Polychrome Constellations: Ceramic Provenance and Cultural Interaction through White-slipped Polychrome Ceramics (± 900 – 1250 CE) in the Mayales River Sub-basin, Chontales, Nicaragua

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Chapter 1, Introduction

Decorated ceramics hold a long history of archaeological importance in Nicaragua. Research focused on belonging and non-belonging, following the interpretation of material remains through culture-historical and ethno-historical approaches. However, the biased approach to decorated ceramics emphasized macro-regional interaction without establishing a framework for local dynamics in several areas in Nicaragua, Chontales among them. However, within more recent archaeological approaches, the material culture of the area has been reframed and revisited to understand the dynamic nature of human-environment interaction from the deep past into the present.

During the 18th and 19th centuries, Central America's material culture was caught up in debates of diffusion and complexity. Researchers were guided by their interest in its intricately decorated ceramics and central questions aimed to classify the cultural material of Nicaragua's departments. They wanted to finally classify Nicaragua's material culture as belonging to a Mesoamerican sphere or an Intermediate area between the Andes in the south, and Mesoamerica in the North (Lange et al., 1992).

The first proper archaeological research in Nicaragua was centered on the archaeology of the Pacific coast, whose rich material culture was conveniently taken up to reflect the Mesoamerican cultural influence present in Nicaragua.[1] As a consequence, Pacific Nicaragua's white slipped polychrome ceramics were taken as diagnostics for ceramics when excavated in surrounding regions. This led to a lack of archaeological research with a regional focus within other parts of the country, as research throughout the 20th century continued its macro-regional approach.

In central Nicaragua, specifically in the department of Chontales, research was conducted by Richard Magnus in the 1970s, and Gorin and Rigat in the 1980s. Their approaches to the ceramic material centered on decorations and diagnostics, seen in attempts to stylistically and morphologically correlate material from Chontales to typologies from the Pacific coast. Gorin's approach included a petrographic ceramic study, although his centralization of decorated material withdrew the focus from local developments. Altogether they mobilized a macro-regional narrative of archaeological belonging and non-belonging to the

[1] The material remains of Pacific Nicaragua were later classified under the name Greater Nicoya, a concept that was introduced by Albert Norweb in 1961

Greater Nicoya culture area. This narrative lasted 15 years until scrutinized in the early 2000s (Donner, 2020; Gorin & Rigat, 1987, p. 260; Gorin, 1990).

Projects directed by Alexander Geurds from Leiden University starting in 2007 aimed to re-evaluate the complex local history of Chontales, signifying a changing approach to the material culture of the area. Through centralizing human-environment interaction, the projects provided a more locally focused historical understanding of life in the valley of Juigalpa[2] from pre-colonial times into the present. They did not shy away from interpreting regional and macro-regional interactions, to which they took a bottom-up approach that looked at local dynamics primarily. As part of the project, Donner (2020) set out to create a vibrant (ceramic) chronology that encompassed human occupation in the valley from the earliest material remains into the present. Unlike previous studies, she incorporated non-decorated local ware, which meant that the decorated ceramics, which had taken center stage in previous research, were reduced to their small makeup of the sample, and put into local perspective.

In contrast to the latest ceramic research in Chontales, I aim to bring decorated, white slipped polychrome ceramics back into the spotlight through this thesis. I will do this by affirming their importance as a proxy for connectivity and exchange amongst communities in the valley of Juigalpa, and to trace regional connections with those living outside of the valley. My focus lies in provenance research through compositional analysis, through which I split locally from non-locally produced ceramics to look at import and exchange. I mobilize fabric analysis through macroscopic analysis and exploratory thin section petrography and interpret these through the *criterion of abundance*. For further interpretation I make use of a *communities and constellations of practice* approach to personalize the ceramic record, contextualize my findings, and tell the stories of local ceramic producing communities and regional *(polychrome) constellations*.

My dataset consists of 274 white slipped ceramic sherds from three different sites in the valley of Juigalpa: La Pachona, Roberto Amador I, and Sabana Grande. I finally compare the results from my analysis to existing data from past studies by i.a., Casale (2017); Casale et al. (2020; 2020); Dennett (2016; 2021); Donner (2020). To guide this research, I have set up the following research question: *How can provenance research into white slipped polychrome ceramic material excavated in the valley of Juigalpa, Chontales, reframe ideas*

[2] The area surrounding the modern town of Juigalpa in the north-west of the province of Chontales, located within the Mayales river sub-basin.

surrounding (inter-)regional trade in finished goods and exchange of ideas in regards to white slipped polychrome ceramic artifacts during the period between 900 - 1250 CE?

This question is guided by the following sub-questions:

- Are there communities producing local interpretations of white slipped polychrome ceramics in the valley of Juigalpa in Chontales?
- What is the origin of the imported ceramic artifacts that were found at La Pachona, Roberto Amador I and Sabana Grande; are they coming from a single production center?
- Can we trace related *communities of practice* through white slipped ceramic manufacture?

To tackle these questions, I will start with a literature review (chapter 2). This is meant to situate my research within the archaeological background of Chontales, and to contextualize it further, by touching upon compositional research surrounding polychrome ceramics in Pacific Nicaragua. I will then outline the main principles of the *communities of practice* approach and those of provenance research, explain my sampling strategy and outline the backgrounds of the sites (first half of chapter 3). I then explain the principles of macroscopic fabric analysis and thin section petrographic analysis, as well as the specific methods that I applied (second half of chapter 3). In chapter 4, I lay out the results of my analysis, which I will then discuss in chapter 5, where I will outline the communities and *constellations of practice* that are producing white slipped polychrome ceramic material excavated within the valley of Juigalpa.

Chapter 2, Archaeological Research in Chontales, and its Neighbors

2.1 Introduction

Western exploration of central Nicaragua goes back to some of the early European colonization missions. Spanish chroniclers interpreted the social context they found themselves in and explorers were fascinated by the cultural and natural world around them. Mining became one of the main uses for Chontales in the 19th century, while archaeological explorations and research saw a scientific approach in the 20th and 21st centuries. Archaeological studies in Pacific Nicaragua framed its historical societies through the rich ceramic record, followed by regional interpretations correlated to the Pacific record in Central Nicaragua. During 21st century fieldwork, archaeological research in Chontales shifted its paradigm and centered on local dynamics and ceramics. To date, a chronology of the Valley of Juigalpa has been established describing the human-landscape interactions that have been taking place from early pre-colonial times into the present.

2.2 Geography and Geology

The department of Chontales is one of the fifteen departments and two autonomous areas of Nicaragua (*figure 2.1)*. It lies at the foot of the Central Interior Highlands and marks the transition of the highlands into the Nicaraguan Depression (*Figure 2.2)*. The latter is characterized by the two Nicaraguan lakes and its considerable number of active and formerly active quaternary volcanoes; the former "is dominated by a series of paleo-arc Tertiary volcanic rocks" (Arengi & Hodgson, 2000, p. 47-48). The area can be further subdivided into five geomorphological units covering the old slopes, rolling hills, and volcanic plateaus at the foot of the highlands, as well as the erosional valleys carved by the local rivers and the lacustrine deltas that form the transitions into the lakes (Garayar, 1972).

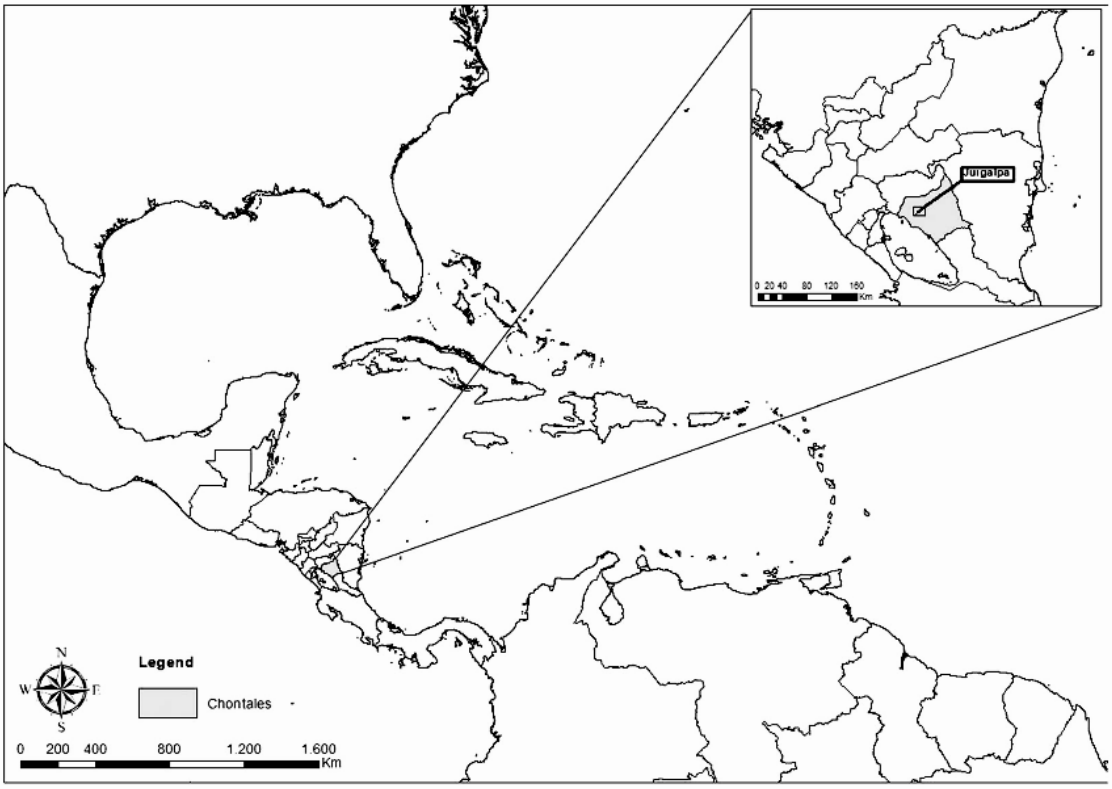

Figure 2.1: Location of the research area in its wider context (Donner & Geurds, 2018, p. 718)

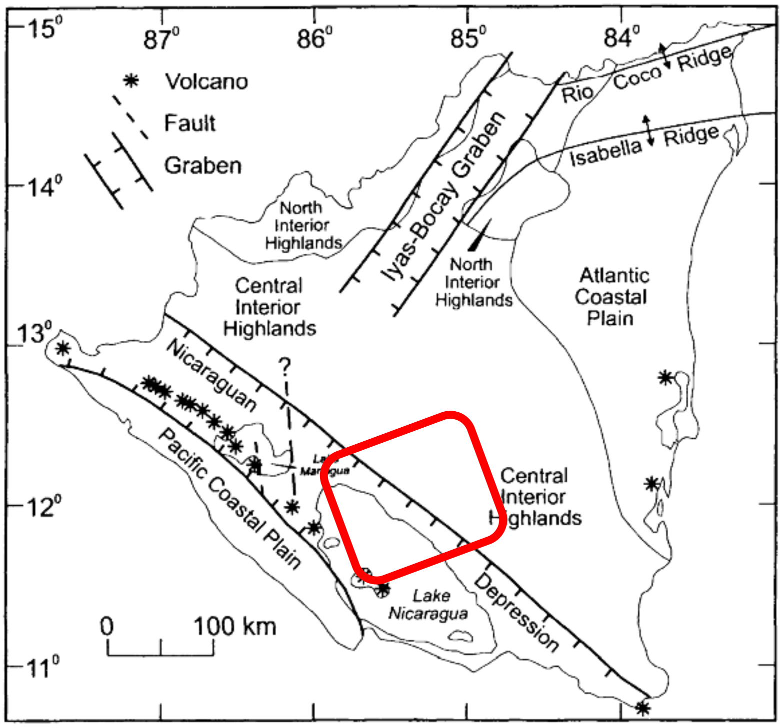

Figure 2.2: Physiographic Map of Nicaragua, the area of this study is demarcated in red (Arengi & Hodgson, 2000, p. 48)

Nicaragua's geology is characterized by volcanism, as reflected in the major groups found within the country (*figure 2.3)*. The stratigraphy in Chontales can be divided into six major groups, summarized in *figure 2.4*. Along with these groups, earlier volcanism is collected under a pre-Matagalpa group. The valley of Juigalpa is the area surrounding the modern town of Juigalpa, it lies in the Mayales river subbasin and is characterized by low lying alluvial terraces, soft slopes that are home to the rivers' main courses, as well as some higher hills (Donner, 2020, p. 21-23). Its geological makeup belongs to "the Matagalpa Group, with volcaniclastic rocks from the Oligocene and Miocene and a few outcrops of lavas associated with the Lower Coyol Group" (Donner, 2020, p. 21).

