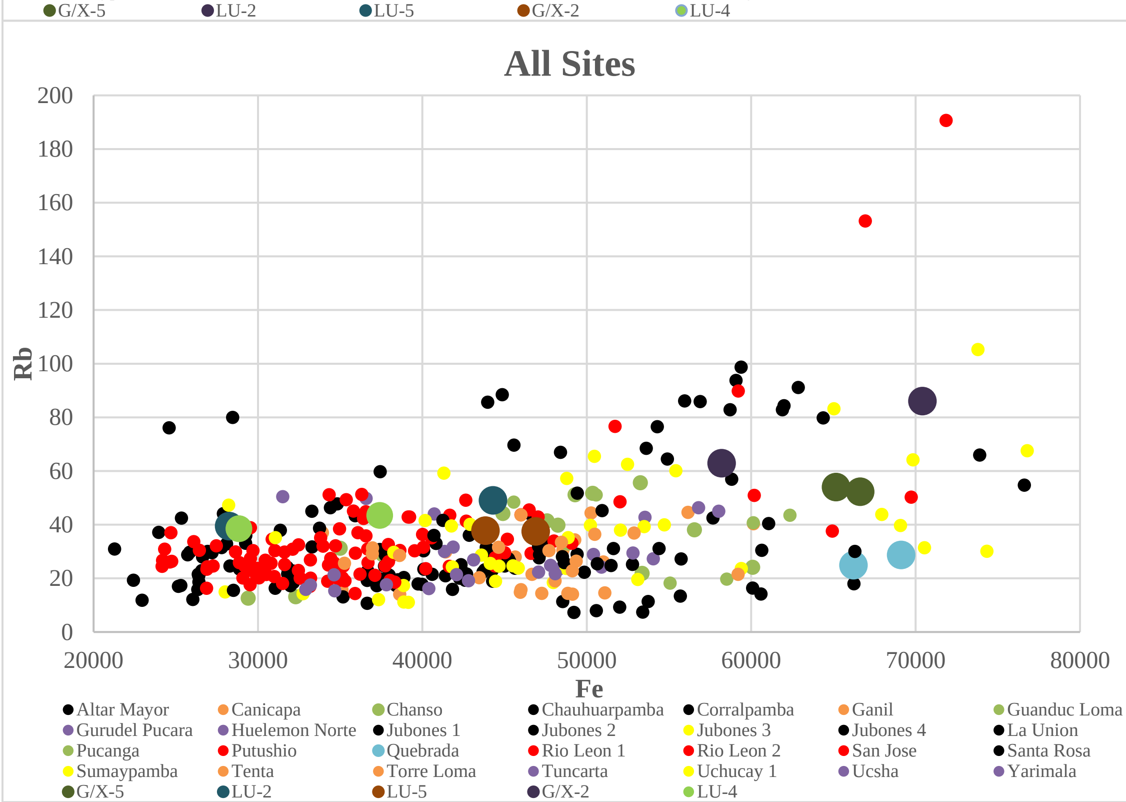
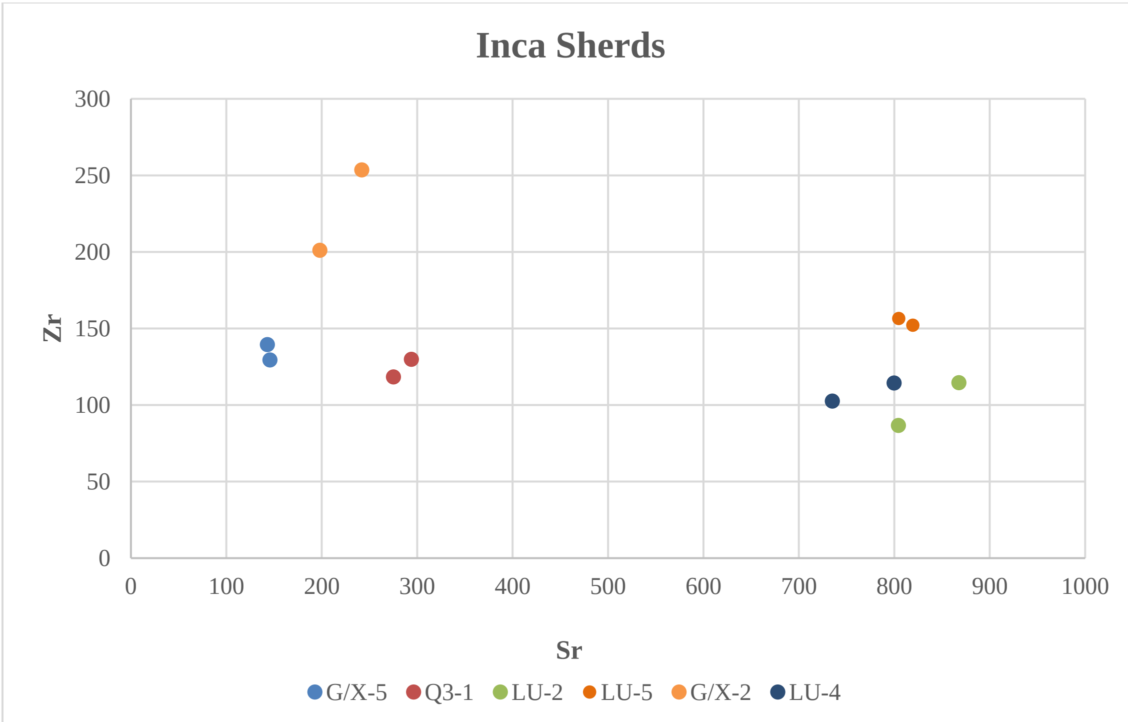




Figure 1. All site in the collection, plotting concentrations of Sr versus Zr (top) and Fe versus Rb (bottom) in ppm. Sites are colored by region; Inca sherds have their own colors and are enlarged.



