

Ceramic production in ancient Nasca: provenance analysis of pottery from the Early Nasca and Tiza cultures through INAA

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Abstract

We report the results of an instrumental neutron activation analysis (INAA) undertaken on a regional sample of pottery from the Southern Nasca Region. The samples included specimens primarily from the Early Nasca (ca. A.D. 1–450) and Tiza (ca. A.D. 1000–1476) cultures from a total of 16 different prehispanic sites. The results of the analysis demonstrate centralized production of Early Nasca polychromes and decentralized production of pottery from the Tiza culture. The results of this analysis confirm previous conclusions about the organization of these two indigenous cultures of the south coast of Peru and support the hypothesis of an excess production of polychromes at the ceremonial center Cahuachi for Early Nasca, and multiple centers of production for the Tiza culture.

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1. Introduction

In this paper we report changing patterns of ceramic production in the Nasca region of the south coast of Peru based on the results of an instrumental neutron activation analysis (INAA) of a regional sample of ceramics. Renowned for their elaborate material culture, indigenous cultures of the south coast of Peru have been known for over a century to the archaeological community. Despite this, it has only been until relatively recently that a wealth of new data from settlement survey, excavations, and compositional analysis has enabled archaeologists to better understand the economic and sociopolitical organization of those cultures.

We focus here on the Early Nasca (ca. A.D. 1–450) and Tiza (ca. A.D. 1000–1476) cultures of the south coast. Recent investigations have demonstrated that major economic and

sociopolitical transformations took place between these two time periods. In particular, results of recent fieldwork have shown that Early Nasca was a middle-range society comprising rural villages with self-sufficient subsistence economies that were related to each other through a wider system of group ceremonies and feasting at the large ceremonial center Cahuachi [21]. On the other hand, multiple centers characterized the Tiza culture of the Late Intermediate Period where local elites were engaged in craft production and exchange networks [5]. Here, we report the results of an INAA on a sample of ceramics from sites dating to these periods that provide another means of gaining insight into the sociopolitical and economic organization of the two cultures. The results demonstrate that at least in the Southern Nasca Region, ceramic production was centralized during Early Nasca, while it was decentralized in the Late Intermediate Period, reinforcing previous conclusions made from settlement patterns and excavations.

We begin this paper with a discussion of the archaeological context of the region focusing on the transitions that took

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place between the Early Intermediate and the Late Intermediate Periods. We then describe the sample of pottery analyzed in this study. The results of the analysis confirm previous propositions that in Early Nasca production of polychrome pottery was undertaken in centralized contexts and the production of pottery during the Late Intermediate Period was dispersed and undertaken in a variety of contexts. The results add to our understanding of the changing nature of economic and sociopolitical organization in the region over time.

2. Archaeological context and previous research

As a physiographic region, the south coast of Peru is very dry, suffers frequent, almost permanent droughts and only enjoys waters from highland rains that channel into rivers crossing the parched landscape to eventually empty into the Pacific Ocean. The region is known archaeologically for the indigenous development of the Paracas, Nasca, and Tiza cultures. Both the Wari and Inca Empires eventually dominated the region in their respective imperial conquests during the Middle and Late Horizons (Table 1). In this paper our focus is on the Southern Nasca Region (SNR) comprising the southern part of the Rio Grande de Nasca drainage and including the Aja, Tierras Blancas, Taruga and Las Trancas valleys (Fig. 1).

Nasca was a middle-range society that developed during the Early Intermediate Period (hereafter EIP, ca. A.D. 1–750). Nasca is generally divided into the Early Nasca (phases 2–4), Middle Nasca (phase 5), and Late Nasca (phases 6–7) cultures [16]. During Early Nasca, settlement was characterized by small villages dotting the foothills of the Andes with a large ceremonial center called Cahuachi located in the lower Nasca Valley. Residents from throughout the south coast of Peru made periodic pilgrimages to Cahuachi, and while several secondary civic/ceremonial centers existed outside the SNR, for example in Palpa [14], it is generally recognized that Cahuachi was the seat of power and the ceremonial core in the region [19,22]. Cahuachi served as a residence for Early Nasca elites where their power appears to have been intimately tied to their ability to sponsor feasts and to associate themselves closely with an ideology centered on agricultural fertility, propagation and water depicted on polychrome pottery [22]. Polychrome pottery depicting the major themes of Nasca ideology was made and

widely distributed during this time and used extensively at residential villages although it was not produced there [21].