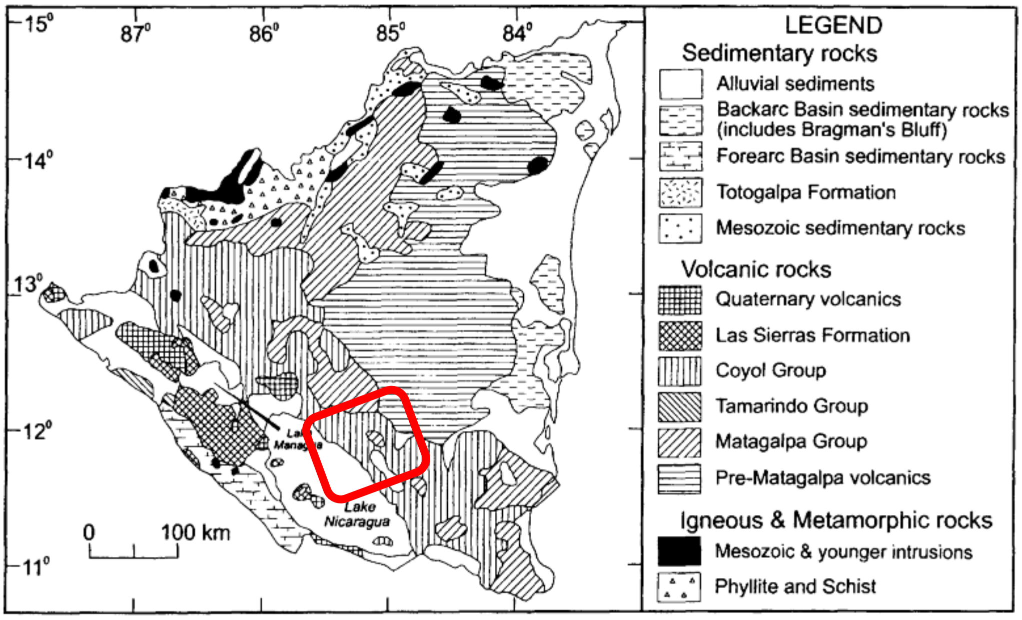

Figure 2.3: Nicaragua's geological areas, the area of this study is demarcated in red (Arengi & Hodgson, 2000, p. 49)

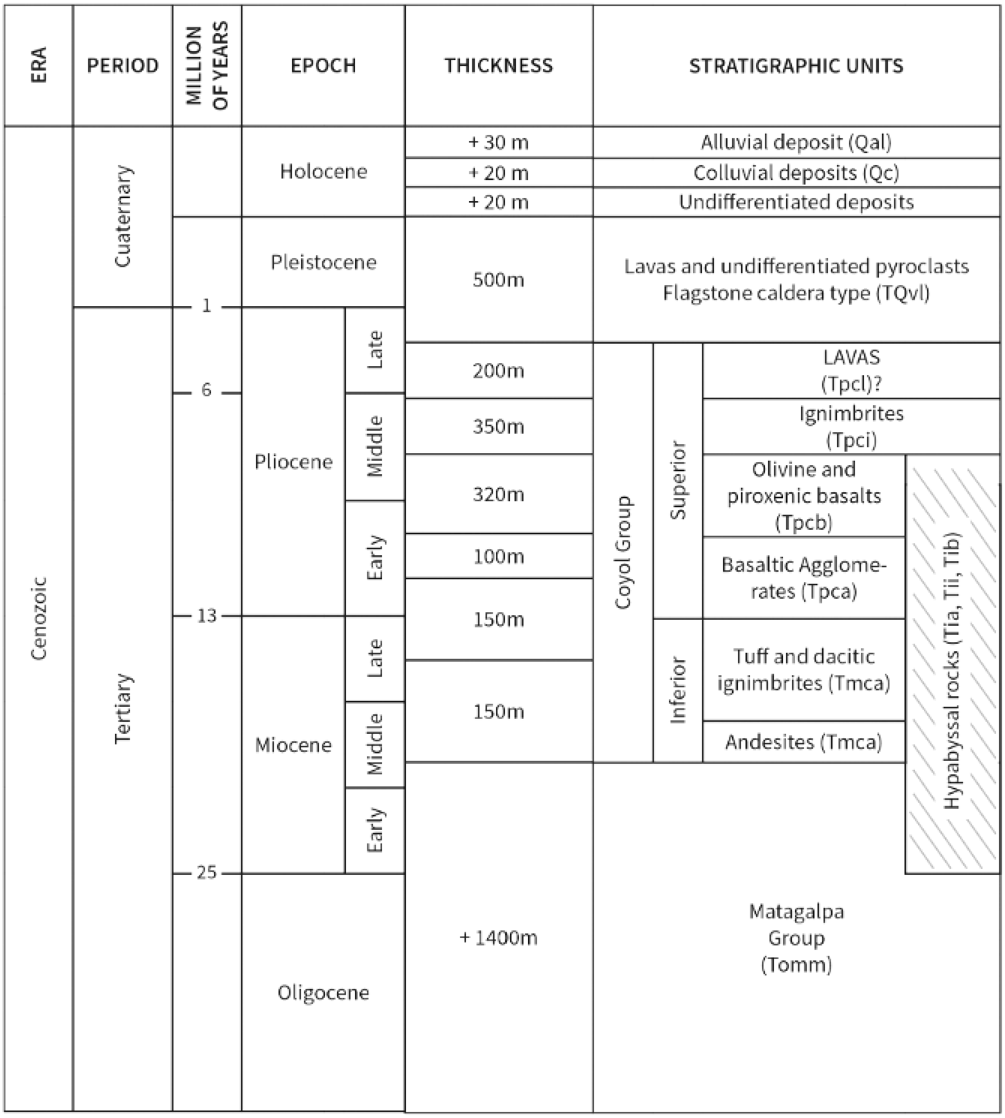

Figure 2.4: The Stratigraphic sequence in Chontales, (redrawn and translated by Donner 2020, p. 21; from Garayar, 1972, p. 16)

2.3 History of Research in Central Nicaragua

2.3.1 Ethnohistorical accounts and Western Explorers[3]

The first western exploration of the modern department of Chontales took place around the end of the 16th century, sometime after the initial Spanish arrival in Nicaragua. Spanish chronicler Gonzalo Fernández de Oviedo y de Valdés is the first to mention the people of Chontales under the name *chondales*, from *chontali*, a Nahuatl word for foreigner (Van Broekhoven, 2002, p. 37, 96; Donner, 2020, p. 39). In the 19th century, explorers continued to write about central Nicaragua, with explorations becoming more "scientific" in nature. In their eyes Chontales, with its central location, was the ideal place to be exploited due to its metallurgic opportunity, the possibility of a railroad to connect the country and a canal to connect both oceans. There are some archaeological accounts from this period that describe the ruins and material culture in the area (Van Broekhoven, 2002, p. 32-33, 46-47). However, it was not until work by Sequeira in 1942, that the first archaeological excavation in Central Nicaragua took place. Although his work is non-scientific, his detailed description and rudimentary classification of the archaeological material reflects an attempt at a more scientific approach. His work had the main goal of establishing a chronology of Chontales, a feat that was only accomplished 40 years later (Van Broekhoven, p. 68-71, 89).

2.3.2 Late 20th Century Archaeology[4]

Following the early (archaeological) explorations of central Nicaragua, the second half of the 20th century brought with it the first scientifically backed archaeological research programs in Chontales. Pioneered by Richard Magnus whose 1975 project focused on mapping the cultural history of Chontales and the Caribbean departments of Nicaragua. Magnus excavated 11 sites, where a small number of polychromes style ceramics led him to tie these sites into trade networks between Chontales and Pacific Nicaragua. His work was based around relative chronologies and the cultural material was compared to Greater Nicoya types due to lack of absolute dating. However, he warned of a Mesoamerican bias and was careful not to tie the appearance of polychromes into a belonging to the

[3] (For an extensive overview of the Western explorations in Central Nicaragua from the 16th century onwards, see Van Broekhoven (2002).
[4] For an extensive overview and summary of the archaeological work conducted in Chontales during the second half of the 20th century, see Donner (2020) and Van Broekhoven (2002).

overarching Greater Nicoya culture area.[5] Instead Magnus saw the cultural development in Chontales as largely independent in nature (Donner, 2020, p. 39-41; Van Broekhoven, 2002, p. 89-92).

In 1983 Frederick Lange, Payson Sheets and Martínez Somarriba conducted a survey in which they visited twenty-six sites, including 5 sites and an archaeological museum within the department of Chontales. Their trip was part of an overarching project to define and classify the Greater Nicoya culture area as having a Mesoamerican influence, being an intermediate area or functioning as a transitional zone between the two. Their analysis of the lithic and ceramic material led them to propose a zoned model of material culture practices in Pacific Nicaragua *(figure 2.5)*. While this survey classified Chontales as a part of Greater Nicoya, the material culture was distinct enough to get its own zone within their model, even though sites were still dated according to Greater Nicoya "diagnostics" due to the lack of a pre-existing chronology in Central Nicaragua (Lange et al., 1992).

[5] The Greater Nicoya concept was introduced by Albert Norweb in 1961 to explain the cultural material he encountered in Pacific Nicaragua

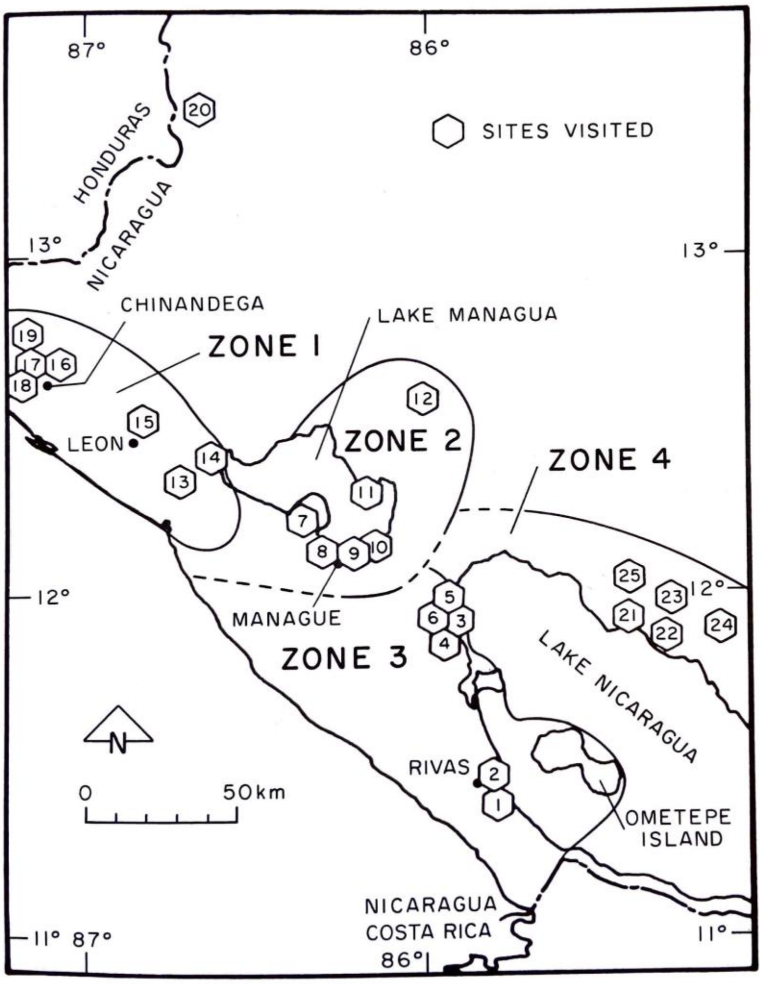

Figure 2.5: Map of archaeological zones in Pacific Nicaragua according to Lange et al., Chontales is in zone 4 (1992, p. 159)

In 1984 Franck Gorin & Dominique Rigat (University of Paris I-Panthéon Sorbonne) started their Proyecto Arqueológico Chontales with the aim of establishing a chronology of human occupation, defining the cultural identity of pre-colonial populations in Chontales, and outlining the cultural and transitional zones between Mesoamerican and South American influences through time (Gorin & Rigat, 1987, p. 258). During 4 fieldwork seasons from 1984 to 1988, they recorded 103 sites organized within 4 zones across Chontales; test pits were opened at 4 sites and covered three types of on-and off-mound contexts. Gorin focused on the ceramic assemblage of over 100.000 sherds, while Rigat focused on the more than 70.000 lithics (Gorin, 1990).

Gorin's stylistic approach allowed him to classify the ceramics according to iconography and morphology and supplemented this with preliminary ceramic petrography. He chose to focus on the decorated ceramics in the area due to their larger variations through time, although they only represented about 15% of the material present. This led to the creation of a biased chronology, with the polychrome ceramics that make up only 5% of the local corpus playing a crucial role in the chronological and ceramic sequence through their comparison with the Greater Nicoya chronological sequence. By basing their research on ethnic movements as reasons for change, macro-regional networks and dynamics took center stage. The chronological sequence was based on diagnostics, local stratigraphy and 9 radiocarbon dates, and dates human presence in Chontales back to 500 BCE. It is structured as follows: Mayales I (500 - 200 BCE), Mayales II (200 BCE - 400 CE), Cuisalá (400 - 800 CE), Potrero (800 - 1200 CE), Monotá (1200 - 1550 CE) and Cuapa (1400 - 1600 CE) (Donner, 2020, p. 10, 42-47; Donner & Geurds, 2018; Gorin, 1990; Gorin & Rigat, 1987, p. 260).