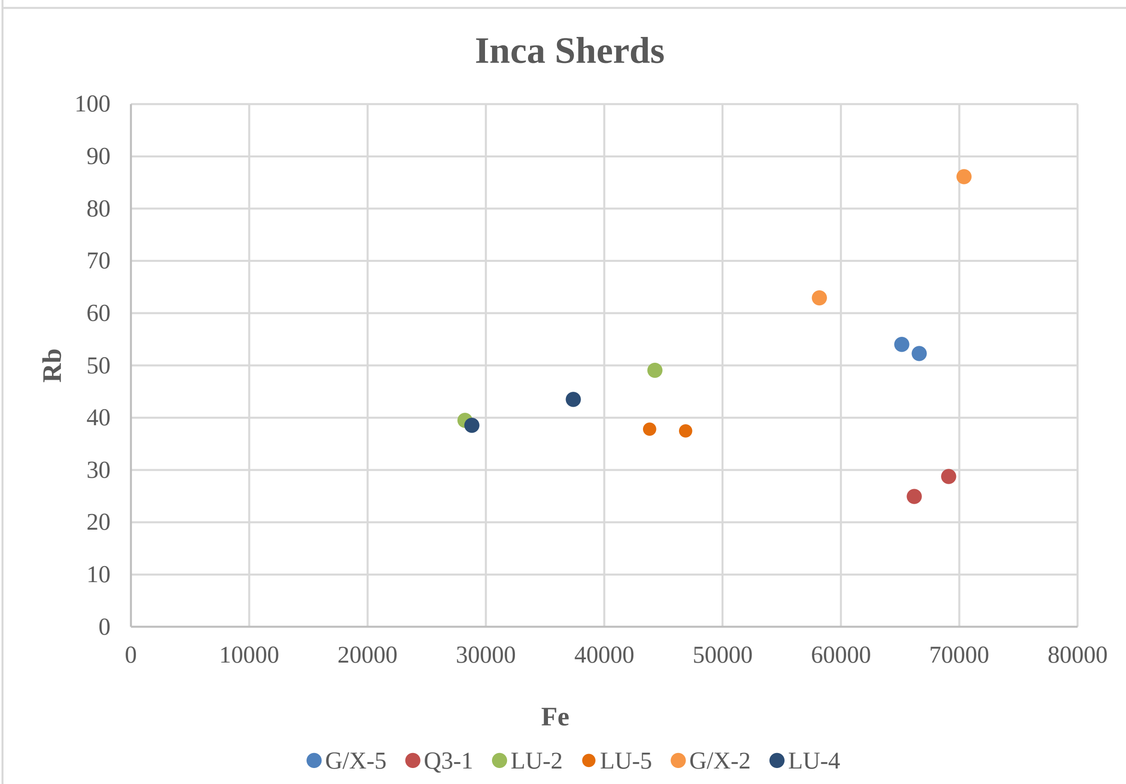




Figure 2. All Inca sherds in the collection, plotting concentrations of Sr versus Zr (top) and Fe versus Rb (bottom) in ppm. Each sherd is individually colored.

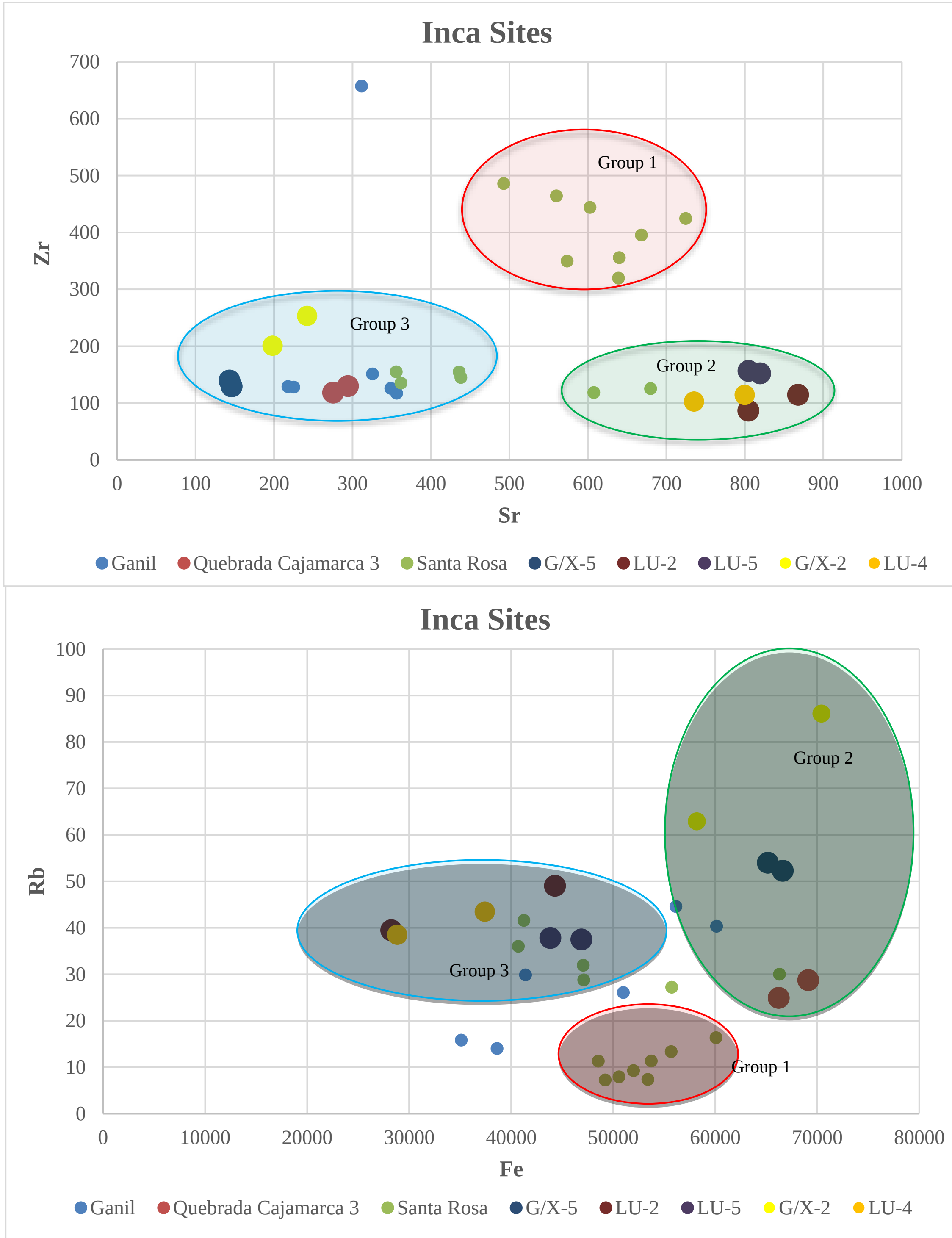
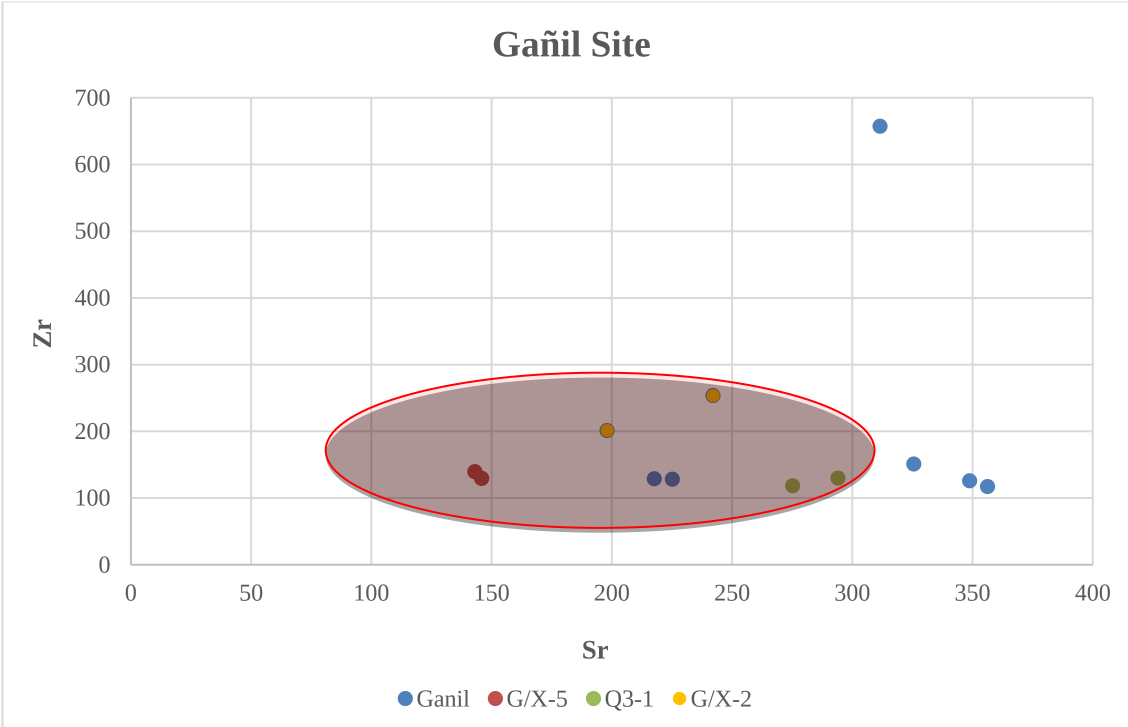



