

**COMPOSITIONAL ANALYSIS OF CERAMICS FROM LA ALETA, DOMINICAN
REPUBLIC: IMPLICATIONS FOR SITE FUNCTION AND ORGANIZATION**

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La Aleta is a major Taíno site that we believe served as a regional ceremonial center. The site's features include a flooded sinkhole and four stone-lined plazas similar to contact-period plazas used for ball games and dances. This paper uses data derived from instrumental neutron activation analysis (INAA) of ceramics from the sinkhole and plazas to evaluate hypotheses about La Aleta's importance and internal organization. The INAA data are not inconsistent with the interpretation that La Aleta served a regional, rather than local, population, but the results to date are probably best described as equivocal. The data do not support the hypothesis that each of the four plazas was used by people from a different locality. Instead, the data are more consistent with alternative hypotheses about the use of the plazas and/or the manufacture of the ceramics found therein.

This paper is an experiment in using data derived from instrumental neutron activation analysis (INAA) of ceramics to evaluate hypotheses about inter-site functional variability and intra-site spatial organization in Taíno settlements. A research team from Indiana University, in cooperation with

Dominican colleagues, has been working in and around the Parque Nacional del Este in the southeastern Dominican Republic (Figure 1) since 1996. This zone formed part of the core of the Taíno chiefdom of Higüey, one of the principal cacicazgos of Hispaniola at the

time of European contact (Las Casas 1967:I:22–26).

Among the sites we have been investigating is La Aleta (Figure 1), which contains a flooded sinkhole known as the Manantial de la Aleta (Atilos and Ortega 2001; Guerrero 1981; Ortega and Atilos 2003). Elsewhere we have argued that the Manantial de la Aleta was an important center for ritual offerings connected with the life-giving properties of water, female fertility, the female qualities of the universe, female supernaturals, and ancestor worship (Beeker et al. 2002; Conrad et al. 2001; Conrad, Beeker, and Foster 2005). Seven AMS radiocarbon dates on organic artifacts from the Manantial range from cal A.D. 1035 to 1420 (Conrad et al. 2001:14–15, Table 1).

In addition to the Manantial, La Aleta also contains four *bateyes* (ceremonial plazas) that are typical features of major Taíno ceremonial centers in the Greater Antilles, especially in Puerto Rico and Hispaniola

(Atilos and Ortega 2001; Guerrero 1981; Ortega and Atilos 2003). During the contact period such plazas were used for ritual activities, including dances and ballgames. The presence of the Manantial and the four plazas suggests La Aleta was a regionally important ceremonial center that served a relatively wide area. The four plazas also suggest that the site was used by multiple Taíno sociopolitical groups, each of which may have been associated with particular zones within the settlement—for example, with a particular plaza.

Our purpose here is to ascertain whether compositional analyses of ceramics can contribute to the evaluation of these specific hypotheses about La Aleta, and by extension to the investigation of broader questions about Taíno history and culture, and Caribbean prehistory in general. Our data derive from INAA studies of 175 sherds: 125 from La Aleta, consisting of 25 samples each from the Manantial and the four plazas; 25



Figure 1. Schematic diagram of instrumental neutron activation analysis.

sherds from a nearby shoreline village site called La Cangrejera; and a total of 25 sherds from three sites in the Punta Macao region, farther to the north (Figure 1).

The samples from the Manantial de la Aleta were selected from collections recovered by the Indiana University team during dives in 1996 and 1997 (Beeker et al. 2002; Conrad, Beeker, and Foster 2005). The sherds from the plazas at La Aleta were excavated by Elpidio Ortega and Gabriel Atilas in 1997 (Atilas and Ortega 2001; Ortega and Atilas 2003), whereas those from La Cangrejera were excavated by Atilas and Harold Olsen Bogaert in 1998 (Andújar and Atilas 2003). The sherds from the Punta Macao sites, which were investigated by Atilas in 2003 and 2004 (Andújar 2004), were initially collected for a different purpose, but proved to have some relevance to the problems under consideration. In May of 2004, the Museo del Hombre Dominicano, at that time directed by Carlos Andújar, graciously made all of these materials available to us for analysis.