In 1998, Etsu Hasegawa attempted to set up a new project in Chontales. He was hoping to complete the overview of archaeological sites in the region, conduct excavations at mounded sites to learn more about the function, purpose, and dating; and analyze settlement patterns to interpret pre-colonial social structures in Chontales. After a single fieldwork season, during which he confirmed four sites previously reported by Gorin, and recorded eight additional sites that were previously unknown, he had to abandon his project (Donner, 2020, p. 48-49; Geurds, 2023, personal communication).

2.3.3 A Changing Approach: PACEN

Around the turn of the 21st century, archaeological research in Central America broadened and diversified in its scope, with an increase in scientific approaches to the archaeological material. Within Central Nicaragua, this was characterized by the creation and execution of the Proyecto Arqueológico Centro de Nicaragua (PACEN) from 2007 onwards, directed by Alexander Geurds of Leiden University. In the primary years of the project, it was a collaboration between Geurds, Van Broekhoven and Zambrana, who initially intended to expand and re-evaluate the complex history of Central Nicaragua through archaeological research, and to protect and record the cultural heritage present in Chontales. In the following years, the focus slowly shifted towards understanding and interpreting monumentality and complexity, borne out of their interest in the site of Aguas Buenas (Donner, 2020, p. 51; Geurds, 2023, personal communication).

The increased interest led to the dawn of a larger project that ran from 2014 to 2020. It had the aim of providing some measure of historical understanding of human-environment interaction in the valley of Juigalpa through a multifaceted approach to the landscape. This approach included a high-intensity full coverage survey of a 52 km2 area, and the excavation of several mounded sites to redefine the chronology of human presence in the valley (see: Auzina, 2017; *Figure 2.6)*. Most of the research centered around Aguas Buenas, its locality, and its regional and macro-regional interactions from pre-Hispanic times into the present (Casale et al., 2020, p. 108-109; Donner & Geurds, 2018, p. 718).

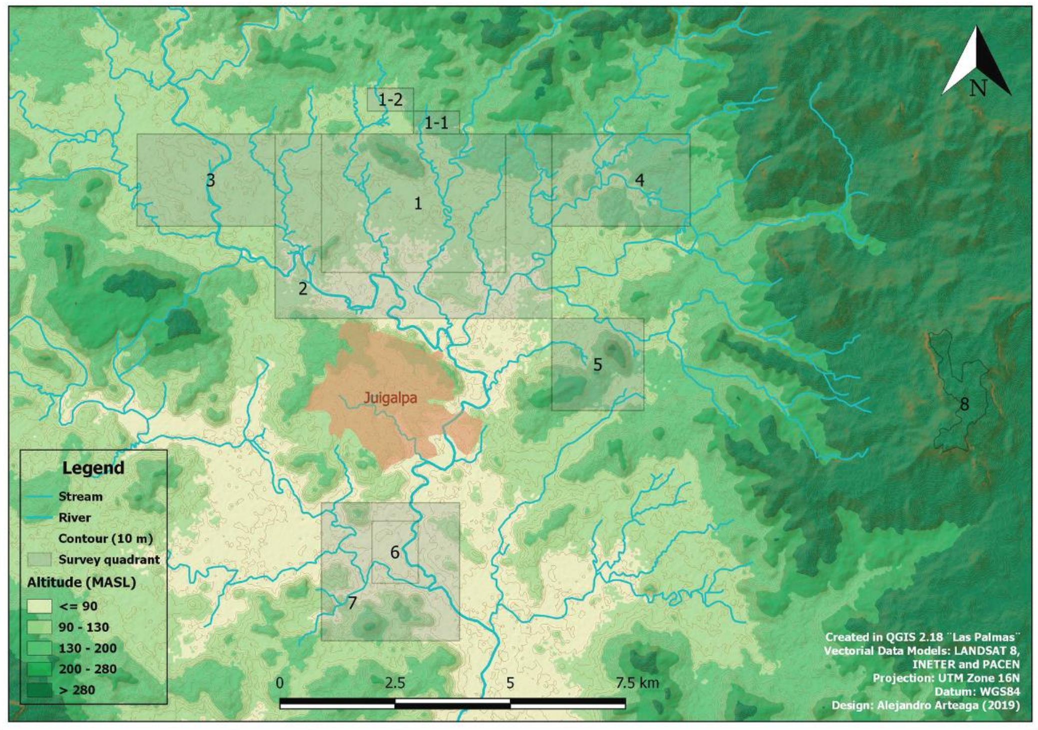

Figure 2.6: Overview of the PACEN research area (Donner, 2020, p. 70)

In terms of archaeometric approaches to ceramic analysis, a clay survey was undertaken in an area of approximately 50 km2, between the Mayales and Carca rivers north of Juigalpa and in the area surrounding La Pachona, south of Juigalpa (Casale et al., 2020, 109). The clay samples were then analyzed by portable X-ray fluorescence (p-XRF), and it was observed that each site in the region has at least one clay source within five hundred meters from the site. Alongside this analysis, ceramics from several sites were analyzed using p-XRF as well as thin section petrography (Casale, 2017; Casale et al. 2020; Donner, 2020).

2.3.3.1 Local Chronology

During PACEN, the ceramic chronology was scrutinized and saw a rearrangement through the work of Natalia Donner, whose 2020 dissertation introduced a new way of looking at (ceramic) chronologies and sequences. She called for an adjustment in the ceramic analysis in Central Nicaragua, stepping away from a sole focus on decoration to a more multifaceted human-environment approach. This new method considered ceramic composition, technology, and style, in a social learning environment, to contextualize ceramic manufacture as a manifestation of human-landscape interactions. It blurred the strict Cartesian chronological boundaries and emphasized the fluidity of human experience, even as it is read in the archaeological record.

Together with Geurds (Donner & Geurds, 2018; 2020), Donner radiocarbon dated twenty-eight samples from 16 different contexts, recalibrated and incorporated Gorin's (1990) 8 radiocarbon dates and, alongside her vibrant chronology, proposed a new cartesian chronology consisting of 6 phases ranging from 300 CE until the present (Donner & Geurds, 2020; Donner, 2020). Phase 2 (900-1250 CE) is the most relevant to this study, and thus a more in-depth overview will follow, phases 1 and 3 will be touched upon for comparative purposes.

The first phase (300 - 900 CE) represents the first human-environment interactions that show up in the archaeological record. This phase reflects a period in which material culture and geometrical mound building practices at the sites of Alberto Obando, Alcides Montiel and parts of Aguas Buenas changed the environment of the valley of Juigalpa for the time to come. Low densities of material traces suggest seasonal practices, while excavations at AB M1 yielded a small number of ceramic imports from Pacific Nicaragua and the Sulaco Valley Technical Complex in Honduras (Donner, 2020, p. 234 - 241; Donner & Geurds, 2020, p. 1508).

Phase two, 900 to 1250 CE, is characterized by population growth and more intensive construction and material use across the valley of Juigalpa in a single, intense occupation period. Areas of Aguas Buenas and Alberto Obando continue to be occupied, while activities at Oporta, Josefa Ocón Robleto, Sabana Grande, Roberto Amador and La Pachona start showing up in the material record. The site arrangements during this period indicate non-planned growth due to a departure from geometric patterns. The increasingly drier environmental conditions allow for construction to take place on alluvial terraces along permanent streams and rivers, and there is an overall increase in the number of mounded sites which cover a larger area of the valley than during the previous period. Sites comprised several mound clusters which held perishable wattle and daub structures on top. The open spaces surrounding the mounds were used for pedestrian circulation, along with food and drink preparation. Waste was discarded next to the mounds. Unlike previous times, sites with monumental architecture yield three-dimensional stone sculpture and the pre-existing ground and chipped stone industries are expanded by obsidian and bifacial technologies.

The ceramic technology shows continuity and change in the form of new vessel shapes (i.e., introduction of colanders and *molcajetes*), while technical similarity and differentiation suggest ties between certain communities and *constellations of practice* within the area. Vessel morphology differs between contexts pointing to differing uses of sites. The appearance of standard paste recipes at certain sites (i.e., Sabana Grande, La Pachona & Roberto Amador I) suggest higher degrees of specialization than in the previous phase but could also point to a higher number of producers. Slipping is the most common decoration method, with red, orange and brown being the most common colors, only a small percentage of the assemblage is slipped white. Materials (ceramic and obsidian) with visible aesthetic and morphological similarities to materials from Pacific Nicaragua and Honduras are found all over the valley, indicating regional and macro-regional connections (Donner, 2020, p. 241-247; Donner & Geurds, 2020, p. 1508 - 1509).

Following this period, human-environment interactions show continuity and discontinuity between 1250 - 1450 CE. The period is characterized by two differing contexts: Barillas and Rosa Dolores Oporta (RDO), delineated by their different material practices and building techniques. The population density across the valley decreases from the previous period, sites show a single occupation period and communities seem less connected. Both sites see a return to geometrical mound organization, which are constructed following the traditional techniques seen in the valley since 300 CE. Plazas are surrounded by larger mounds, structures are still made from wattle and daub, and there is a continued association to permanent water sources. Ceramics at Barillas show a connection to Northeastern Honduras but both Barillas and RDO have a minimal number of material culture imported from or resembling that of Pacific Nicaragua. Three-dimensional stone sculpture or bifacial technology is no longer present at the sites, although a single obsidian piece was excavated at RDO (Donner, 2020, p. 247 - 250; Donner & Geurds, 2020, p. 1509).

2.3.4 Ceramic Research in Pacific Nicaragua

Pacific Nicaragua has also seen a shift in archaeological methodology and research scope in the past few decades, especially surrounding the interpretation and analysis of polychrome ceramics (for overview of research in Pacific

Nicaragua see: Dennett, 2016; Steinbrenner, 2010; 2021). The shift in methodology contrasts the earliest work on polychrome type ceramics in the area by Samuel Lothrop, who stylistically classified the ceramics he encountered in the later determined Greater Nicoya culture area (Lothrop, 1926). In the first decade of the 21st century, Larry Steinbrenner, under supervision of McCafferty of the University of Calgary, (2010; 2021) applied a type-variety based approach to the ceramics of Pacific Nicaragua. This signaled a slow change in approach to the ceramics of Pacific Nicaragua through his critique on the inability to investigate intertype relationships and intertype continuity within this approach. He concluded that Pacific Nicaraguan polychromes are a product of a common potting tradition and that polychrome styles might be indigenous to southern central America rather than imported through ethnic movement (Steinbrenner, 2021, p. 216).

Carrie Dennett (2016; 2021) has taken a more compositional approach to the analysis and interpretation of polychrome producing communities. Dennett's archaeometric research into the polychrome ceramic economy of Pacific Nicaragua focused on mapping communities, constellations, and networks of practice throughout the area, and reframed the Greater Nicoya concept into a long-term ceramic network. Her methodology centered thin section petrography, Instrumental Neutron Activation Analysis (INAA) and comparative volcanology, which allowed her to define the ceramic economy of Pacific Nicaragua on a period-by-period basis and identify and interpret the local communities and *constellations of practice* operating in the Granada and Rivas areas.

The ceramics of interest in this thesis fall within the Sapoá period[6] (800–1300 CE). During this period, the ceramic economy of Pacific Nicaragua became increasingly centralized in its organization, upscaled its ceramic manufacture and its levels of ceramic standardization. Emergence of new *constellations of practice* through direct involvement in mass production of ceramics led to the creation and distribution of more standardized pastes of white slipped polychrome ceramic in a number of different complexes across Pacific Nicaragua (Dennett, 2021, p. 211-244, 293-294).

[6] The chronological sequence in Pacific Nicaragua is as follows: Orosí (2000–500 BCE), Tempisque (500 BCE–300 CE), Bagaces (300–800 CE), Sapoá (800–1350 CE) and Ometepe (1350–1550 CE).

2.3 Conclusion

Ceramics in Nicaragua have a long history of importance for local chronology building, interpretation of regional and interregional dynamics, and migrations. However, critiques on and changes in methodology and interpretation are solidifying through an evolution of archaeological chronologies. In more recent decades, Archaeological research is taking a step away from a distinct, type based ceramic sequence and is embracing ceramics as a manifestation of natural and cultural interaction seen in recent research by Steinbrenner (2010, 2021), Dennett (2016, 2021) and Donner (2020). I will be following this change in perspective in terms of methodology and will be applying archaeometric techniques in the form of compositional analysis to investigate local dynamics and landscape interactions through the lens that ceramics offer us. Following Dennett (2016), I will make use of different layers of analysis and interpretation through a *communities and constellations of practice* framework that centers human interaction within a social environment.