Middle Nasca (A.D. 450–550) marks a major transformation in Nasca society. New construction at Cahuachi ceased [11,19], though the site was still clearly employed for ritual and for burying the dead [10,17], *puquios* (filtration galleries) were constructed [18], settlement patterns shifted as people began to move towards the drier middle valleys for the first time in many areas [18], and potters began to make design innovations to polychrome pottery so that the iconography included many more abstract motifs [15]. These transformations appear to be correlated with a pan-Andean drought [1,18]. Late Nasca (A.D. 550–750) marks a continuation of the settlement shifts that occurred in Middle Nasca with groups of people aggregating into large towns located in each valley of the SNR. This aggregation appears to correlate with a general increase in conflict throughout the region [16].

While clear societal transformations occurred during the EIP, one theme throughout Nasca prehistory was the use of polychrome pottery as the principal medium of ideology [1]. Nasca polychromes are famous for their quality of manufacture and although the iconography is well known, it has only been relatively recently that we are beginning to get a clear idea of how this artifact class was incorporated into Nasca domestic and ceremonial life. For example, recent excavations at Early Nasca villages have provided insight into domestic life and into the nature of polychrome production and consumption. Excavations at Marcaya, a small Early Nasca village demonstrated that residents were mixed agro-pastoralists living in economically self-sufficient households except for pottery production. Although not produced there, households used a substantial quantity of Nasca polychromes. While certain vessel shapes were reserved for high status individuals at Marcaya – headjars, cupbowls and modeled vessels in particular – the consumption of a wide variety of additional polychromes by ordinary households suggests that they were not goods that were reserved for elites. Based on excavations alone it was unclear exactly how and where polychromes were produced and distributed, but it was clear that they were an important group of artifacts in the development of Nasca [21].

A major shift occurred in the political structure of the region when the Wari empire entered the SNR during the Middle Horizon (A.D. 750–1000). At the height of Wari expansion there was a decrease in population and movement of people away from Wari settlements suggesting resistance [17]. This resistance was probably initiated by local leaders and led to expanded positions of power for certain individuals. Especially important were new kinds of elites who appear to have established their positions based on their resistance to the state [7].

The collapse of Wari at the end of the Middle Horizon disrupted the region as many settlements were abandoned [13,17]. After this abandonment, people of the region deserted ritual practices closely tied to the Nasca and Wari cultures, probably because they were seen as unstable [6]. Elaborate iconography was no longer used on ceramics and large ceremonial sites were no longer built. In conjunction with this

Table 1
Abbreviated Peruvian and Nasca chronology

Horizons and Intermediate Periods	Culture	Phases	Approximate dates
Late Intermediate Period	Tiza	n/a	A.D. 1000–1476
Middle Horizon	Loro, Wari	Nasca 8, MH 1-2	A.D. 750–1000
Early Intermediate Period	Late Nasca	Nasca 6-7	A.D. 550–750
	Middle Nasca	Nasca 5	A.D. 450–550
	Early Nasca	Nasca 2-4	A.D. 1–450
Early Horizon	Proto Nasca Paracas	Nasca 1	100 B.C.–A.D. 1 800–100 B.C.