INAA Results

The INAA was carried out at the Archaeometry Laboratory of the University of Missouri Research Reactor Center (MURR), using the standard MURR procedures described by Christophe Descantes et al. in the introductory paper of this volume (see also Baxter 1992; Bieber et al. 1976; Bishop and Neff 1989; Descantes and Glascock 2004; Glascock 1992; Neff 1994, 2001; Sayre 1975). We identified five compositionally homogeneous groups within the ceramics (Figure 2), designated La Aleta 1 (n=6), La Aleta 2 (n=11), Punta Macao (n=24), Group 1 (n=101), and Group 2 (n=4); 29 samples were unassigned (Table 1). Each of these groups is distinguished from the others by being relatively enriched (or

diluted) in a different set of elements. Compared to the other groups, La Aleta 1 ceramics are enriched in chromium and cobalt, whereas La Aleta 2 ceramics are enriched in antimony, arsenic, terbium, samarium, lutetium, and uranium (actinide). The Punta Macao group is enriched in sodium, potassium, hafnium, rubidium, and barium. Group 1 ceramics are enriched in manganese, while those in Group 2 are enriched in hafnium, zirconium, uranium, and actinide. Following the “provenance postulate” of Weigand et al. (1977), these compositional groups are assumed to represent geographically restricted sources or source zones.¹

We should note that there may be only a three-group structure, because there is a possibility that compositional groups La Aleta 2 and Group 2 are transformations of Punta Macao and Group 1. All of the sherds in those first two groups were recovered from the flooded sinkhole known as the Manantial de la Aleta, and their chemical composition may have been altered by their prolonged immersion in deep water. In other words, there is the possibility that the underwater postdepositional environment of the La Aleta sherds may have affected the sherds by enriching them in uranium.

The five (or three) groups have different distributions. The groups designated La Aleta 1, La Aleta 2, and Group 2 occur only at the site of La Aleta. As indicated above, all of the Group 2 and La Aleta 2 specimens were recovered from deep-water contexts in the Manantial. In contrast, all of the La Aleta 1 sherds came from the four plazas at the site. Group 1 ceramics were found at three sites: La Aleta, La Cangrejera, and Punta Macao proper. The Punta Macao group had the widest distribution, being represented at all

five sites: La Aleta, La Cangrejera, and the three sites in the Punta Macao area (see Table 1).

**La Aleta as a Regional Center:
INAA Evidence**

In terms of our first hypothesis, if La Aleta was indeed a regionally important center, pottery found at the site would have been drawn from—and manufactured across—a wider area than the pottery from La Cangrejera, a village site with only local importance.² If so, we would expect compositional analyses of ceramics from the two sites to produce different results. For example, if the pottery from La Cangrejera was indeed manufactured within a restricted geographical area, we would expect the chemical range of variation to be minimal in

terms of clay sources and paste “recipes,” and thus have few recognizable compositional groups. In contrast, if La Aleta had a broader regional importance, we would expect its ceramics to be more heterogeneous in terms of sources, recipes, and composition, and therefore have more identifiable groups than comparable sites in the area.

Compositional analysis does indeed reveal that samples from La Aleta have a wider range of variation than samples from La Cangrejera (Figure 3). The first 50 samples submitted for analysis were the 25 sherds from the Manantial de la Aleta and the 25 from La Cangrejera. Clear chemical compositional differences exist between the ceramics from these two sites, most visible in bivariate projections that include uranium and arsenic concentrations, however, it should be