Chapter 3, Methodology & Theoretical Approach

3.1 Introduction

To answer my research question, I have done compositional analysis with a focus in provenance research. My methods consist of macroscopic fabric analysis, through which I created fabric groupings. I then took 1-3 samples from these groups to be analyzed through thin-section petrography and compared my results to pre-existing studies by Casale et al. (2020), Dennett (2016), Donner (2020), and existent geological information about the research area by Arengi & Hodgson (2001), Garayar (1972). I will then use a *communities and constellations of practice* framework to guide the interpretation of the results.

3.2 Communities and Constellations of Practice

Within my research, I centralize a *communities and constellations of practice* approach to not lose track of the human-environment interaction within my compositional analysis. The *communities of practice* concept was first introduced by Lave and Wenger (1991) in their book *Situated Learning*. Here, they define a *community of practice* as a group identified by a shared practice and "repertoire of resources," setting them apart from others. While working within the domain, members of the *community of practice* engage in sustained contact with one another which enables them to learn and identify together. Within the community, membership is not inherent through proximity or genealogy, but through sustained contact through the craft. Communities thus crosscut traditional boundaries such as ethnicity (Joyce, 2020; Wenger-Trayner & Wenger-Trayner, 2015).

Within archaeology, the *communities of practice* approach has seen a rise in popularity over the past few years, because it presents an alternative to a culture history or taxonomical approach to material culture (Joyce, 2020, p. 35-36; Roddick and Stahl, 2016). In this context, communities "relate to the organization and function of 'traditional' artisanal groups and their associated technologies" (Dennett, 2016, p. 38). By centralizing interaction between human and non-human actors, crafts and crafting communities are interpreted as manifestations of social relationships and cultural practices. This allows for a more personal interpretation of the archaeological record (Roddick and Stahl, 2016; Stark, 2006).

Constellations of practice scale up from *communities of practice* as they are "[interconnected] communities of varying size, form and distance from one another" (Dennett, 2016, p. 40), incorporating participants based on broader shared technological traditions, history, kinship, alliances, and/or similar ideology. *Constellations of practice* have a larger spatial extent and connect multiple local systems through increased indirect exchange of goods and information (Stark, 2006, p. 26). "The contrast with *communities of practice* is the "scope of engagement" – not a geographic scale, but a *level of interaction* that we can visualize as a grouping of people working together and understanding each other as in some sense an identified collectivity" (Joyce, 2020, p. 42). Boundary objects are central to defining communities existing within a constellation. They provide an analytical framework that shows how things (i.e., locations or decorative styles) can bridge, mediate, or form liminal spaces between communities, while still allowing distinct traditions to exist between communities (Roddick and Stahl, 2016, p. 10).

Within Nicaraguan archaeology, the *communities of practice* framework was used by Dennett (2016) to contextualize and place localized style variations and changes amongst communities into a social network, a network of practices. This network allowed her to step away from identifying ethnic or linguistic groups as agents of cultural change. made a more dynamic view of the ceramic economy possible and allowed for a human interpretation of compositional approaches to archaeological material.

3.2 Sampling Strategy

For this research, I took my dataset from the samples present at Leiden University. The samples were taken during different fieldwork seasons of PACEN and were thus already present as a sample of the complete archaeological record in the Mayales river subbasin. I initially chose to pick out all white slipped ceramic sherds that I could find, regardless of the site they were from. Once I grouped all sherds by site, I was left with a number of sites that had numbers of white slipped sherds that were too low for me to work with (<15). So, I chose to analyze the three sites that had the highest number of white slipped sherds: Sabana Grande (LD), La Pachona (LP), and Roberto Amador I (RAI) (*table 3.1)*. Of these three sites, Sabana Grande has the highest number of white slipped sherds by far. This is important to keep in mind while working with the samples, but it makes sense considering the size of the site and the high density of ceramic material present on the surface and subsurface (Arteaga, 2017; Donner, 2020). I chose to focus on all three sites rather than just Sabana Grande because the *communities and constellations of practice* approach allows me to take a more regional approach to the ceramic material. By focusing on all three sites, I hoped to gain more insights into local, inter-site dynamics.

Site Name	**Site Code**	**Nr. of White Slipped Sherds from Site**
La Pachona	LP	35
Roberto Amador I	RAI	37
Sabana Grande	LD	201

Table 3.1: Number of white slipped sherds per site taken up in my sample

3.3 Provenance Research

Provenance research looks at the source of ceramic artifacts in relation to the sourcing of raw materials and the production location. Locating the production center of ceramics can give insights into trade and exchange, mobility, and migration, to learn more about local economies and cultural exchange. Given my research question, my focus lies on splitting the local ceramics from the non-local ceramics to get an overview of the exchange of ideas and goods.

Provenance research often makes use of compositional analysis in the form of macroscopic fabric analysis, thin section petrography and geochemistry. It is assumed that the makeup of the ceramic directly reflects the geological makeup of the clay source(s) and tempers used. So, through comparing the ceramic material to geological information about the area at hand, the production location can be broadly determined (Degryse & Braekmans, 2014, p. 192 - 193; Quinn, 2022, p. 167 - 203).

As there is little information on white slipped ceramics within Chontales, I take the *criterion of abundance* as a central part of my analysis to explore the differences between local and imported material. This principle “assumes that a particular type of ceramic object or, in the case of thin section petrography, a specific fabric will occur in its greatest abundance near to its place of origin, and its frequency will decay with increasing distance from the source” (Quinn, 2022, p. 169). Once we are aware of the production locations of ceramic material, we can place the ceramics and their producers within networks of *constellations of* *practice* to better understand how the raw materials, finished products as well as ideas and cultural practices moved around in the area.

3.4 Site backgrounds

The three sites covered in this thesis: Sabana Grande, La Pachona and Roberto Amador I, all have similar locations in relation to fresh water sources and elevation, as well as the highest variety in ceramic technology within their assemblages. However, there might be a slight bias in the sample, as these site contexts had the highest concentrations of ceramic surface material in the area (Donner, 2020, p. 85, 87). The archaeological assemblage points to a regional focus of intense production practices meant for local consumption and exchange, and possible production with perishable materials at these sites (Donner, 2020, p. 241-247).

All three sites have a history of archaeological analysis that goes back to archaeological fieldwork by Richard Magnus back in the 1970s. The sites were revisited by Gorin and Rigat during their field projects and were of interest during PACEN as well. Sabana Grande and Roberto Amador I were described in depth by Alejandro Arteaga as part of his master's thesis, RAI is also part of research being done by Irene Torregiani on the fluvial and social dynamics in the area.

3.4.1 Sabana Grande

Sabana Grande is located on a plain flowing into a low hill, just south of where the Carca and Manigua streams meet. Its mounds are part of a larger cluster of four sites that includes Josefa Ocón Robleto II. The site currently consists of eighty mounds, spaced out in a non-geometrical way. The alignment of the large mounds at the site is like other sites in the area but the presence of a *plaza* or a structured spatial organization at a larger scale is hard to identify due to deterioration. Sabana Grande is assumed to be one of the largest sites in the region due to the high density, diversity and distribution of material remains. These include imported ceramic material from Pacific Nicaragua, stone sculpture, and obsidian tools. Over the past 50 years, the site has been used for agricultural purposes due to its fertile soils, which led to the destruction of a part of it. There used to be more mounds, but these were removed to facilitate plowing. Sabana Grande has also seen frequent looting during this time (Arteaga, 2017, p. 316-319; Donner, 2020, p. 241-242).

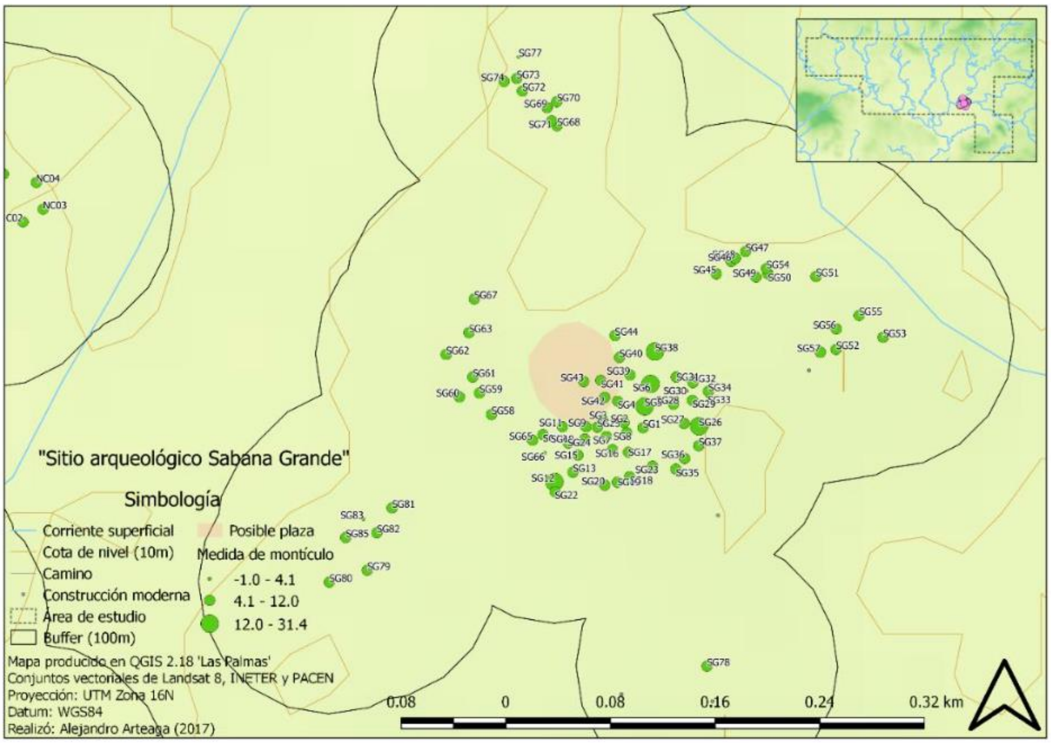

Figure 3.1: Map of Sabana Grande (Arteaga, 2017, p. 319)

3.4.2 La Pachona

La Pachona is located at an altitude of 80m. It lies about 200m west of the Mayales river and 300m north of the Cuisalá river. The site has twenty-seven mounds, and nine possible additional structures, arranged in a non-geometrical pattern. The mounds surround a large open space at the center, which could have functioned as a plaza. There is a lot of material diversity, which includes polychrome material, bifacial lithics and some stone sculpture. There are also some on- and off-mound human burials present at the site. Since the 1980s the land has been used as farmland (Donner, 2020, p. 45, 256; Gorin, 1990, p. 206 - 219).

Figure 3.2: Map of La Pachona, the circular structures represent the mounds, black squares represent burials (Gorin, 1990, p. 207)

3.4.3 Roberto Amador I

Roberto Amador I consists of fifteen mounds and is located on top of a river terrace that forms a meander of the Mayales river. There is a high diversity of material: ground and chipped stone, metates with zoomorphic motifs and ceramic material thought to be imported from Pacific Nicaragua. Like Sabana Grande, the presence of a plaza is speculated based on the arrangement of the larger mounds, but no clear geometrical organization of mounds is visible. Human interments are present in on- and off-mound contexts. Roberto Amador I is the northern half of the site Roberto Amador. The southern half, RAII has only eight mounds which are also arranged in a non-geometrical pattern. The current owner of the land is Roberto Amador, who uses the area for cattle ranching (Arteaga, 2017, p. 312-314; Donner, 2020, p. 256).