Figure 3. All Inca sites, plotting concentrations of Sr versus Zr (top) and Fe versus Rb (bottom) in ppm. Sites each have their own color; Inca sherds are individually colored and enlarged.



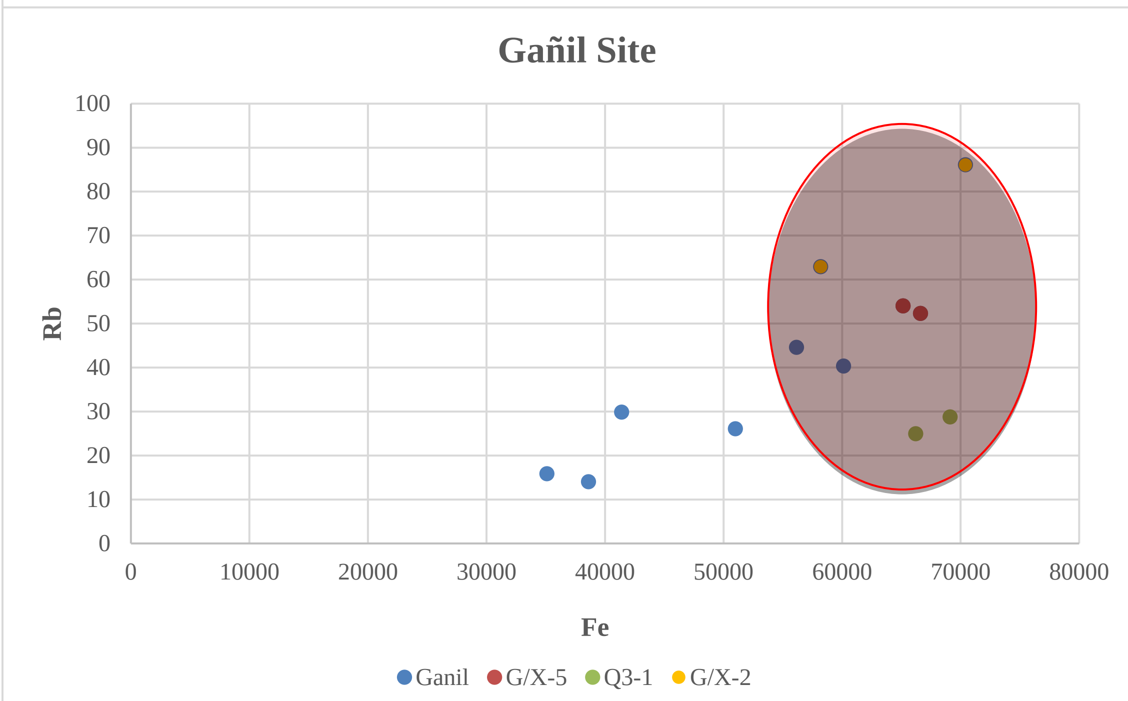
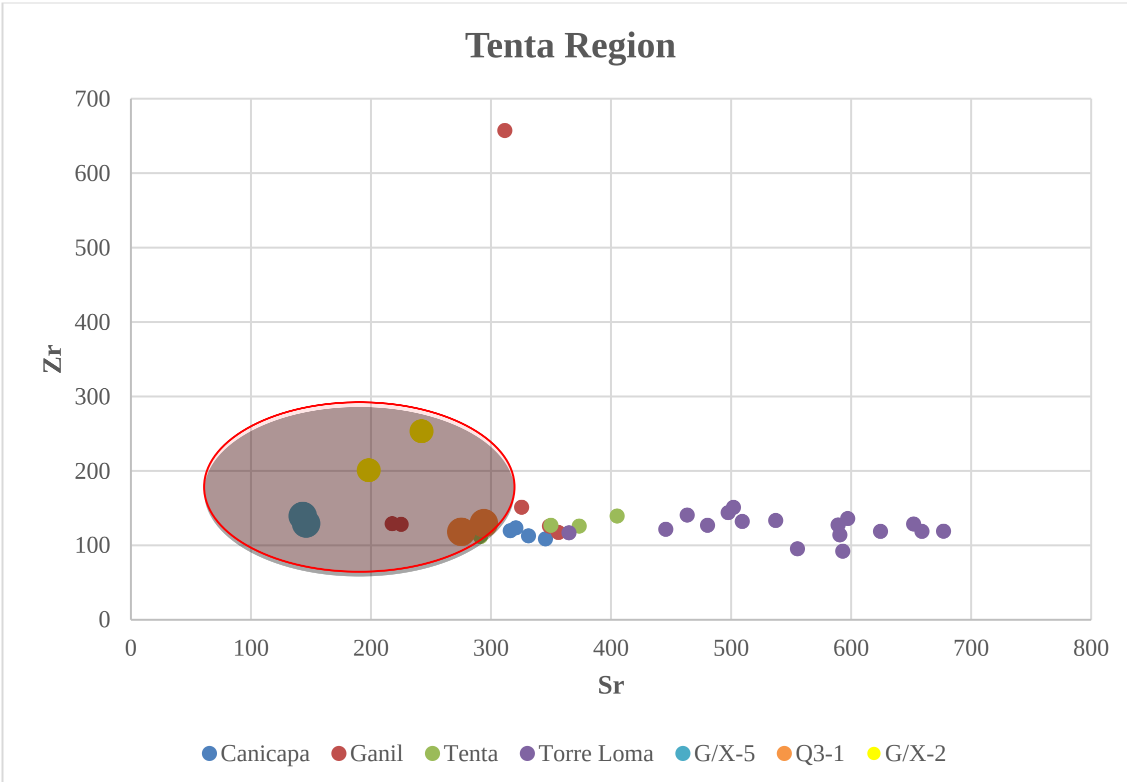