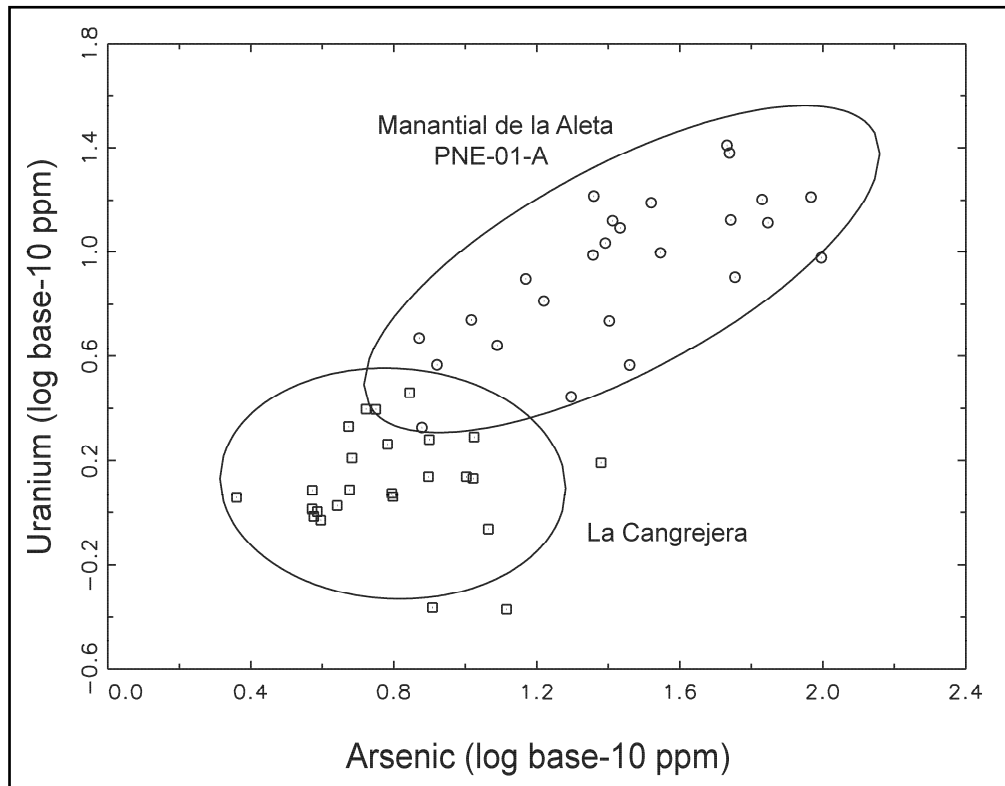


Figure 3. Plot of arsenic and uranium concentrations showing the contrast between ceramics from La Aleta and La Cangrejera.

noted again that the underwater postdepositional environment may have affected the sherds at the Manantial de la Aleta by enriching them in uranium. Overall, the La Cangrejera ceramics are more homogeneous than the specimens from the Manantial de la Aleta. When the ceramics from the four plazas are included in the comparison, the heterogeneity of the ceramics from La Aleta increases considerably, magnifying the contrast between the two sites. All five (or three) of the compositional groups are represented at La Aleta, whereas only two groups are represented at La Cangrejera. Admittedly, when the samples from the plazas are included, the sample size for La Aleta is five times as large as that from La Cangrejera .

In brief, compositional analyses offer some, albeit limited, support for the hypothesis that La Aleta was a ceremonial center that served a regional Taíno population. The compositional evidence is consistent with some stylistic evidence we have published elsewhere, although that evidence is also limited (Beeker et al. 2002). At this point much work remains to be done before we can delimit the region served by La Aleta, which may well have fluctuated through time. To judge from the results of the preliminary work presented here, however, it seems very likely that additional compositional analyses could be very helpful in resolving this question.

Use of the Plazas: INAA Evidence

Our second hypothesis is concerned with the internal organization of La Aleta, and specifically with the four plazas. If the artifacts recovered from La Aleta were drawn from—and manufactured across—a wide area, ceramics *from the site as a whole* should

be relatively heterogeneous in terms of sources and recipes. A closer examination of intra-site patterning, however, might provide additional information about La Aleta. That is, if each plaza was used by Taíno groups from a different locality or set of localities, with every group providing its own ceramics, we would expect compositional analyses of sherds from each of the plazas to produce different results.³ On the other hand, if all plazas were used by all groups but for different ceremonies, the results from all of the plazas should look similar.

INAA data indicate that the compositions of the plaza ceramics cannot be separated in elemental or principal component space (Figure 4). No statistical difference exists among the chemical compositions of the ceramics found on the four plazas; i.e., none of the plazas appear to have chemically distinctive or unique ceramics. At first glance these data suggest that the use of any given plaza was not restricted to a particular group or groups. Instead, the data are more consistent with the hypothesis that each plaza was used by all groups for a different set of activities distinguished by content, timing, or other factors. In other words, it seems likely that what differentiated the four plazas from one another was the ceremonies that took place in them, not the people who participated.