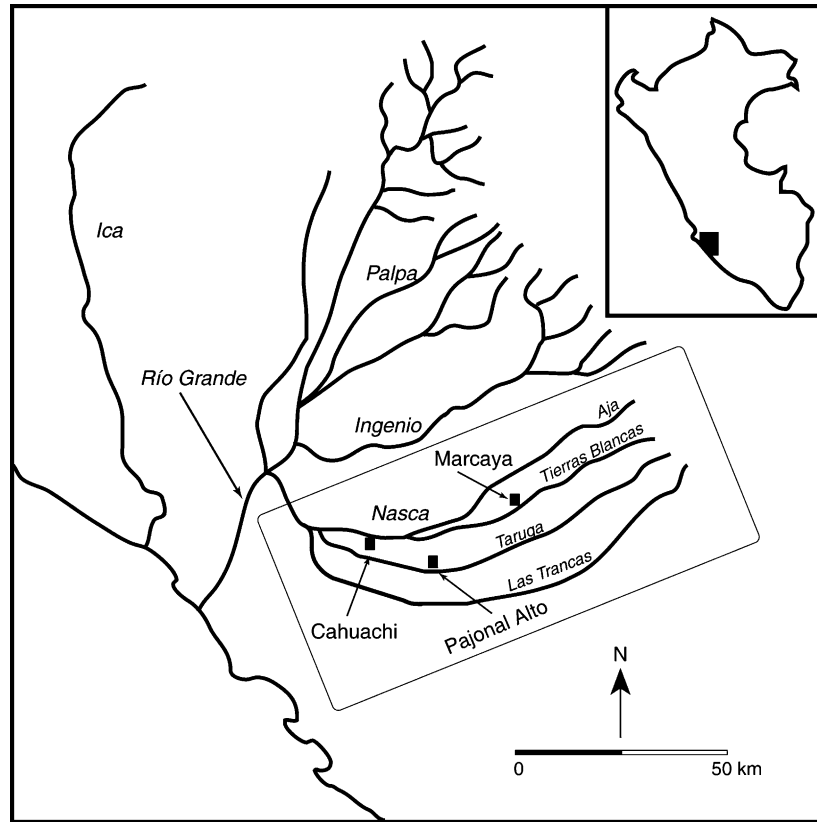


Fig. 1. Map of the south coast of Peru with the Southern Nasca Region (SNR) highlighted.

desertion of earlier religious resources, local elites used new material resources to build political power. In the post-Wari Late Intermediate Period (hereafter LIP; ca. A.D. 1000–1476) Tiza culture local elites engaged in the production of utilitarian items, participated in regional and long-distance exchange, and were involved in new ritual practices [5,6].

Pajonal Alto, located in the middle of the Taruga Valley, was a predominantly LIP and Late Horizon (A.D. 1300–1532) site. Excavations there revealed that the group of high status individuals at the settlement had access to long-distance trade items and a diversity of food products that others did not have. In addition, evidence of utilitarian ceramic production was associated with the elite domestic area located next to a small mound and plaza [5]. Evidence from Pajonal Alto and settlement pattern data suggests that during this period there was an increase in regional exchange and that more settlements were involved in the production and trade of goods such as ceramics. The pottery produced during this period bore a much less complex iconography when compared to that of the Nasca culture, was painted with a maximum of three colors, and the majority of the images consisted of simple, geometric patterns. Vessels were thicker and less uniform in construction than their earlier counterparts. From a macroscopic paste analysis it was determined that the vessels used at Pajonal Alto came from a variety of clay sources [4].

In 1476 the Inca conquered the Nasca region and they established the site of Paredones in the Nasca Valley. During the Late Horizon there is evidence that some sites were abandoned

but population in the region remained high. Despite the impact of the Inca state many domestic practices appear unchanged [3]. At Pajonal Alto the local Late Horizon occupation is similar to that of the previous LIP in terms of subsistence practices and economic activities indicating that the Inca did not interfere directly with daily life in rural areas [3].

3. Compositional analysis of ceramics

The results of excavations at Marcaya led to a provenance analysis of the ceramics recovered in those excavations. Because excavations at the site demonstrated a high consumption of polychromes even though they were not produced at Marcaya, a compositional analysis of a sample of the pottery recovered in excavations was undertaken to determine the variability in the paste types present at the site. An instrumental neutron activation analysis (INAA) of a sample of both polychrome and plain pottery from Marcaya revealed that most painted pottery had a unique chemical signature and formed a single compositional group referred to as “INAA Group 1” while plain pottery had various chemical signatures [24]. This homogeneous paste type was attributed to at least part-time specialization in ceramic production, though this conclusion remained a hypothesis open for further testing.

The INAA study of ceramics from Marcaya initiated a follow-up INAA study that is the focus of this paper. Specifically, the goal of our study here is to (1) broaden the geographic sample of the original Marcaya study, (2) include samples

from the LIP, the only time period for which we had primary excavation data, and (3) determine if there was further compositional variability in ceramics from sites throughout the region.