Figure 4. Gañil site with Q3 nubbin added, plotting concentrations of Sr versus Zr (top) and Fe versus Rb (bottom) in ppm. Inca sherds are individually colored.



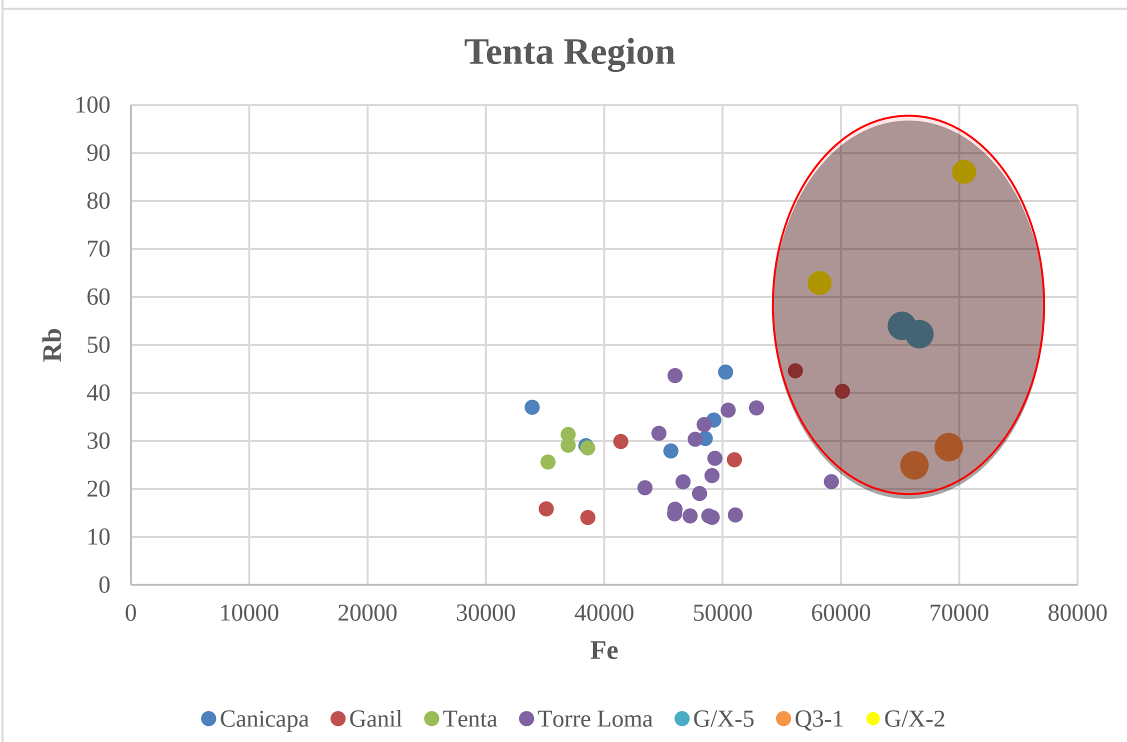
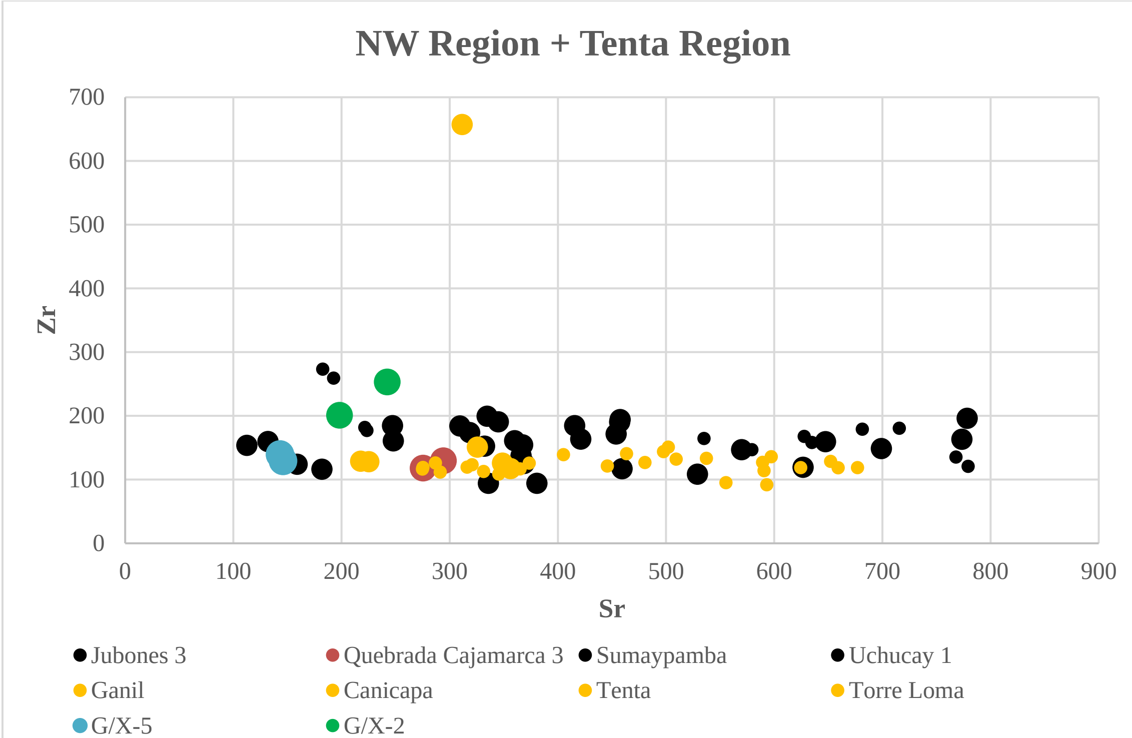