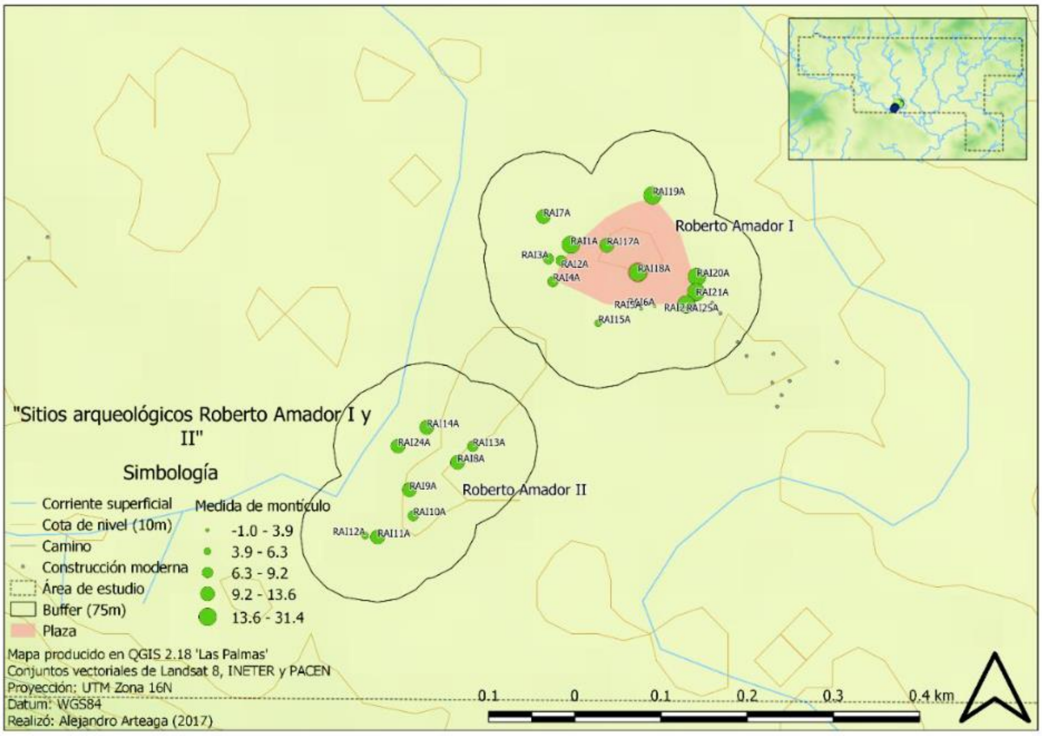

Figure 3.3: Map of Roberto Amador I and II (Arteaga, 2017, p. 314)

3.5 Methods

3.5.1 Macrofabric Analysis

Macroscopic analysis of ceramic fabric is often used as a method to preliminarily group ceramic sherds based on their composition, although it can also stand alone as a method. Macrofabric analysis makes use of a lower magnification, often in the form of a hand loupe or low power microscope. Like thin section petrography, macrofabric analysis can be used to answer research questions surrounding provenance and technology. The fabric (or paste) consists of the clay matrix, as well as inclusions within the clay as a result of natural processes and technological choices by the potter. The analysis of the fabric yields a lot of information about the use of raw materials, technological choices during manufacture and post-depositional processes that took place. To ensure the best look at the fabric of the ceramic artifact, a fresh break is needed as the surface of the ceramic might be affected by post-depositional processes. However, unlike in thin section, inclusions smaller than sand size cannot be identified, and optical properties of minerals cannot be distinguished under plane or reflected light (Orton & Hughes, 2013; Quinn, 2022, p. 151-162).

For this research, my compositional analysis started with a macroscopic analysis of the fabric of all the sherds in my sample. I used a microscope with low magnification (6x & 12x, 60x) and reflected light. To attain this fresh break, I cut a piece of the vertical axis of every sherd using a pair of pincers. For the analysis itself I followed the guidelines and tables in Donner (2020, p. 143-146) and grouped my samples according to the form of the fresh break, fabric color and firing/oxidation, as well as the type, size, sorting quality, orientation, and roundedness of the inclusions, among others. I grouped my sherds per site to have a better overview of the sample as well as inter-site similarities and differences. I then completed the macrofabric group form (*figure 3.3)* for every group separately and picked 1-3 samples from each group to be processed for thin section petrography.

PACEN 2016/17
Ceramic
Macro-Fabric
Group

Form
Page 1/2

Contextual Data	
Macro-Group Code	
Site	
Excavation Unit	
Stratigraphic Unit	
Level	
Bag #	
Weight	

Color		
Cross section	Core	
	Int. Margin	
	Ext. Margin	
Internal Surface		
External Surface		
Slip		
Paint		

Inclusions	
Identity	
Frequency	<5% - 5% - 10% - 15% - 20% - 25% - 30% - 35% - 40% - 45%
Size	Pebbles / Granule / Very Coarse / Coarse / Medium / Fine / Very Fine / Silt
Sorting	Very well sorted / Well sorted / Moderately sorted / Poorly sorted
Roundness	High / Low Sphericity
Shape	V. Angular / Angular / S-Angular / S-Rounded / Rounded / W. Rounded / Irregular / Flat
Orientation	Parallel to wall / Sub-Parallel to Wall / Horizontal / Oblique / Concentric / Chaotic
Color	

Voids	
Visible	YES - NO
Shape	Plate-like / Oval-Sphere / Rhombs / Irregular
Orientation	Parallel to wall / Sub-Parallel to Wall / Horizontal / Oblique / Concentric / Chaotic

Other Characteristics	
Hardness	Soft / Hard / Very Hard
Fracture	Subconchoidal / Smooth / Fine / Irregular / Hackly / Laminated
Feel	Harsh / Rough / Smooth / Soapy / Powdery

Core-Margin Relationships	
A	1 - 3 - 5 - 7 - 9
B	2 - 4 -6 - 8 - 10

Figure 3.4: PACEN Macrofabric form (credits: Natalia Donner)

3.5.2 Thin Section Petrography

Thin section petrography is one of the oldest scientific methods used for compositional analysis in archaeology. It uses principles from optical mineralogy to identify rock and mineral inclusions within clay and ceramic samples. Thin sections are 30µm thick sections of a ceramic artifact, fixed onto a microscope slide and analyzed at high magnifications (25x - 400x). The microscope uses plane polarized light (PPL), similar to regular transmitted light, and crossed polars (XP), which polarizes light in two different directions and interacts with the minerals in the thin section to produce optical effects that aid in the identification of minerals (Quinn, 2022, p. 13). Ceramic petrography can be used to tackle questions related to composition, technology, and provenance, as the compositional makeup reflects the availability of raw materials (Quinn, 2022, p. 16).

Within a thin section, the ceramic fabric consists of three main components: the clay matrix, inclusions, and voids. The matrix is the dominant brown material which is often homogenized within analysis.[7] The color of the matrix can vary within a single thin section, pointing to the use of different clay sources as well as uneven firing. The optical activity of the clay[8] under XP can tell us about the firing temperatures and conditions (Quinn, 2022, p. 47-52). Inclusions are the "isolated particulate bodies within the matrix" (Quinn, 2022, p. 47). They can consist of minerals, rocks, and organic materials. Inclusions are naturally present within clay, but potters also add them as i.e., temper to improve the workability of the clay (Quinn, 2022, p. 52-76). Voids "are holes where no matrix or inclusions are present" (Quinn, 2022, p. 47) and are naturally present in clay. They can increase in number and/or size during the ceramic manufacturing process during the forming and drying of artifacts, or due to the destruction of organic material during firing. Voids influence the density, shrinkability and thermal conductivity of ceramic material (Quinn, 2022, p. 76-86).

To make the best use of the limited time that I have for this thesis,[9] I have chosen to focus on explorative petrography. With pincers, I cut off about 2-centimeter chips of the samples I selected, these were then sent to the lab to be processed. During my analysis, I made fabric groups based on visual differences in the matrix, voids, and inclusions, seen at 40x - 100x magnification in plane polarizing light (PPL) and crossed polars (XP) using a Leica DM2700P microscope located at the Material Culture Laboratory at Leiden University's Faculty of Archaeology. I decided to let go of the site boundaries of my macro fabric groups to emphasize regional similarities. However, the sherds all have site codes to easily retrace their original contexts. After creating the groups, I compared them to my existing macro fabric groups as well as to existing petrographic research in the area (i.e., Casale, 2017; Casale et al., 2020; Donner, 2020; for petrographic research in Pacific Nicaragua and Greater Nicoya, see for example: Dennett, 2016; 2021).

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[7] Clay particles are too small to be analyzed in thin section.
[8] This is elated to sintering and vitrification on the birefringence of clay minerals, for a more in-depth explanation see: Quinn (2022)
[9] The thin section samples that were sent only arrived late march rather than early January.

3.6 Conclusion

Provenance research often makes use of a compositional approach as it best lends itself to the questions being asked. In my case, macrofabric and thin section analysis, although destructive, allowed for the best use of the sample available due to its small size. Grouping the sherds by fabric and interpreting them through the *criterion of abundance* allows me to see whether a local community of polychrome producers might exist in Chontales, and where it is located in regard to the three sites covered.

Chapter 4, Results

4.1 Introduction

The macrofabric results that led to my petrographic results have shown a large regional similarity regarding paste groups. Major groups depend on differences in inclusion identity and paste composition, while subgroups show smaller differences in technological variation. The assemblage seems to have originated at a number of different production centers, however following the *criterion of abundance* it might be possible that I am dealing with a group of local potters that produced white slipped vessels.

4.1 General Macrofabric Results

My dataset consisted of 274 sherds. These were divided into twenty-eight fabric groups distributed over the three sites covered (LP, RAI, and LD). Overall, the sherds were small (2-5 cm) in size, with larger sherds present in the groups with larger sample sizes. The ceramics are composed of a couple of different main clays, which I classified by color: red and reddish brown, tan/light brown, dark brown, and grayish/blueish black. Inclusions were mostly sand sized with some coarse gravel; often present inclusion identities are quartz and feldspar, as well as mica, iron, and grog (blue, yellow, and orange). The presence of a distinct colored grog defines certain fabrics: blue grog and clay (*figure 4.1)* is only present in three groups across the entire assemblage, and these are thus assumed to originate from a different context. All groups contain inclusions with high sphericity and sub-rounded to sub-angular clasts, reaffirming the importance of rivers in the area and thus pointing to local manufacture of ceramics.

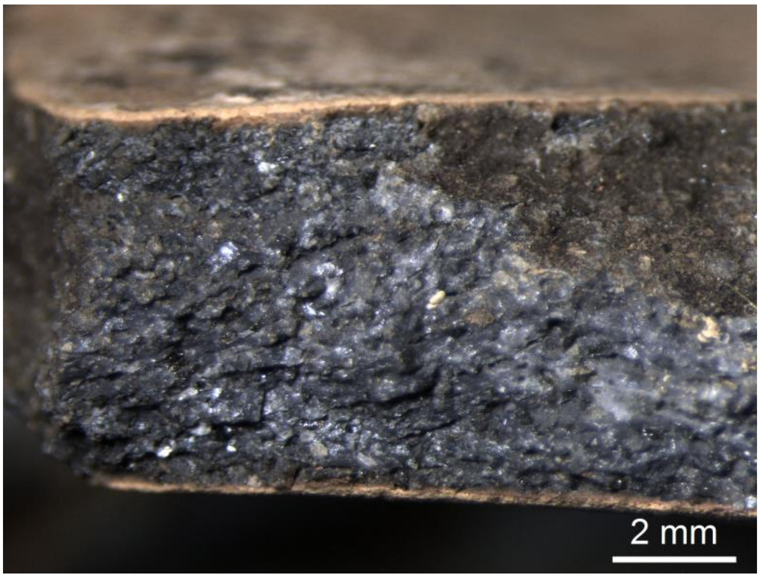

Figure 4.1: Example of a blue clay group, sample LD2-VIII4-1-V3 (100x)

Slips are present on both surfaces about half the time and range in color from white to gray. Gray slips are often a result of overfiring or burning, either during the use-life of a vessel or as a post-depositional process (Donner, 2022, personal communication). Some slips are light red and pinkish white in color, due to the thinness of the slip layers. Paint is often black and/or red, with some discoloration due to burning. The designs that are still visible on some sherds often feature thin lines of about 2mm thick. A small number of sherds have decorative incisions.

The macrofabric groups that I initially created are over split, especially compositionally. Technologically, these sherds show slight differences regarding raw material processing and clay preparation (more/less inclusions and degree of sorting), but they are compositionally similar in terms of paste and inclusion type. Some of the groups could thus be classified as sub-groups rather than stand-alone groups within the assemblage (i.e., LP-C, LP-D and LP-E) (*Figure 4.2 & 4.3)*. I have summarized the results from the macroscopic fabric analysis in *Appendix 1*.

Figure 4.2: Group LD-B, sample LD2-XII4-1-V3 (100x)

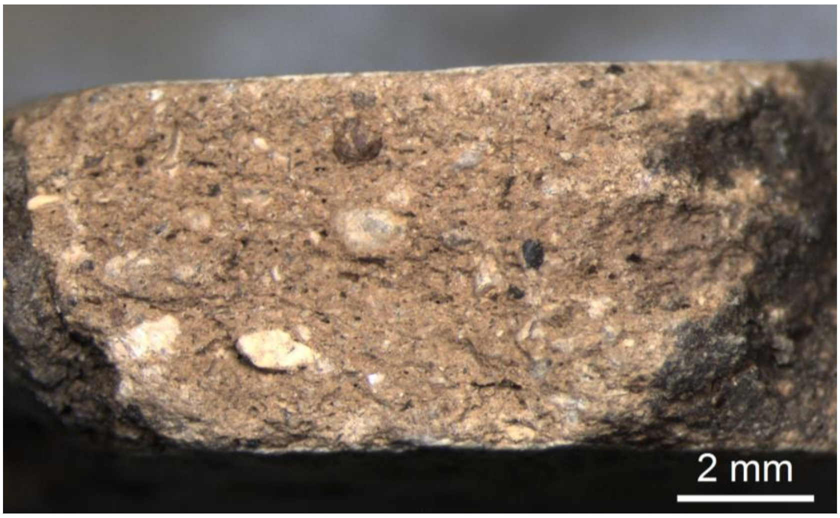

Figure 4.3: Group LD-C, sample LD1A-V3 (125x)

While creating the macroscopic fabric groupings, I noticed significant compositional similarities amongst groups from different sites. Sherds, across contexts, seem to originate from the same production centers. Considering this, I decided to take a more macro-regional approach and group all sherds together within the petrographic fabric groups, regardless of their site of origin. Along with this being a methodological recommendation given in Quinn (2022, p. 162),[10] the thin sections all had a code that allowed me to trace them back to their macrofabric group of origin.