In order to reach these goals, we augmented the previous study by taking samples from (1) surface collections from settlement survey throughout the SNR, and (2) excavations at Pajonal Alto. The surface collections come from a settlement survey directed by Schreiber between 1984 and 1996 with the intent to evaluate settlement patterns in the SNR through time [16]. Over 1000 archaeological sites were recorded in the field including habitations and cemeteries from the Initial Period through the Late Horizon. A sample of diagnostic ceramics was collected from the surface of each site recorded. Fourteen of these sites with a major Early Nasca component were selected to provide additional samples for this study (Fig. 2).

The majority of ceramics selected from these sites were painted polychromes, while unpainted utilitarian jars and cooking vessels were also sampled. Sherds were assigned dates if their phases could be recognized. Some sherds in the analysis were indistinct. In the case of these samples, we assigned dates based on their association with other sherds from the site. This results in some very specific phases being assigned to some samples (Nasca 3, for example), while others are simply “Early Nasca.” Additionally the sample includes 15 “painted jars,” large jars with a cream slip and black and red wavy vertical lines [21], a common form found in the Nasca region. Assigning dates to these are problematic because they last throughout the Early Intermediate Period.

Because it was difficult to assign them to Early, Middle, or Late Nasca they were analyzed as a distinct category. In 2001 samples of these ceramics were exported to the United States to augment the original Marcaya analysis.

Reflecting the primary occupation of the site, all of the Pajonal Alto sherds were from either the LIP or the Late Horizon. The sherds selected from this site represent the main types found at this village. These include utilitarian ollas, a common bowl type (cumbrous bowl), a common jar type (dot-band jar), unfired clay, sherds from pottery that may have been imported from the Ica Valley and one Inca style plate. These samples were chosen in order to examine the range of ceramics found at the settlement and to compare them with the regional data. All of the samples come from domestic contexts at the village and were recovered during excavations.

4. Results

Samples were submitted to the University of Missouri Research Reactor (MURR) for instrumental neutron activation analysis (INAA). The samples were analyzed using standard MURR procedures for INAA of pottery and ceramic raw materials [8,9]. Thus, we used two irradiations, three gamma-ray counts, and a standard-comparator approach to calibration to obtain concentration data for 33 elements.

Results of the INAA are shown in Tables 2 and 3. A majority (82%) of the sherds in the sample ($n = 213$ of 260) can be assigned to four compositional groups: INAA Groups 1, 2, 3, and 4 (Figs. 3 and 4), while the remaining 18% ($n = 47$)