Figure 5. Gañil site within its' region (Tenta) with Q3 added, plotting concentrations of Sr versus Zr (top) and Fe versus Rb (bottom) in ppm. Sites each have their own color; Inca sherds individually colored and enlarged.



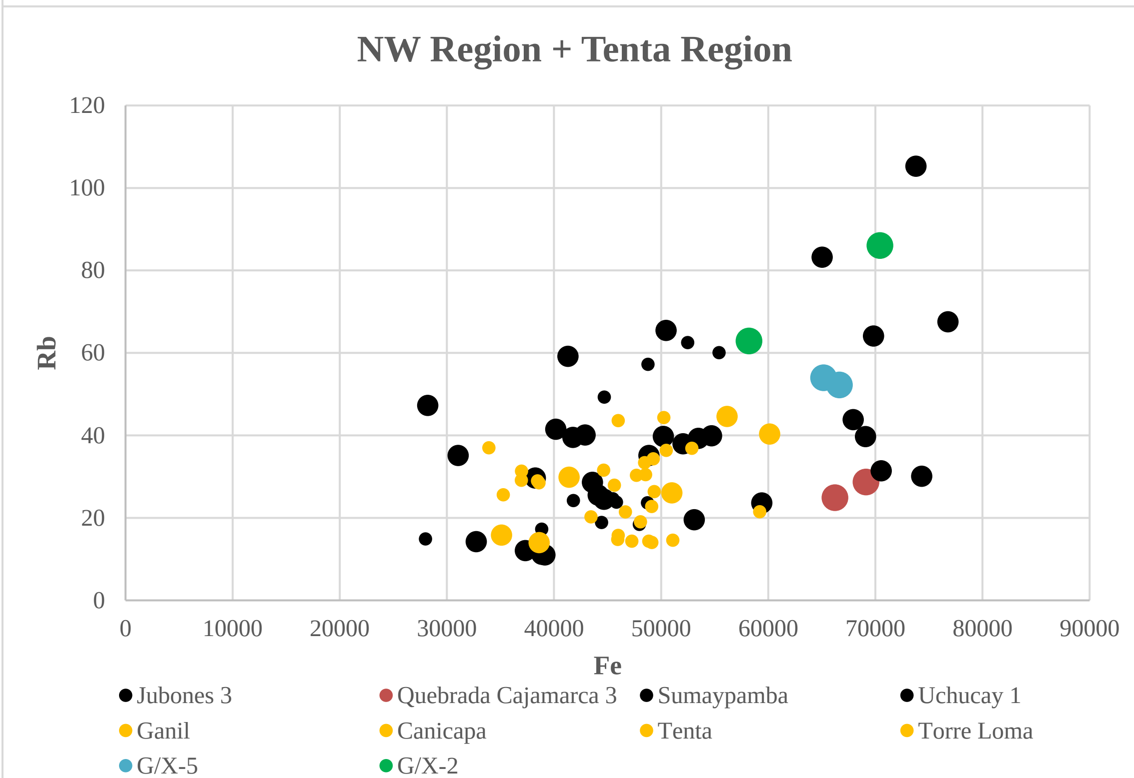
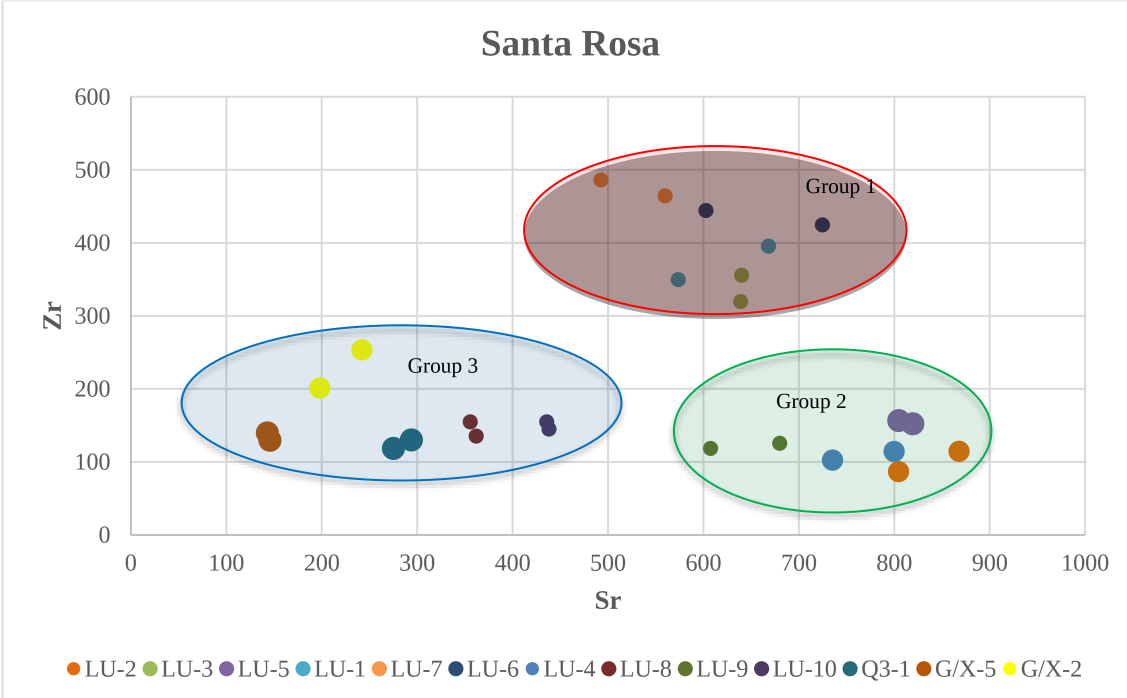