[10] It allows for a less biased view from the researcher.

4.2 Macrofabric per Site

4.2.1 La Pachona

La Pachona has three distinct groups with red pastes, these have similar inclusions but there are some technological differences in the manufacturing process, as mentioned before. Due to the small number of sherds within the La Pachona assemblage I had the time to extensively look at each sherd and focused on the technological differences to group them separately.

4.2.2 Roberto Amador I

The assemblage from Roberto Amador I is the smallest in total number of sherds, however sherds are most evenly distributed amongst the fabric groups. Here, the red paste groups do not make up as large of a majority compared to red groups at the other two sites. However, I still chose this group to sample for compositional analysis, due to its similarity to the red pastes at the other sites. What this seems to indicate is that there was no white slip ceramic manufacturing going on at RAI, and that all white slipped sherds excavated here arrived through exchange and trade.

4.2.3 Sabana Grande

The ceramics from Sabana Grande make up the largest part of the assemblage; this site also has the largest number of fabric groups. There are some groups of fabric groupings with similar paste, inclusions, slip and paint, but technological differences in tempers and handling. This has led to pastes with variations in inclusion size and sorting, as well as void shape. Examples of these groups are LD-B, LD-C and LD-D; LD-G, LD-H and LD-I, with LD-F, LD-N as a possible sub-group; LD-K and LD-L. The similarities present among these groups could point to the use of different clay sources or manufacture during different periods, but ceramics could have been created by the same community.

4.4 Thin Section Petrography Results

Following the macrofabric grouping, I chose thirty-three sherds to be processed for thin section petrography. Following the *criterion of abundance*, I picked one sherd per group (where possible), and two to three sherds from the largest groups per site as these had the biggest chance of being locally produced (Braekmans, 2022, personal communication). An important part of this process was to make sure I did not sample sherds from the same vessel, as some fabric groups were made up of multiple sherds from the same ceramic artifact. Sampling codes were made up of the first letter of the site (i.e., L for La Pachona), the letter that indicated the macrofabric group of origin (i.e., A), 22 for sampling year 2022, K for Kai, and a number from 1 to 3 to indicate the number of the sample taken from the group. I kept a spreadsheet to keep track of the original sherd that the sample was taken from. The samples were grouped into 6 major groups, with 3 outliers being present in the assemblage. I created my groups solely based on visual differences (due to the time constraints mentioned earlier) regarding fabric color, inclusion density, sorting and orientation, void shape, and optical activity. Putting all sherds from the three different contexts together allowed me to create fewer groups that were larger in number and thus representative of the entire assemblage. *Table 4.1* summarizes my petrofabric groups with preliminary descriptions, *figures 4.4* to *4.9* show the petrofabrics:

Table 4.1: Petrographic fabric groups with preliminary results

Group	Color	Inclusions	Optical activity	Voids	Samples
Group 1	Orangey yellowish brown, pale firing	30%	Active	Planar and channel	LC22K1, LC22K2, LD22K1, LE 22K1, RG22K1, RG22K2, SF22K1, SG22K1, SG22K2, SH22K1, SH22K2, SI22K1, SI22K2, SM22K2
Group 2	Orangey yellowish brown, pale firing	15% - 20%, moderately - well sorting	Active	Channel voids, oriented sub-parallel to parallel to the walls	RA 22K1, RD 22K1, SK 22K1, SN 22K1
Group 3	Pale firing	25% - 35%, average - fine in size, moderately sorted, randomly oriented	Active	Vugh and planar shaped voids	LA 22K1, RC 22K1, SB 22K1, SD 22K1
Group 4	Orangey color, pale firing	15%, moderately sorted		Planar shaped, grassy voids	RB22K1, SC22K1, SL22K1
Group 5	Very dark gray/brown	10% - 20%, average size, moderately sorted	Not very active	Channel and planar voids	RF 22K1, SA 22K1, SJ 22K1
Group 6	Dark red	20% - 30%, poorly sorted	Active	Mainly channel, some planar	LB22K1, SM22K1
Outliers					LC22K3, RE22K1, RG22K3

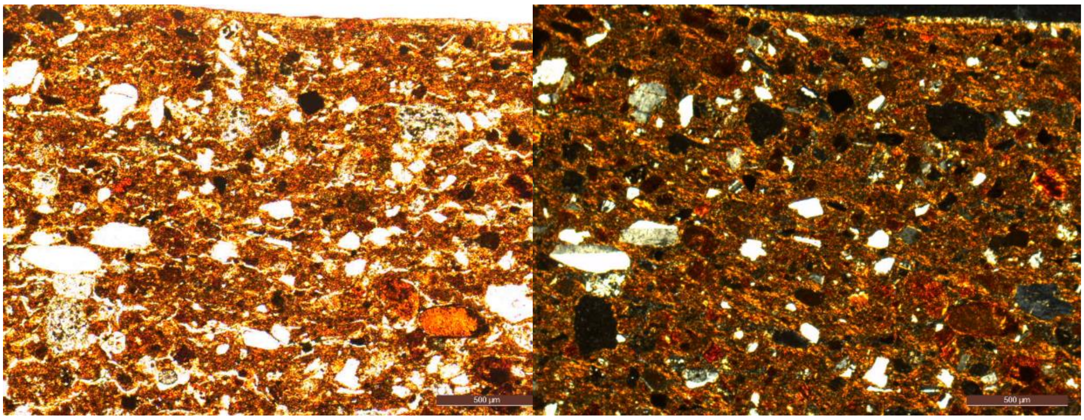

Figure 4.4: Sample from group 1 (SM-22-K2), photographed under plane polarized light on the left, and crossed-polarized light on the right (photo by the author)

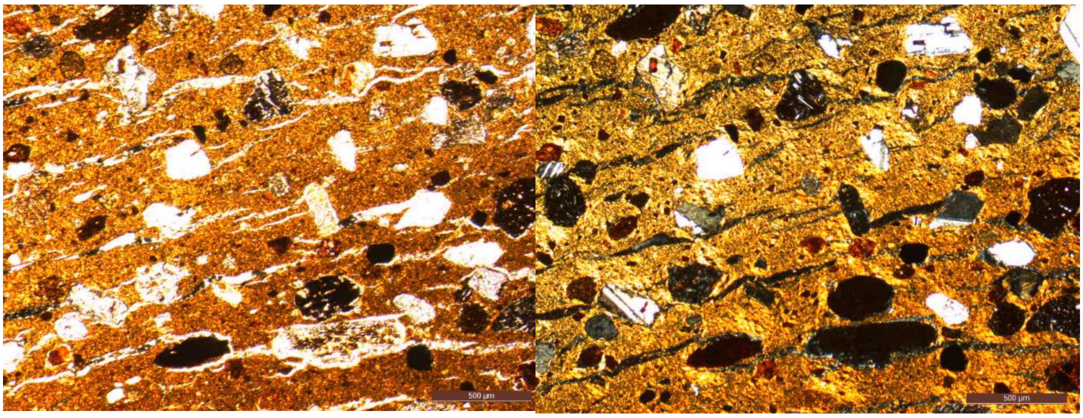

Figure 4.5: Sample from group 2 (SK-22-K1), photographed under plane polarized light on the left, and crossed-polarized light on the right (photo by the author)

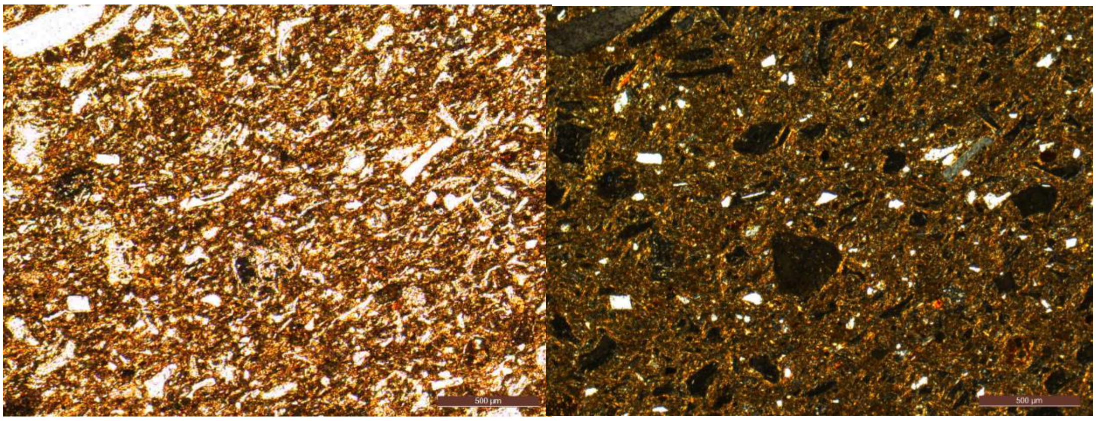

Figure 4.6: Sample from group 3 (LA-22-K1), photographed under plane polarized light on the left, and crossed-polarized light on the right (photo by the author)

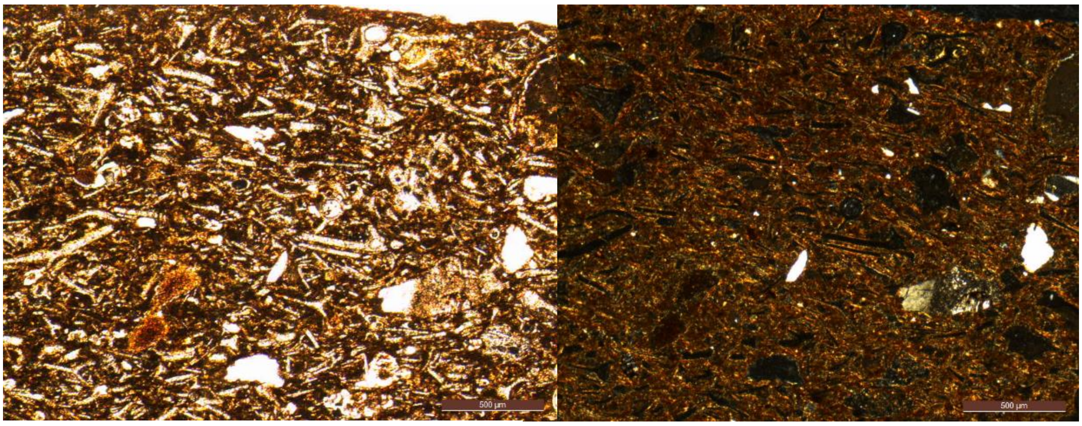

Figure 4.7: Sample from group 4 (SL-22-K1), photographed under plane polarized light on the left, and crossed-polarized light on the right (photo by the author)

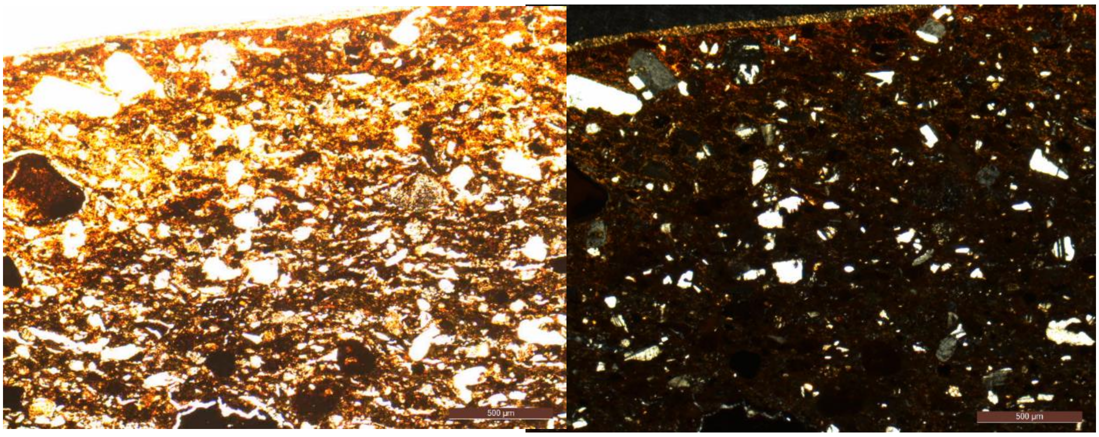

Figure 4.8: Sample from group 5 (RF-22-K1), photographed under plane polarized light on the left, and crossed-polarized light on the right (photo by the author)

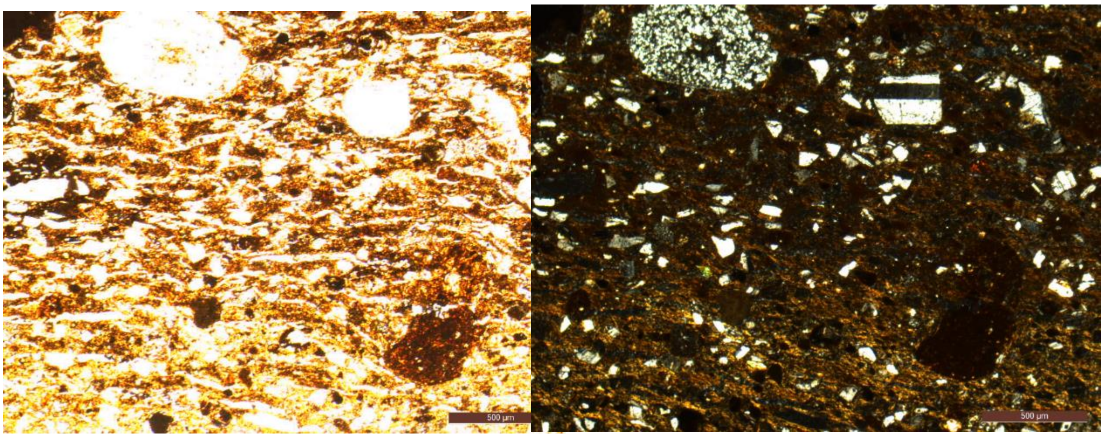

Figure 4.9: Sample from group 6 (LB-22-K1), photographed under plane polarized light on the left, and crossed-polarized light on the right (photo by the author)

4.3 Conclusion

The results of my compositional analysis indicate regional similarity in terms of composition and technology. Major groups depend on differences in inclusion identity and paste composition, while subgroups show smaller differences in technological variation. These differences are the result of production by different potting communities at various production centers. Differences in location, presence of different clay sources and geological variation can be seen in both macrofabric and petrographic analysis. The major group found within this assemblage originates in the valley of Juigalpa and would thus pose a locally produced variant of the other white slipped ceramics in this sample.