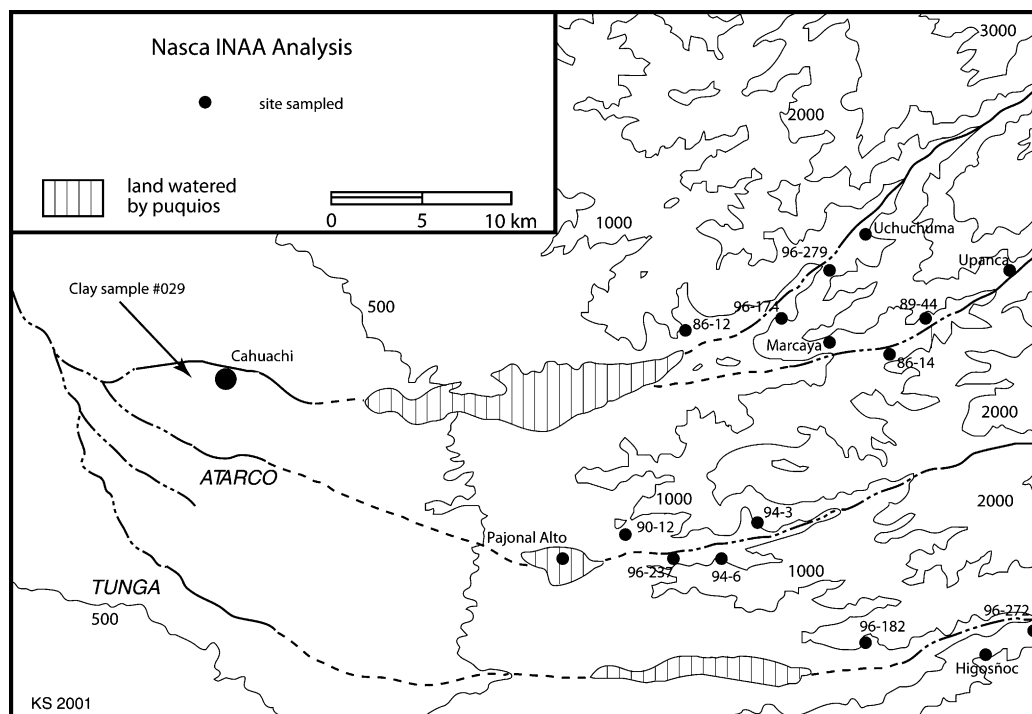


Fig. 2. Sites from the SNR included in this study. All site samples were from surface collections except for Marcaya and Pajonal Alto where samples were taken from excavations. Map is redrawn from Schreiber [17].

Table 2
Results of the INAA by time period

	Group 1	Group 2	Group 3	Group 4	Unass.	Total
EH	2	0	2	1	2	7
EH%	28.57	0.00	28.57	14.29	28.57	100.00
EN	106	0	0	4	20	130
EN%	81.54	0.00	0.00	3.08	15.38	100.00
MN	6	0	0	0	3	9
MN%	66.67	0.00	0.00	0.00	33.33	100.00
LN	2	0	0	0	0	2
LN%	100.00	0.00	0.00	0.00	0.00	100.00
MH	1	0	0	0	0	1
MH%	100.00	0.00	0.00	0.00	0.00	100.00
LIP	7	0	2	1	10	20
LIP%	35.00	0.00	10.00	5.00	50.00	100.00
LH	7	0	0	0	3	10
LH%	70.00	0.00	0.00	0.00	30.00	100.00
Painted jar	14	0	0	0	1	15
Painted jar%	93.33	0.00	0.00	0.00	6.67	100.00
Utilitarian	30	16	4	8	8	66
Utilitarian%	45.45	24.24	6.06	12.12	12.12	100.00
Total	175	16	8	14	47	260
Total%	67.31	6.15	3.08	5.38	18.08	100.00

were left unassigned to any group defined in the analysis. INAA Groups 1, 2, and 3 were previously defined in the Marcaya study [24], while INAA Group 4 is newly recognized here.

The majority of sherds sampled ($n = 175$ of 260, 67%) fall into INAA Group 1. This group is composed mostly of Early

Table 3
Results of the INAA by valley

	Group 1	Group 2	Group 3	Group 4	Unass.	Total
Aja						
86-12	5				4	9
96-174	5				4	9
96-279	9		2	2		13
Uchuchuma	8			1	2	11
Total Aja	27	0	2	3	10	42
Tierras Blancas						
Marcaya	67	15	3	6	10	101
86-14	8	1			1	10
89-44	7		1	1	1	10
Upanca	9					9
Total TB	91	16	4	7	12	130
Taruga						
Pajonal Alto	11			1	13	25
90-12	8				2	10
94-3	2				3	5
94-6	9				1	10
96-237	7			2		9
Total Taruga	37	0	0	3	19	59
Las Trancas						
96-182	3		2		3	8
Higosñoc	6			1	3	10
96-272	11					11
Total LT	20	0	2	1	6	29

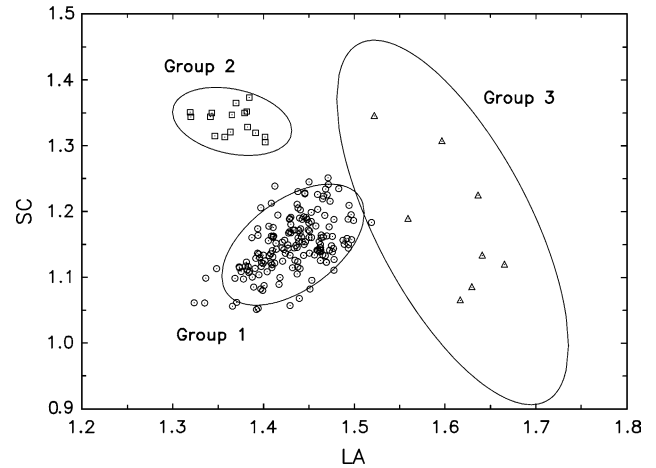


Fig. 3. Bivariate projection of INAA Groups 1, 2 and 3 with 90% confidence intervals. INAA Group 1 is the principal polychrome group whose source can be traced to somewhere near the ceremonial center Cahuachi. INAA Group 2 is a group of utilitarian pottery from Marcaya and 86-14, a small habitation located near Marcaya. INAA Group 3 is a small, highly variable group comprised primarily of plain, utilitarian pottery.