Figure 6. Tenta region and NW region together, plotting concentrations of Sr versus Zr (top) and Fe versus Rb (bottom) in ppm. Sites are colored by region; Gañil and Sumaypamba are enlarged to 8pt; Inca sherds are enlarged to 10pt and individually colored.



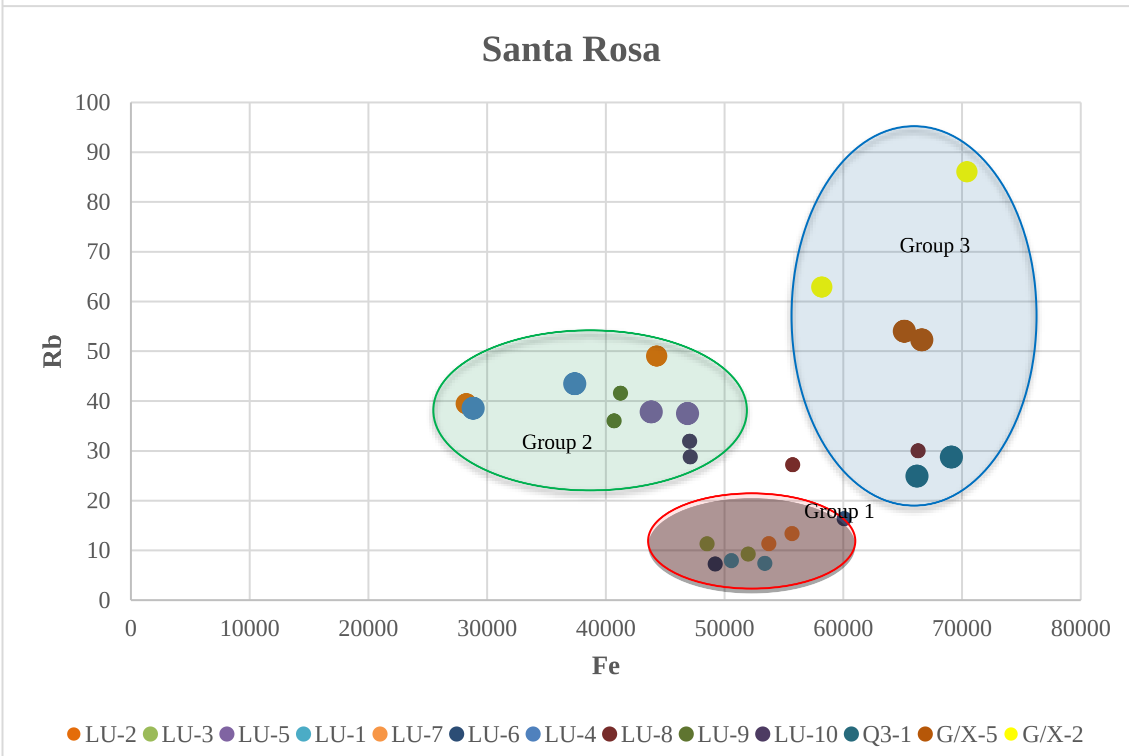




Figure 7. Santa Rosa site within Gañil and Q3 added, plotting concentrations of Sr versus Zr (top) and Fe versus Rb (bottom) in ppm. Each sherd is individually colored; Inca sherds enlarged.