In reality, however, the similarity in the chemical compositions of the ceramics does not preclude either possibility: that each plaza was used by all groups, as above, or that the four plazas were used by different groups. The hypothesis as stated assumes that each group was bringing its own pottery, made with its own local clays, for use in ceremonies at La Aleta, and that there was no centralized ceramic production for the site. In

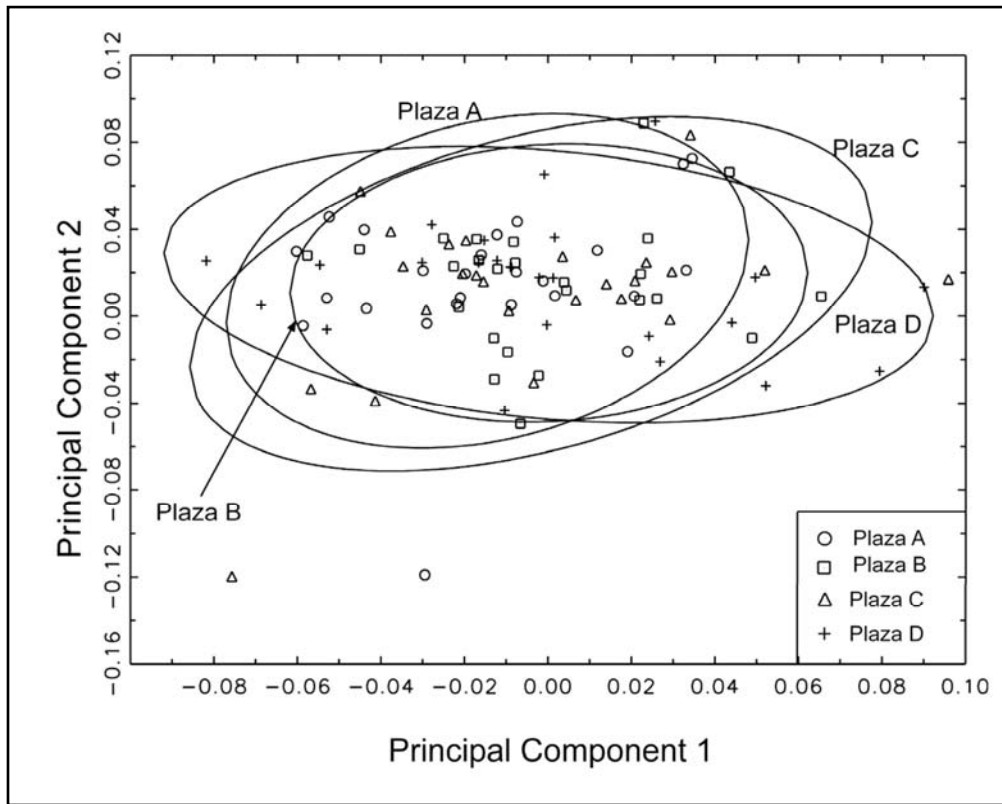


Figure 4. Plot showing no compositional difference among the ceramics from the four plazas.

fact, the data for the ceramic groups from the plazas may raise questions about this assumption. The vast majority of the sherds from the plazas—81 percent—are assigned to Group 1, with only rare occurrences of ceramics from other compositional groups (Figure 5). The proportion of Group 1 sherds in the individual plazas ranges from 72 to 88 percent. If we consider only samples that can be assigned to one of the five compositional groups, the proportion of Group 1 increases to 91 percent, with a range of 88 to 95 percent for the individual plazas. The overwhelming preponderance of Group 1 in these samples might reflect centralized, and possibly specialized, production of ceramics for use in the ceremonies held in the plazas,

regardless of the group or groups participating. If so, we do not know at present where this production might have occurred.

A third possibility is that the ceramics have nothing to do with the use of the plazas but are simply rubbish deposited as construction fill. In that case, the high percentage of Group 1 ceramics might indicate that the fill in the four plazas originated from a single source, a large midden in which Group 1 pottery predominated. We cannot completely discount this possibility, but we consider it unlikely, as no one has yet identified any substantial midden deposits at La Aleta outside the plazas themselves. For the moment, we consider it more probable that the results of the INAA analyses reflect use