Nasca polychromes while painted jars, utilitarian wares, and other sherds from all time periods are also included. Of the 130 Early Nasca polychromes sampled in this study, over 81% ($n = 106$) are assigned to INAA Group 1. The remaining 19% of the Early Nasca sherds were either assigned to Group 4 ($n = 4$) or remain unassigned ($n = 20$).

Smaller groups found in the analysis comprised a variety of utilitarian and other wares. INAA Group 2 is made up entirely of unpainted utilitarian pottery, almost exclusively from Marcaya, with one additional sample from 86-14, a small habitation located just upriver from Marcaya on the opposite side of the Tierras Blancas Valley. INAA Group 3 was also defined in the original Marcaya analysis by the assignment of three utilitarian sherds from the Early Nasca site. With this analysis, five additional specimens were added to the group: two Early Horizon sherds from 96-182 in the Las Trancas Valley, two LIP sherds from 96-279 in the Aja Valley, and one utilitarian sherd from the Early Nasca site 89-44.

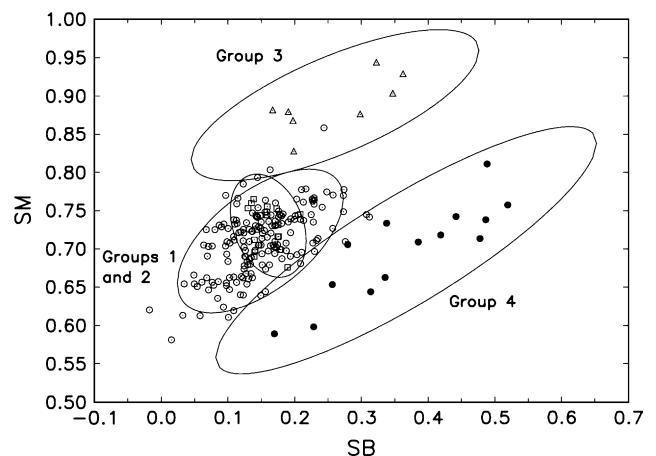


Fig. 4. Bivariate projection of INAA Groups 1–4 with 90% confidence intervals. INAA Group 4 is a small, highly variable group.

The 14 sherds that comprise the newly defined INAA Group 4 include sherds from the Early Horizon ($n = 1$), Early Nasca ($n = 4$), the LIP ($n = 1$), and utilitarian pottery dating to the Early Nasca period ($n = 8$). The Early Horizon sherd is from 96-279 in the Aja Valley and the LIP sherd is from Pajonal Alto.

Utilitarian pottery, which comprises the next largest group (after the Early Nasca polychrome group) sampled in the study ($n = 66$), was variable in composition. Approximately 45% ($n = 30$) fell into INAA Group 1, while 24% ($n = 16$) were assigned to Group 2, 6% ($n = 4$) to Group 3, 12% ($n = 8$) to Group 4, and 12% ($n = 8$) remain unassigned.

Because painted jars are not diagnostic to particular phases, but instead can date to any phase during the EIP, these were analyzed separately. A total of 15 painted jar fragments were analyzed with 14 of those being in Group 1. The single sherd that was not part of that group remains unassigned. The sherd comes from 94-3, a small Early Nasca site located in the upper Taruga Valley. It could be a statistical outlier or could represent a different workshop. Indeed, three of the five sherds from this site were unassigned.

Although the sample of Early Horizon sherds included in the analysis was small ($n = 7$), they were highly variable in composition as well. Two sherds fell into Groups 1 and 3, two remain unassigned, while one sherd was assigned to Group 3. The compositional variability of the Early Horizon specimens is consistent with what has been found in previous INAA studies [20].

Interestingly, Middle and Late Nasca sherds that were sampled ($n = 13$) mostly fell into INAA Group 1 as well (8/11, 73%). The three that did not remain unassigned. Middle Horizon samples were limited to only one Loro sherd from the predominantly Early Nasca site 96-279. This sherd also was assigned to INAA Group 1.