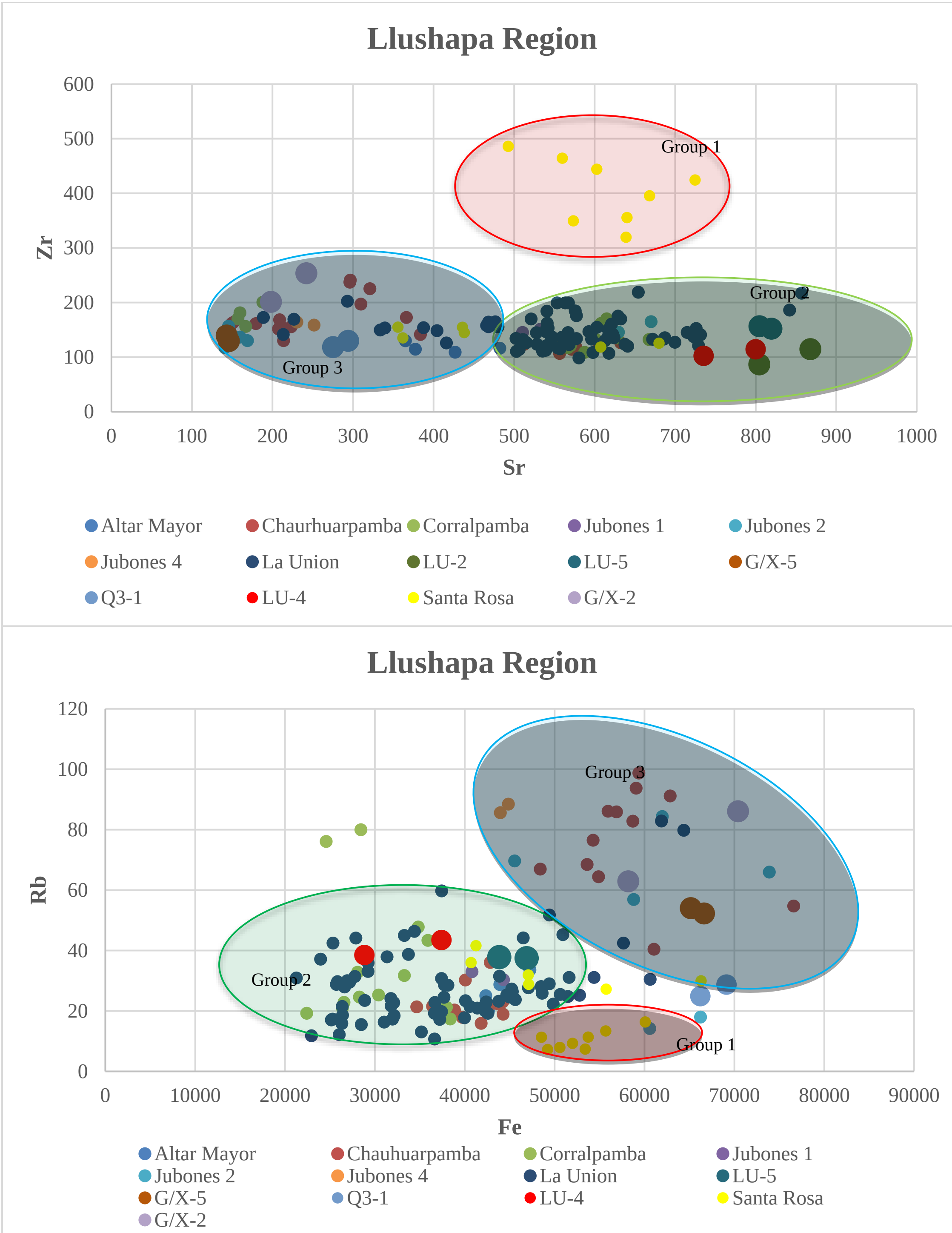
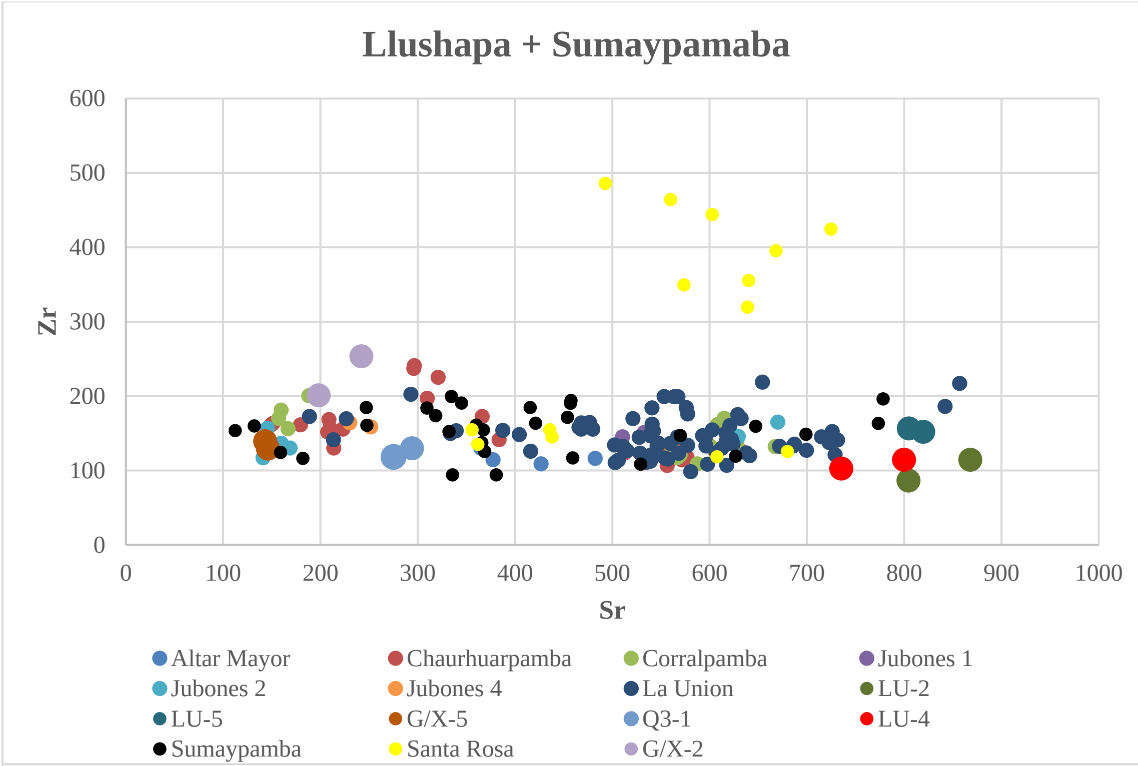



Figure 8. Santa Rosa within its' region (Llushapa) with Gañil/Q3 Inca sherds added, plotting in concentrations of Sr versus Zr (top) and Fe versus Rb (bottom) in ppm. Sites each have their own color; Inca sherds are enlarged and individually colored.