Chapter 5, Discussion: Polychrome Constellations between the Valley of Juigalpa and its Neighbors

5.1 Introduction

Following the results, the major fabric groups in the region can be correlated and compared to existing paste groups in Chontales and Pacific Nicaragua. Although I am not yet able to exactly locate the production centers, there are indicators pointing towards the presence of a polychrome potters community within the valley of Juigalpa. This community formed constellations with polychrome producers in areas beyond Chontales. Although this interpretation largely depends on more in-depth research into polychrome ceramics from Pacific Nicaragua and the valley of Juigalpa, this thesis correlates the pastes covered to types that were previously identified, mainly based on typological features, and substantiated by paste analysis.

5.2 Local Communities and Constellations of Polychrome Potters

During the macroscopic fabric analysis, I noticed that there were a number of fabrics that consisted of reddish clay: LP-C, LP-D, LP-E, RAI-E, RAI-G, LD-F, LD-G, LD-H, LD-I. The ceramics within these groups had similar inclusions in different densities and sorting qualities. Due to the high numbers of ceramics that these groups consisted of, and taking the *criterion of abundance* into account, 2-3 samples were taken per group. During subsequent thin section petrography, almost all these samples were grouped together, forming the largest group in the sample. Following interpretation through the *criterion of abundance*, we can carefully start speaking of a locally produced variety of white slipped polychrome ceramics created by a community of potters that was active in the valley of Juigalpa.

This local red paste group might be part of the larger Papagayo complex, one of the “flagship types” of the Sapoá period in Pacific Nicaragua (Dennett, 2016, 222). Along with the macrofabric and petrofabric similarities to some of Dennett’s Papagayo groups, as well as the stylistic similarities of the sherds, this type was one of the most found types within the Granada Complex. A fairly standardized version of the Papagayo paste was produced at various centers in the Greater Granada Mombacho complex, so, the similarity of these pastes to that found within the red group from the Valley of Juigalpa could indicate the presence of a Papagayo production center that had not previously been located.

It is unclear as of now at which site the ceramics were produced, as the red paste group covers all three sites in similar distribution (*table 5.1)* and makes up the vast majority of white slipped sherds in total (±50% vs. ±10% or less per group). The size difference between sites, as also seen in the number of ceramics sampled from each site, complicates the matter. My sample here represents only about 1-3% of the total amount of sherds sampled at each site, but right now it is unknown how much of the total sample is currently still present at Leiden University. This makes it hard to say the percentage with which we are exactly dealing. Donner (2020, p. 10) states that white slipped ceramics generally make up only about 5% of the entire ceramic sample, however, the sites in this research *are* the ones with the largest numbers of white slipped ceramics.

Site	**Nr. of sherds in red paste groups**	**Total white slipped sherds at site**	**Percentage of total sherds with red paste**
La Pachona	20	35	57%
Roberto Amador I	18	37	49%
Sabana Grande	84	201	41%

Table 5.1: Red paste groups as percentage of total number of white slipped sherds per site

Following the petrographic research by Donner and Casale, the petrofabrics from group 1 from Alberto Obando and group 2 from Josefa Ocón Robleto (Donner, 2020) seem to be similar in composition to group 1 presented in this thesis. Along with this, Sabana Grande is part of a cluster of four sites that also includes JOR. Considering the high number of ceramic finds at LD, it is possible that there was a community of potters working at this site cluster that produced ceramics using one distinct source for their raw materials to form a range of different vessels, both morphologically and stylistically. The community of potters that produced the white slipped polychrome ceramics would thus form a constellation with communities of potters outside of the area, as well as with potters in their direct surroundings that used the same raw materials to create distinctive styles. Some of these potters might have belonged to both communities.

5.3 Polychrome Constellations: Connecting Polychrome Manufacture within the Valley of Juigalpa to Communities Beyond

The polychrome potting community active within the Valley of Juigalpa presents a local interpretation or production center of the white slipped (Papagayo) style thought to be characteristic for Pacific Nicaragua. Their stylistic choices tie them into a larger constellation of practice with communities outside of the research area of this thesis, through a commonality of white slipping practices. Outside of ceramic manufacture, cultural affiliation and similarity in subsistence practices could have held these communities together. It is currently unclear where potters acquired the material for white slip.

During the macroscopic fabric analysis, I encountered certain sherds that had previously been assigned to an existing stylistic grouping, such as Pataky and Vallejo. These ceramics showed vast differences in paste and inclusions from the previously described red paste groups as well as from each other. These vessels found their way into the valley of Juigalpa through import or migration. The non-local sherds make up the other 50% of the white slipped ceramic assemblage covered in this study and solidifies the existence of macro-regional trade networks crossing Lake Cocibolca and reaching north into Honduras and South into Costa Rica.

I further solidified these groups during petrographic analysis, as most macroscopic fabric groups that were compositionally similar (across sites) were grouped together based on their petrographic fabric. I was also able to correlate certain groups to types identified by Dennett (2016). These types are present in different densities, thus showing different relationships of interaction among different networks of exchange. However, the overall similarity in distribution amongst sites points to a more regional network of exchange in which white slipped polychrome is imported and spread out over the region.

5.3.1 Vallejo

The Vallejo sherds present a tan/light brown paste macroscopically, with inclusions that range in size from coarse to very fine to silt, these are fair to well sorted. Within this assemblage, the Vallejo polychrome is represented by macrofabric groups: LP-A, RAI-B, RAI-C, LD-B, LD-C, LD-D and LD-L, and petrofabric groups 3 and 4.

To date, the production location for these ceramics has not been located, but Dennett (2016, p. 213- 218) relates it to the Gulf of Fonseca in Honduras. Among the Vallejo sherds, there is a technological difference between the two groups that is also present in the sample Dennett worked with: Group 4, which I correlate to Group B in Dennett, features the same inclusions and grass like voids, which Group 3 and A seem to lack. Vallejo polychromes were in use across pacific Nicaragua, from Honduras in the north, to the Nicoya peninsula in the south, and we know now that they were also prominent east of the Nicaraguan lakes.

5.3.2 Pataky

The Pataky ceramics present in this sample are defined by the blue clay and/or grog present as inclusions. Within my assemblage, Pataky sherds make up the following macrofabric groups: LD-A, LD-J, RAI-F, as well as petrofabric group 5. The Pataky type was introduced during the Sapoá period, and along with Papagayo polychrome, became a very typical style. Dennett (2016, p. 223) describes the designs associated with these types as the most “coveted”, imitated, and adapted across Pacific Nicaragua. Characteristic temper materials featured in these “fairly standardized” Papagayo and Pataky pastes are crushed plagioclase and andesite rich sands (Dennett, 2016, p. 222–223).

5.3.3 Rivas-Ometepe Polychrome Complex

The Rivas-Ometepe complex is characterized by a large number of styles that are very distinct in composition from the Pataky and Vallejo pastes. Within my assemblage, sherds belonging to two macrofabric groups were identified with two separate styles from this complex: RAI-D was determined to be Madeira polychrome and fits into petrofabric group 2. The other sherds in this group did not have any prior stylistic affiliation and could thus also be Madeira type polychromes or fit into the Rivas-Ometepe complex more generally.

The other group that fits within this complex is a sherd from LD-O that was classified as Luna Ometepe type. However, no samples were prepared for compositional analysis as the group only contained three decorated rim sherds.

5.4 Conclusion

Communities and constellations of potters producing white slipped polychrome ceramics in Nicaragua seem to be widely connected in their practice. From similar paste recipes to similar stylistic and morphological approaches to vessel making, communities learn from each other and connect through their crafts. Although it is not completely clear yet where potters procured slips, and where they produced their polychrome ceramics within the valley of Juigalpa, networks existed between regions more broadly following the similarity of distributed varieties. All these findings allow us to slowly start shaping networks of exchange that existed between people living and working in the valley of Juigalpa and beyond.

Chapter 6, Conclusion

Decorated ceramics in Chontales have long stood within a research framework that centered their existence. However, the biased approach to decorated ceramics emphasized macro-regional interaction without establishing a framework for local dynamics in Chontales. Without this locally focused historical understanding, the ceramics solely became part of a trend in narratives of cultural belonging and ethnic movement in Nicaragua at large. As more recent approaches centered on local human-environment interaction in the valley of Juigalpa, I have taken a similar approach in this thesis to reframe white slipped polychrome ceramics as a proxy for regional exchange of ideas and finished goods.

Here, I confirm the existence of (inter-)regional trade in finished goods in the form of white slipped polychrome ceramic vessels. I analyzed and grouped 274 white slipped polychrome ceramics through macroscopical and petrographic compositional analysis. The ceramics were excavated during PACEN at Sabana Grande, Roberto Amador I and La Pachona, located in the valley of Juigalpa and dated to the period between 900 - 1250 CE. Further interpretation through the *criterion of abundance*, and a *communities and constellations of practice* framework, establishes the presence of a local community of potters that produced white slipped polychrome ceramics in the valley of Juigalpa. These ceramics are stylistically and compositionally most like the Pacific Nicaraguan Papagayo style.

This seemingly lone community of polychrome potters was connected to other polychrome producing communities to the north, south and west. Non-local communities produced Vallejo, Pataky and other polychrome styles that were traded into the valley of Juigalpa, possibly inspiring the local potters and tying them into polychrome producing constellations. Based on the ceramic distribution and site size, the potters community was most likely located at the Sabana Grande site cluster, although it is not clear yet where potters procured white slips. Following these results, we can now slowly start shaping networks of interaction that existed between people living and working in the valley of Juigalpa and beyond. This reaffirms Chontales to be but a small region in a large area of interaction during the period between 900 and 1250 CE.

Further research will be necessary to confirm the exact production location of the polychrome manufacturers in the valley of Juigalpa. A geochemical approach to the ceramic data, specifically by processing the XRF data that I initially collected as a part of this thesis, would be a good starting point. Through further comparison to petrographic studies from Northern Costa Rica and Southern Honduras and those by Dennett, trade networks can be imagined, established, and confirmed. Alongside this, a geochemical and/or mineralogical study of white slip to locate the procurement locations, would give further insight into production and procurement practices. From a local perspective, it would be useful to compare clay procurement and processing between the white slipped polychrome ceramics and non-decorated ceramics produced in the Valley of Juigalpa during 900-1250 CE. This could confirm the existence of a separate potters community only producing the polychrome ceramics, or a community producing more than just one type of ceramic.

Abstract

Decorated ceramics in Chontales, Nicaragua, have long stood within a research framework that centered their existence. However, up until the 1990s the biased approach to decorated ceramics emphasized macro-regional interaction without establishing a framework for local dynamics in Chontales. Without a local historical understanding, the ceramics solely became a part of a trend in narratives of cultural belonging and ethnic movement in Nicaraguan archaeology at large. As more recent approaches center on local human-environment interaction in the valley of Juigalpa, I have taken a similar approach in this thesis to reframe white slipped polychrome ceramics as a proxy for the regional exchange of ideas and finished goods.