Sherds were far more variable in the Late Intermediate Period. Of the 20 samples, 35% ($n = 7$) were assigned to Group 1, 10% ($n = 2$) to Group 3, 5% ($n = 1$) to Group 4, and 50% ($n = 10$) remained unassigned. In the Late Horizon, of the 10 sherds sampled, 70% ($n = 7$) were assigned to Group 1, while 30% ($n = 3$) remained unassigned and all of these are from Pajonal Alto. Of the sample from Pajonal Alto 52% ($n = 13$) remain unassigned.

5. Discussion

There are two important conclusions that can be made from this analysis: (1) Early Nasca polychrome sherds have a remarkably uniform paste type no matter where they are found in the SNR, and (2) LIP ceramics are very heterogeneous. We believe that this reflects the changing economic organization of the two cultures in the region and we discuss these results in more detail below.

Of the Early Nasca sherds 81% ($n = 104$) were assigned to the principal compositional group (Fig. 5). In the original Marcaya analysis it was suggested that the sample needed to be broadened so that specimens from a wider geographic area were taken [24]. Without the broad geographic sample it was unclear if the polychromes from Marcaya simply represented a local production source. The results here clearly indicate that this is not the case. Nasca polychrome sherds from throughout the SNR, from the Aja to the Las Trancas valleys, have remarkably homogeneous pastes when compared to utilitarian wares of that period and all wares of later periods.

In light of the heterogeneity of other wares, the lack of evidence for production at domestic sites excavated, and other compositional data suggesting uniformity in the recipe and source used for black paint on Nasca pottery [26], we



Fig. 5. Sample of Early Nasca sherds from Upanca (previously called 96-285). Sample numbers top row from left to right: KJV762, KJV763, KJV764 and KJV765. Sample numbers bottom row from left to right: KJV766, KJV768, KJV769, KJV770 and KJV771. All samples from Upanca were assigned to INAA Group 1.

attribute the homogeneity of the Early Nasca polychromes to a centralized production source. A recently reported raw material survey in the SNR demonstrates that the clay source of INAA Group 1 can be traced to somewhere in the vicinity of Cahuachi [25]. Thus, it is likely that the source of the production of ceramics bearing the compositional signature of INAA Group 1 is somewhere near the ancient ceremonial center. With recent evidence for habitation at the site, and the growing evidence for ceramic production there, we suggest here that Cahuachi was a principal source of polychrome production in the Southern Nasca Region. This is not surprising as Cahuachi was clearly the seat of power in Early Nasca, and Vaughn has argued that controlling the production and distribution of items bearing the principal motifs of ideology would have been beneficial to elites in residence at the site [21,22].

While we are confident in arguing that the majority of Early Nasca polychromes in the SNR came from Cahuachi, the sources of the 19% of the sample that do not fall into INAA Group 1 remain to be determined. These include four sherds that were assigned to INAA Group 4, and 20 sherds that were unassigned. We believe that these represent either imports from other possible Early Nasca production centers perhaps in Ica or Palpa, or they could represent local copies of Nasca polychromes. While other production centers have not been formally identified, Petersen [12] in passing mentions a Nasca ceramic production site at Toma Luz in the Ica Valley.

The unassigned specimens could also be local copies of Nasca polychromes made at household workshops where presumably people were making utilitarian pottery. Although no evidence for pottery production has been found in excavations at Early Nasca sites thus far [21–23], it is quite possible that the evidence for small scale production of pottery would be difficult to see archaeologically.

Also included in INAA Group 1 were about 45% of the utilitarian sherds sampled. These also came from a widespread area of the SNR (that is, they were not limited to particular drainages). One frequently cited cautionary note is that temper can affect compositional groups. This does not appear to be the case in Nasca. While the painted polychromes had very little temper the sampled utilitarian sherds were heavily tempered. Even so a portion of these utilitarian sherds were still assigned to Group 1 [24]. Thus, the compositional groups that were found in this analysis do not seem to reflect functional groups (e.g., cooking, storage and serving vessels).

Utilitarian specimens that comprise INAA Group 2 were primarily from Marcaya ($n = 15$) with one additional sherd from 86-14, a small Early Nasca site across the Tierras Blancas Valley from Marcaya. We suggest that this indicates that INAA Group 2 is composed of pots from an as of yet unidentified workshop local to this part of the Tierras Blancas Valley.