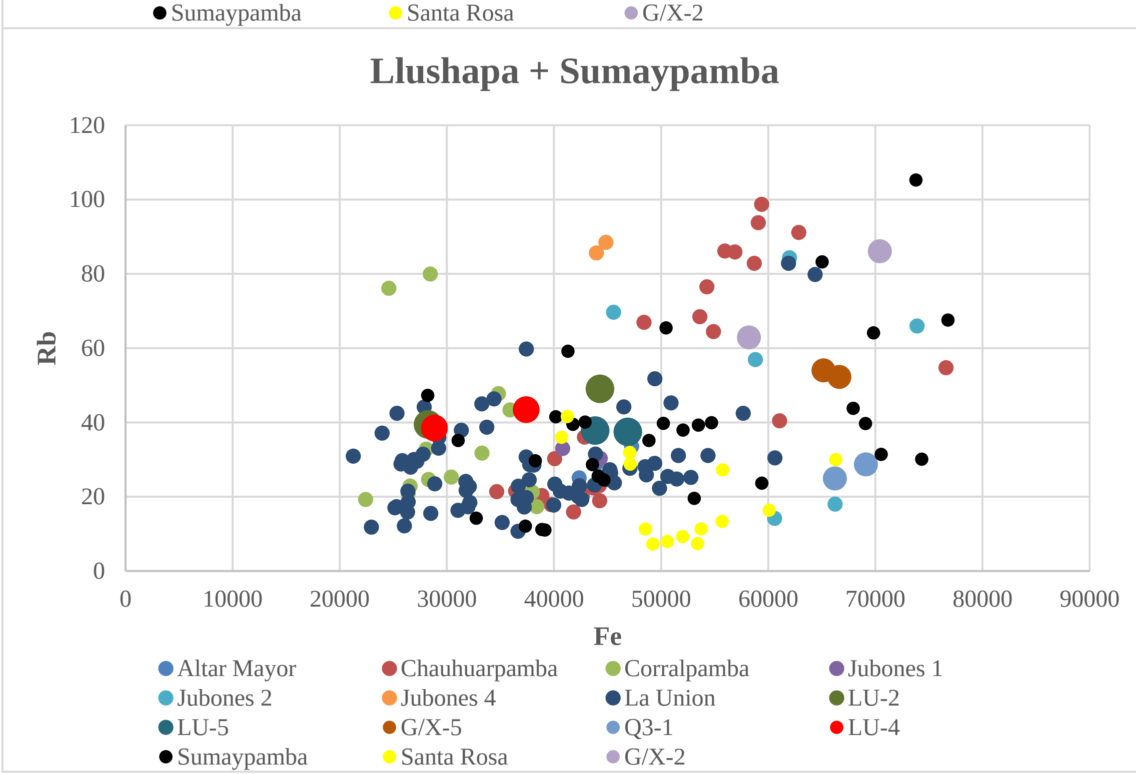




Figure 9. Llushapa Region with Sumaypamba, and Gañil/Q3 Inca sherds added, plotting concentrations of Sr versus Zr (top) and Fe versus Rb (bottom) in ppm. Sites each have their own color; Inca sherds enlarged and individually colored.

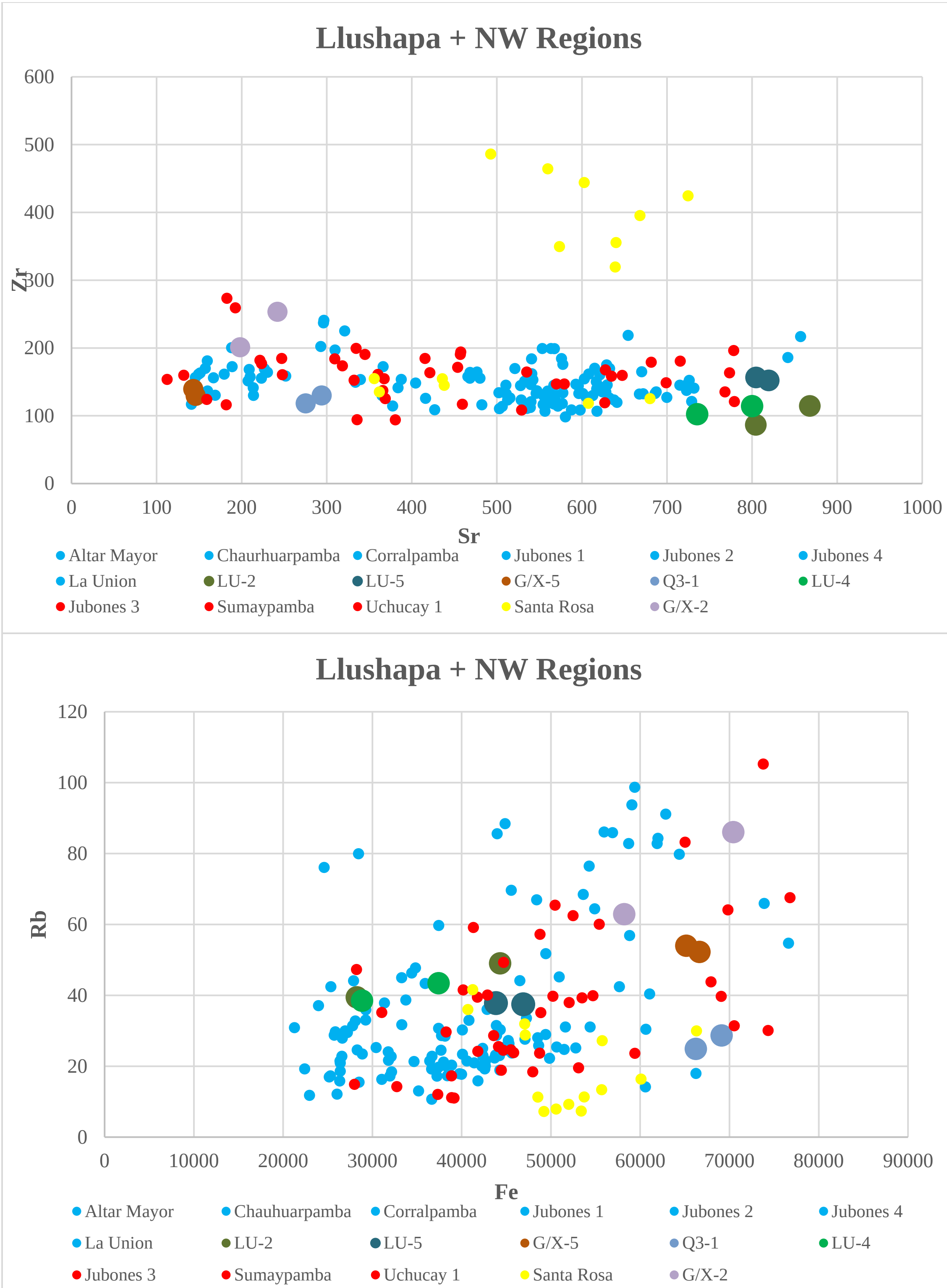



Figure 10. Llushapa region and NW region with Gañil Inca sherds added, plotting in concentrations of Sr versus Zr (top) and Fe versus Rb (bottom) in ppm. Sites colored by region except for Santa Rosa and Inca sherds which each have their own color; Inca sherds are also enlarged.