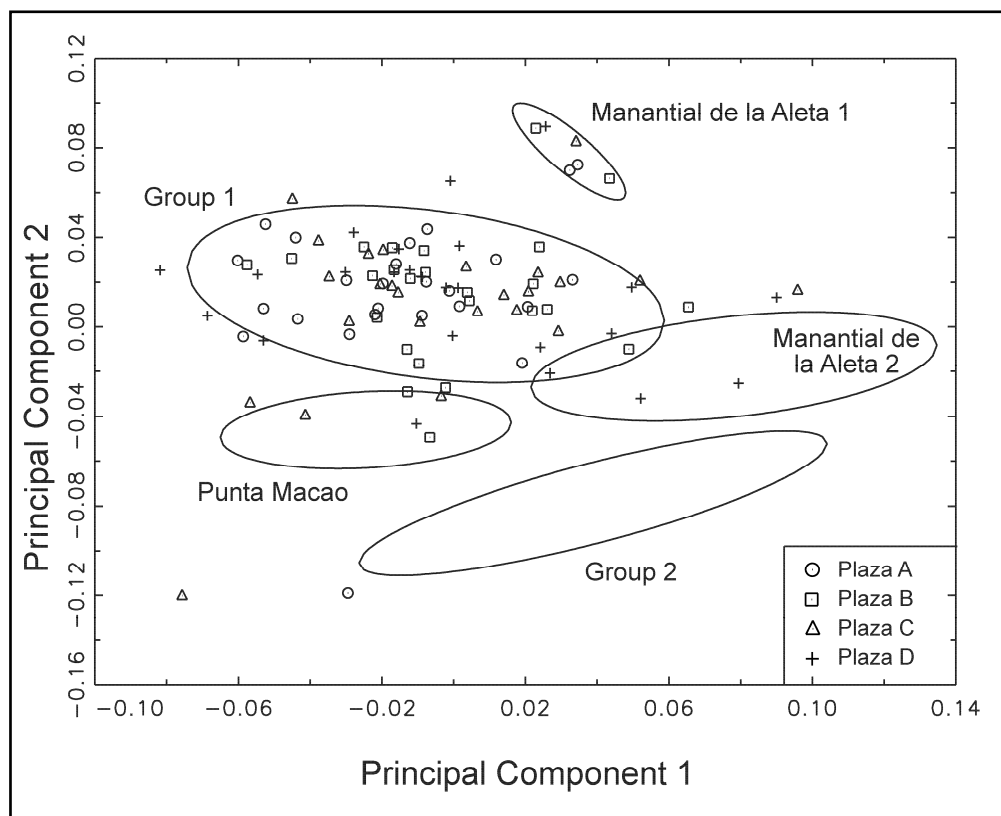


Figure 5. Plot showing the sherds from the four plazas affiliated primarily with Group 1.

of each plaza in different ceremonies, localized and perhaps specialized production of ceramics for use in the ritual activities carried out in the plazas, or both.

Vessel Forms and Compositional Groups

In response to an earlier version of this paper (Conrad, Descantes, VanderVeen, and Glascock 2005), Emily Lundberg (personal communication 2005) asked whether we had attempted to control for vessel form, and whether it might be an important variable. The answer to the first question is “no,” except unintentionally in the case of the sherds from the Manantial de la Aleta. For pragmatic reasons we chose nondiagnostic body sherds from most contexts.⁴

Twenty-two of the 25 specimens from the Manantial can be categorized by vessel form,

however. Sixty-four percent (51 of 80) of the recognizable vessels or fragments recovered from the Manantial were bowls (Beeker et al. 2002), and 68 percent of the identifiable sherds from the Manantial that were sent to MURR (15 of 22) were bowl fragments. Of the identifiable sherds that could be assigned to specific compositional groups, the percentage of bowls in each group ranged from 60 to 100 (Table 2). This limited evidence suggests that the percentage of bowls in each compositional group mirrors the percentages in the sample submitted to MURR and the total assemblage from the Manantial; we suspect the same is true of other vessel forms as well. Accordingly, there does not appear to be a strong correlation between vessel forms and compositional

groups, but at this point the sample is really too small to permit definite conclusions.

Conclusion

Clearly, our sample sizes are small, and Ronald Bishop (personal communication 2006) has rightly characterized our results as “equivocal.” Accordingly, our interpretations can only be viewed as preliminary. Nonetheless, the results do indicate that compositional analyses have the potential to make major contributions to Caribbean archaeology—even if all they do at this point is call our attention to new questions. What do the INAA results tell us about La Aleta? Did the Manantial serve a regional population, whereas the plazas were used only by local groups? Was pottery “mass-produced” for use in activities connected with the plazas, but not the Manantial? If so, does that mean the Manantial was reserved for use by regional elites, while the plazas were accessible to local commoners? Was the Manantial in some way a more sacred space than the plazas?