INAA Groups 3 and 4 are small and highly variable that include specimens from all four valleys of the SNR. The groups include principally plain pottery, but also some Nasca polychromes (in INAA Group 4), a few specimens from the Late Intermediate Period and one sherd from the Early Horizon. The small group sizes preclude any speculation on the source

of the pottery, but we would expect that additional work will further define these groups in the future.

The second major conclusion in this analysis is that the LIP ceramics are heterogeneous especially when compared to the Early Nasca sample. It has been proposed that during the LIP and through the Late Horizon there were more communities involved in ceramic production and greater exchange of these products within the region than there was in the EIP [5,6]. The large number of unassigned sherds from the site of Pajonal Alto is consistent with this argument. The unassigned sherds come from ceramic types common in the region such as bowls, dot-band jars, and utilitarian ollas suggesting that they come from local clay sources. However, there are also three unique ceramic types in the unassigned category. One of the unassigned sherds (KJV850) is of the Ica style and it is likely an import or local copy of this style. Another of the unassigned sherds (KJV868) is from an Inca style plate and one of the only Inca related sherds from this village. The third (KJV852) is from a type that dates very early in the Late Intermediate and may also be an import from Ica (Fig. 6). All three of these sherds were part of vessels that were likely constructed in contexts and from materials that were not commonly used at Pajonal Alto.

Two common ceramic types found in the LIP and Late Horizon in the Nasca region are the dot-band jar and the cumbersome bowl. Samples from these types are assigned to INAA Group 1 ($n = 3$) and are unassigned ($n = 4$) indicating that these types are made from a variety of clay sources and were probably produced in several locations. The one sherd from Pajonal Alto that was assigned to INAA Group 4 is also unique. It is part of a fineware bowl and it too may have been produced in Ica or in another area of the drainage. Two pieces of unfired pottery were tested from Pajonal Alto. The first was a piece of an unfired olla and was assigned to INAA Group 1 suggesting that there is a source of clay near Pajonal Alto with a similar composition to INAA Group 1 sherds. The other piece of unfired clay fall into the unassigned category.

With the decline of ceremonial centers (and the large gatherings that took place at them) during this period there was likely a shift in the structure of pottery production and exchange. No longer was production focused at Cahuachi and under the control of religious elites. The results of this INAA study and previous examinations from ceramics dating to this time period in the region indicate that pottery production took place at many sites throughout the region including small villages such as Pajonal Alto. Production in some contexts appears to be under control by local elites perhaps to create items to use in regional exchange or for feasting activities.

The results of this study reinforce our understanding of the major economic transformations that took place in the region over time. Centralized production in Early Nasca and decentralized production in the LIP is consistent with the findings of recent settlement survey, excavations, and compositional analysis. What is needed now though is to expand the study reported here. Our investigation has focused on the Southern Nasca Region and does not include samples from outside the SNR. In particular, samples from the Ica and Palpa valleys,



Fig. 6. Sherds from Pajonal Alto included in the analysis. Top row from left to right (all are INAA Group 1): KJV872, KJV871, KJV854, KJV855, KJV869. Second row (INAA Group 1): KJV853, KJV870, KJV864, KJV866, KJV859. Third row (INAA Group 4): KJV851. Row 4 (unassigned): KJV868, KJV852, KJV850, KJV857, KJV856. Row 5 (unassigned): KJV858, KJV860, KJV861, KJV865, KJV863, KJV867, KJV862.

dubbed the Northern and Middle Nasca Regions recently by Carmichael [2], should be analyzed using the same techniques as those reported here. An extended regional sample will help to determine how far Cahuachi's reach was in Early Nasca, and how extensive the exchange networks mobilized by elites were in the LIP.

Of course we would also anticipate broadening the chronological sample reported here. Although we include samples from the Early and Middle Horizons, the sample size is so small that it is difficult to decipher any broader patterns during those time periods. The Early and Middle Horizons are of particular interest for several reasons. First, we suspect that the roots of the ceremonial activities that led to Cahuachi's dominance in the EIP were established in the Early Horizon. Second, it is clear that the transformations that took place in the region during the Middle Horizon eventually led to the profound changes manifested in the LIP.

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