Here, I confirm the existence of (inter-)regional trade in finished goods in the form of white slipped polychrome ceramic vessels. Through a macroscopical and petrographic compositional approach, I analyze, and group 274 white slipped polychrome ceramics from the sites of Sabana Grande, Roberto Amador I and La Pachona. All three sites are in the valley of Juigalpa and have been dated to the period between 900 - 1250 CE. Further interpretation through the *criterion of abundance*, *communities and constellations of practice,* and comparison to previous studies, allowed me to establish the presence of a local community of potters that produced white slipped polychrome ceramics in the valley of Juigalpa. This community is likely located within the Sabana Grande site cluster, and produced ceramics that make up about half of the white slipped polychrome ceramics recorded in the region. The ceramics are stylistically and compositionally most like the Pacific Nicaraguan Papagayo style. Non-local communities produced Vallejo, Pataky and Rivas-Ometepe complex polychrome styles that were traded into the valley of Juigalpa, inspiring the local potters and tying them into polychrome producing constellations.

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Appendix 1: Macrofabric Results Summarized

Group	Nr. of Sherds	Color[11]	Slip and Paint (color & presence)	Inclusions	Voids	Fracture	Firing (core-margin relationships)[12]	Notes	Nr. sampled
LP-A	5	Core: light red, internal margin: pink	Slip: white, paint: black	20% coarse-fine sized quartz, feldspar, and mica. Fair-good sorting, high sphericity, sub-parallel to the walls	Plate-like voids, sub-parallel	Irregular	Even (1) & incomplete oxidation (11)	Similar to Vallejo fabric	1
LP-B	4	Core: gray - reddish brown, internal margin: light red,	Slip: white - grey	30%, low sphericity, medium - very fine, well sorted. Sub-angular to sub-rounded quartz and grog, angular mica, rounded iron, concentric orientation	Plate-like, oval-sphere and rhombs, parallel to wall	Irregular, laminated	Even (1) & incomplete oxidation (3)	Salmon paste	1
LP-C	14	Core: red internal surface: pink	Slip: white paint: red stripes	20%, high sphericity, medium - very fine, well sorted. Sub-angular to sub-rounded quartz and grog, angular mica, rounded iron, parallel to the walls	Plate like and oval-spheres, sub-parallel to the walls	Smooth, Irregular	Even (1) & incomplete oxidation (5)	Main red group LP	3
LP-D	4	Core: gray internal margin: red	Slip: white - gray, both red paint	20%-30% with low sphericity, medium - very fine in size. Well sorted subangular to sub-rounded quartz, feldspar, grog, and black non-shiny angular inclusions, oriented parallel - sub-parallel to the walls	Sub-parallel to walls	Irregular, hackly	Even (1) & incomplete oxidation (4)	Burned sherds, red group with different inclusions from LP-C	1
LP-E	2	Core: reddish brown, internal margin: red	Slip: white - pinkish white both paint: red	30%, high sphericity, medium - silt sized, very well sorted. Angular mica, sub-angular to sub-rounded quartz, matte yellow inclusions, rounded iron, sub-parallel to the walls.	Plate-like voids, oriented sub-parallel to the walls	Irregular	Even (1) & incomplete oxidation (3)	3rd red paste group LP	1
RAI-A	3	Core: black, margins:	Slip: pinkish white	15%, high sphericity, coarse-fine in size and very well sorted. Angular mica, sub-angular clay pellets and quartz, sub-parallel to wall and	Irregular voids, oriented sub-	Hackly, laminated	Incomplete oxidation (5)	Mainly medium sized mica inclusions	1

[11] Colors according to Munsell soil chart
[12] Core-margin relationships follows table in Donner (2020), p. 146.

		reddish brown		concentric	parallel to the walls				
RAI-B	3	Core: dark gray margins: yellowish red	White slips both	20%, high sphericity, medium - very fine size and well sorted. Sub-angular to sub-rounded quartz, feldspar, and some small angular mica, parallel to the walls	Plate-like voids, oriented parallel to the walls	Irregular	Even (1) & incomplete oxidation (11)	Brown fabric, similar to previously identified vallejo polychromes	1
RAI-C	7	Core: Black, internal margin: light brown	Slip: pinkish white - white - gray, both	25%, high and low sphericity, coarse - very fine, medium sorting. Angular matte black inclusions, sub-angular to sub-rounded quartz and feldspar, parallel to the walls	Plate like voids, oriented parallel to walls	Irregular, hackly	Even (1) & uneven (5)	Similar fabric to RAI-B but inclusions are larger and less well sorted	1
RAI-D	6	Core: black - dark greenish gray, internal margin: brown - red	Slip: white - pinkish white, both paint: black and red	15% - 30% with high sphericity, coarse - fine in size, well sorted. Angular mica, sub-angular quartz and grog, rounded iron, parallel to the walls	Plate-like voids, oriented parallel to the walls	Irregular, laminated	Incomplete oxidation (5) & (17)	Madeira polychrome, mica very prominent	1
RAI-E	8	Core: dark reddish brown, gray, very dark gray. Internal margin: red.	Slip: white - gray, red paint	30% - >30% low sphericity, granule - very fine in size, poorly sorted. Very angular - angular mica and other matte black inclusions, angular - rounded quartz, iron, and grog, parallel - sub-parallel to the walls.	Plate-like voids, parallel and sub-parallel to the walls	Irregular - Hackly	Complete (1) and incomplete oxidation (3) & (5)	Almost all sherds are burned, hence gray slip color	1
RAI-F	2	Core: reddish brown, internal margin: red	Slip: internal white, external reddish paint: red	30% - >30% both high and low sphericity, very coarse - fine, medium sorting. Rounded iron, sub-rounded blue, and orange grog, sub-rounded - sub-angular quartz, feldspar, sub-angular matte black inclusions, parallel to the walls	Plate-like voids, parallel to the walls		Incomplete oxidation (3) & (9)	Group contains 1 Pataky sherd. Defining principle is blue grog inclusions	1
RAI-G	10	Core: gray - dark reddish gray, internal	Slip: pinkish white - gray, both	25% high and low sphericity, very coarse to silt sized, fair sorting. Sub-rounded grog and iron, sub-rounded to sub-angular quartz, feldspar, and sub-angular matte black inclusions, parallel - sub-parallel to the	Plate-like, oval-sphere, rhombs, and irregular voids,	Irregular - hackly	Complete (1) and incomplete oxidation (3) & (5)	The big red group for RAI, similar to red groups from other sites	3

		margin: red	Paint: red. external surface	walls	oriented parallel - sub-parallel to the walls				
LD-A	6	Core: dark blueish gray	Slip: White - pinkish white, both. Paint: horizontal thin red stripe	30% - >30% high sphericity, coarse - silt sized, fair sorting. Sub-rounded iron, sub-rounded to sub-angular quartz, feldspar and grog, angular mica, oriented parallel to the walls	Plate-like voids, oriented parallel - sub-parallel to the walls	Irregular - Laminated	Incomplete oxidation (9)	Blue paste group	1
LD-B	9	Core: light brown - reddish yellow	Slip: white - beige - very pale brown slip, both. Paint: black and red	20% inclusions with high sphericity, medium - silt sized, fair sorting. Sub-angular to sub-rounded quartz, mica, feldspar, chalk, matte black inclusions, oriented parallel - sub-parallel to the walls	Plate-like voids, oriented sub-parallel to the walls	Fine - Laminated	Even (1)	2 Vallejo sherds	1
LD-C	9	Core: brown	Slip: white, both. Paint: black, red, and blue	20% - 30%, high sphericity, coarse - very fine sized, fair sorting. Angular mica, sub-angular to sub-rounded quartz and feldspar, rounded iron, parallel to the walls	Irregular voids, orientated sub-parallel to the walls	Smooth - fine	Incomplete oxidation (7), (9) & (11)	2 Vallejo sherds. Fine paste, similar to LD-B (firing, slip, paint)	1
LD-D	6	Core: pink	Slip: white on both, paint: red and black	>30%, high sphericity, fine - silt sized and sorted very well. Sub-angular to well-rounded inclusions, oriented sub-parallel to the walls.	Irregular voids, chaotic and sub-parallel to the walls	Smooth - fine	Incomplete oxidation (5) & (7)	Paste and designs is similar to LD-B & C, but with finer inclusions	1
LD-E	3	Core: reddish gray, external margin: reddish brown - red	Slip: white - gray, both. Paint: white and red	30% - >30%, high sphericity, very coarse to fine, fair sorting. Sub-angular to sub-rounded quartz, sub-rounded iron, and sub-angular mica, oriented parallel to the walls	Plate-like voids, oriented parallel to the walls	Laminated	Incomplete oxidation (5) & (10)		0

LD-F	12	Core: reddish black, internal, and external margin: dark reddish brown	Slip: gray, both. Paint: red	30%, high sphericity, coarse - fine in size, fair sorting. Very angular mica, angular to sub-rounded feldspar, quartz, and sub-rounded grog, oriented sub-parallel to the walls	Plate-like and oval-sphere voids, oriented parallel to the walls	Hackly - laminated	Incomplete oxidation (5) & (13)	Brown reddish paste, vaguely similar to the abundant red groups	1
LD-G	32	Core: reddish gray, internal margin: red	Slip: white - gray on both. Paint: red	20%, high sphericity, medium to very fine in size, well sorted. Angular mica, sub-angular to sub-rounded quartz and feldspar, sub-rounded grog, chaotic orientation	Oval sphere and irregular shaped voids, chaotic orientation	Irregular	Even (1) and incomplete oxidation (5)	Largest red paste group	2
LD-H	14	Core: reddish gray, internal margin: red	Slip: pink - white - gray on both, paint: red	10% - 20%, high sphericity, coarse to fine sized, fair sorting. Angular mica, sub-angular to sub-rounded quartz and grog, well rounded iron, oriented sub-parallel to the walls	Irregular voids, oriented sub-parallel to the walls	Smooth	Even (1) and incompletely oxidation (5)	One rim has a very similar morphology to rim in LP-C	2
LD-I	26	Core: red	Slip: pinkish white - white, paint: brownish red and black	30%, high sphericity, very coarse to fine in size, fair sorting. Sub-angular to sub-rounded grog and quartz, rounded iron, and sub-angular mica, oriented sub-parallel to wall	Plate-like and rhomb shaped voids, oriented sub-parallel to the walls	Irregular - hackly	Even (1) & incomplete oxidation (5)	Largest rim has similar morphology to rim in LP-C, but different paint	2
LD-J	15	Core: dark reddish gray - reddish brown, internal margin: red	Slip: pinkish white - white - gray, paint: red and black	20% - 30%, high sphericity, coarse - very fine, poorly sorted. Angular mica, sub-angular to sub-rounded quartz, blue and orange grog, sub-parallel to the walls, chaotic	Plate-like and oval-sphere voids, oriented parallel to sub-parallel to the walls		Incomplete oxidation (10)	Blue grog inclusions	1
LD-K	11	Core: dark reddish brown	Slip: light gray - beige, paint: black and red	20% - 30%, high sphericity, medium - fine, fair sorting. Very angular to angular mica, sub-angular to sub-rounded quartz, sub-rounded grog, sub-parallel to the walls	Plate-like voids, oriented sub-parallel to the walls	Laminated		Brown clay with black mica inclusions	1

LD-L	4	Core: strong brown	Slip: gray, paint: brown/black	25%, high sphericity, medium to fine, well sorted. Sub-angular to sub-rounded quartz, feldspar, and sub-angular mica, sub-parallel to the walls, concentric	Irregular voids, chaotic orientation	Fine	Evenly oxidized (1)	Similar inclusions to LD-K	1
LD-M	8	Core: weak red, internal margin: red	Slip: white - pink, paint: red	30%, high sphericity, very coarse to very fine, poorly sorted. Sub-angular mica, sub-angular to sub-rounded quartz and feldspar, grog, rounded iron, sub-parallel, concentric	Plate-like and rhomb shaped voids, oriented parallel to the walls	Irregular	Even (1) & incomplete oxidation (5)	Last red group, definitely the one with the largest inclusions and the worst sorting	2
LD-N	7	Core: yellowish red - red	Slip: white, paint: black and red	30%, high sphericity, very coarse to fine, poorly sorted. Angular mica, sub-angular to sub-rounded quartz, feldspar, sub-rounded iron, and grog, parallel - sub-parallel	Plate like voids, oriented parallel to the walls	Irregular	Evenly oxidized (1)	Reddish group, distinct grog inclusions	1
LD-O	3	Core: dark reddish brown	Slip: very pale brown - white paint: black and red	30%, high sphericity, medium - silt sized, very well sorted. Angular mica, sub-angular quartz, and grog, sub-parallel to the walls	Plate-like voids, oriented sub-parallel to the walls	Irregular - Laminated	Evenly oxidized (1)	Luna ometepe polychrome	0
LD-P	3			30%, high sphericity, medium to very fine, well to very well sorted. Sub-angular matte black inclusions, sub-angular to sub-rounded quartz, feldspar, iron, parallel to wall	Irregularly shaped voids, oriented chaotically	Smooth - Irregular	Evenly oxidized (1)	Salmony paste similar to LP-B, but group was just rims	0
LD-Q	3			30% - >30%, high sphericity, medium to silt size, fair - well sorted. Sub-angular to sub-rounded feldspar, mica, sub-rounded to rounded grog, iron, sub-parallel to walls	Irregularly shaped voids, oriented sub-parallel to the walls	Irregular	Evenly oxidized (1)		