It is true that our results to date can provide at best equivocal answers to these questions. Nonetheless, without INAA analysis we

could not address these problems, because the ceramics from the different contexts look the same stylistically. In fact, without the INAA analysis, would we even know that these questions existed? The analysis of additional samples from the sites under consideration here, as well as samples from clay sources in the region, would not simply support or cast doubt on our current interpretations. As above, they would lead us to new research questions about the Taíno occupation of the Parque Nacional del Este region. In terms of even broader, longer-term implications, the work presented here indicates that compositional analysis has the potential to reveal significant spatial groupings, and ultimately temporal groupings as well, in Caribbean artifacts. If so, it can make powerful contributions to a host of questions in Caribbean archaeology that are now debated inconclusively on the basis of stylistic and documentary evidence alone.

Acknowledgments

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Table 2. Manantial de la Aleta: vessel form by compositional group.

	Group 1	Group 2	LA2	Unass.	Total
Bowl	2	3	6	4	15
Olla	0	0	1	0	1
Jar	0	1	0	2	3
Bottle	0	0	1	0	1
Platter	0	0	1	0	1
Buren	0	0	1	0	1
??	0	0	1	2	3
Total	2	4	11	8	25

Patrimonio Cultural Subacuático, for all they have done to make our research possible. The samples from the Manantial de la Aleta and La Cangrejera were processed through the operating support for the MURR Archaeometry Laboratory by the National Science Foundation (Grant BCS-0504015). Analysis of the samples from the plazas at La Aleta was made possible by a grant-in-aid from the Office of the Vice President for Research (now the Office of the Vice Provost for Research), Indiana University. Tessa Schut and Nicole Little of MURR carried out the preparation and irradiation of the samples. Figure 1 was prepared by Ellen Sieber of the William Hammond Mathers Museum, Indiana University. We are grateful to all of those institutions and individuals for their help. We also appreciate Ronald Bishop's insightful comments on the version of this paper we presented at the original SAA symposium. Any errors of interpretation are our responsibility.

Finally, and with a profound sense of loss, we want to express our thanks to James B. Petersen, who saw value in an early and quite rough version of this paper and went out of his way to tell us so. That was typical of Jim. He was a fine scholar and a warm and engaging human being. We miss him on both counts.

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Notes

¹ For detailed descriptions of the INAA results see Descantes and Glascock (2004) and Descantes et al. (2006).

² The hypothesis as stated here assumes that the pottery found at La Aleta was made elsewhere, or at least with clays obtained elsewhere. Earlier reports on our INAA work presented at conferences (Conrad, Descantes, VanderVeen, and Glascock 2005; Conrad et al. 2006) stated incorrectly that there are no clay sources within 15 km of La Aleta. This claim was based on the initial stage of a survey by Robert Green of the Department of Anthropology, Indiana University. More recently Green (personal communication 2006) has found clay at La Granchorra, about 5 km east of La Aleta.

³ This hypothesis assumes that that all of the plazas are contemporaneous. The available evidence does not indicate any major chronological differences among the plazas (Atilés and Ortega 2001; Ortega and Atilés 2003). For our purposes here, however, the INAA results render the point moot.

⁴ In his discussion of the papers presented at the symposium that was the basis for this volume, Ronald Bishop pointed out that for INAA analyses, diagnostic ceramics are preferable to nondiagnostic ones. We agree, but for the specific analyses discussed in this paper, we deliberately asked for nondiagnostic sherds because we thought it might facilitate approval of our

request. In 2004 Gabriel Atilés (personal communication) told us that he did not know of any earlier requests to remove artifacts from the Museo del Hombre Dominicano for destructive analysis and that, in his opinion, previous administrations of the museum would not have granted one. As it turned out, the administrations of the museum with which we have worked have been extremely helpful in making specimens available for INAA, and we have selected diagnostic sherds for subsequent analyses.

For the initial analysis of specimens from the Manantial de la Aleta, small, undecorated fragments were removed from larger, diagnostic pieces, which is why vessel form is known in most cases.