ANCIENT POTS AND POTTERS OF THE ATURES RAPIDS REGION: OCCUPATION AND INTERACTION PROCESSES IN PRE-COLONIAL MIDDLE ORINOCO, VENEZUELA

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Declaration

I, Natalia Lozada Mendieta, confirm that the work presented in this thesis is my own. Where information has been derived from other sources, I confirm that this has been indicated in the thesis.

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Bogotá, 27 September 2019

Abstract

The earliest written sources on the Middle Orinoco inhabitants singled-out the Átures Rapids as a key trading centre between the 16th and 18th century and from before the Spanish arrival. The previous archaeological studies described the ceramic materials in terms of form and style, following a cultural historic approach, and mostly interested in answering chronological questions. However, the pre- colonial indigenous occupation of the area and exchange network was still poorly known. In particular, the peopling of this area has been the centre of debate since most of the archaeological materials found along the river present a varied range of co-occurring paste recipes that used several different inorganic and organic ingredients, followed distinct production technologies and displayed different vessel forms, challenging the idea of a traditionally defined ‘ceramic culture’. Co-existing, distinct ceramic wares with different production sequences are reconstructed in the present research using petrography, portable X-ray fluorescence and macro trace analysis, which suggest a more nuanced ‘reading’ on the ancient inhabitants of the Orinoco river. Based on ceramic technology studies, interaction, emulation, innovation and trading activities are discussed through the analysis of pottery sherds recovered from three newly excavated sites: Culebra (cal. AD 437-1155), Rabo de Cochino island (cal. 100 BC- AD 1440) and Picure island (cal. AD 310-1480). The stratigraphic distribution, persistence of ceramics through the sequence and variability in these sites will be presented as part of an initial discussion that intends to contribute to the reconstruction of various pre-colonial occupations and interaction processes of the Átures region in Venezuela.

Impact Statement

Communities in the river banks of the Middle Orinoco today are multicultural societies in which both Colombians and Venezuelans, from different ethnic groups, live together. Previous archaeological and historical studies conducted in the area suggest there were multiple groups that already inhabited and travelled up and down its stream, long before the definition of the national state territories and the arrival of the Europeans. Despite the *longue durée* human presence along the course of the river, and a very productive archaeological research program during the 1940's to the 1980's, our understanding of the ancient groups who settled in the Middle Orinoco was very limited. The reconstruction of the different occupations and the activities that took place in the pre-colonial period followed a cultural normative approach, in which most of the stylistic transformations and incorporations in material culture were explained as the product of migration or trade phenomena.

The academic impact of this new research (the first one to be held in this area in almost 30 years), is grounded on new empirical data and theoretical and methodological approaches that resulted in a novel understanding of the nature of interactions between different groups in the pre-colonial period in the Átures Rapids region. It applied the *chaîne opératoire* approach and state-of-the-art macroscopic and microscopic analytical methods to systematically identify distinct ceramic production protocols and the groups of potters behind them. This research refines the occupation sequence in the area and identifies the ancient groups that produced, used, consumed and traded ceramic vessels in the rapids. It also offers new avenues of research to address the multi-component assemblages and diversity observed in the ancient archaeological deposits from this area, which reflects the complexity and socio-cultural plurality of the ancient inhabitants of the Orinoco, antedating the mixture and creolization processes that were observed during the colonial period. It also provides a different reading of the material culture beyond the normative categories, to interpret the co-occurrence of multiple style and/or complexes.

Outside academia, this research involved local indigenous and creoles as active partners during the different fieldwork phases of the project. This study, as part of the *Cotúa Reflexive Archaeology Project*, aimed at reaching a collective construction of archaeological knowledge between locals and archaeologists. The ensuing dialogic exchange allowed to apprehend how locals perceive historical heritage and value the relevance of archaeology in present-day Puerto Ayacucho city, facing the Átures Rapids. Sadly, the critical socio-political and economic situation of Venezuela today, coupled with the rearming of a dissident faction of the armed guerrilla forces of FARC in the Colombian side of the Orinoco border, means that this research may well represent the last one to take place for some time to come. The rich pre-colonial history of this region, as portrayed throughout this study, is a first step in making this history relevant to present-day indigenous partners and should not be the last. It is an indigenous longue durée history that enriches the world and deserves attention now and in the future.

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1. INTRODUCTION

This thesis aims to reconstruct the pre-colonial occupation of the Átures Rapids region, in the Orinoco river, appointed by both historians and archaeologists as a key trading centre where people from the Western Llanos and the Guianas exchanged goods and ideas (Morey, 1975; Zucchi and Gassón, 2002; Hornborg, 2005; Gassón, 2014). The resulting periods and interactions that occurred in this area before the arrival of the Europeans are based on the analysis of ceramic materials recovered from recent excavations conducted between 2015 and 2017, as part of the *Cotúa Island Reflexive Archaeology Project* (Oliver et al., 2014) in which I was involved during the fieldwork and laboratory analysis. Three archaeological sites were excavated in the rapids and surrounding area, called Culebra (AM-1), Picure (AM-2) and Rabo de Cochino (AM-3), which provided the ceramic materials included in the study and served as a base to propose the ceramic complexes and occupation periods of the Átures area. By applying a new methodology to propose techno-stylistic ceramic traditions, this project was able to contribute with new knowledge and insights on ancient ceramic production techniques, as well as on processes of transmission, emulation, trade and multi-ethnic communities during pre-colonial times in this portion of the Orinoco.

The Orinoco river extends for over 2,200 km from its source in the Parima mountains and into the Atlantic Ocean, draining and area of 880,995 km^2. Its major tributary rivers include the Meta and Apure rivers, coming from the Northern Andes, and the Caura and Caroní rivers, originating in the Guyana Uplands (***Fig.1-1***). It is also linked through the Casiquiare canal to the Negro River, which is a major affluent of the Amazon river. The main channel of the Orinoco connects different ecosystems, from tropical rainforests in its upper area, to open savannahs and gallery forest on its middle and lower sections (Lasso et. al., 2010). Today, its basin is home to more than 26 indigenous communities (Gassón, 2002), some of which live, establish alliances and/or trade with each other.

Ethnohistoric sources often single out the Átures Rapids as a strategic *locus* on the river due to its year around fish stock and its strong currents, which represented an obstacle for canoe travelling beyond this point in the river. The Adoles Indians, who inhabited the rapids at the moment of the second expedition by Antonio de Berrío in 1584, were known for exchanging fish, slaves, gunpowder and iron weapons (Rey Fajardo, 1966; Mercado, 1966 [1685]). Other items such as textiles, plants and ceramic plates were part of the exchange network in the area (Zucchi and Gassón, 2002 p. 70). While some of the bartered elements could have certainly been traded among local indigenous communities in pre-colonial times, the presence of certain weapons and slaves might have been a product of the contact with Europeans (Gassón 1996; 2007). This in turn, queries whether these islands where used for this kind of activity before the 16th century.

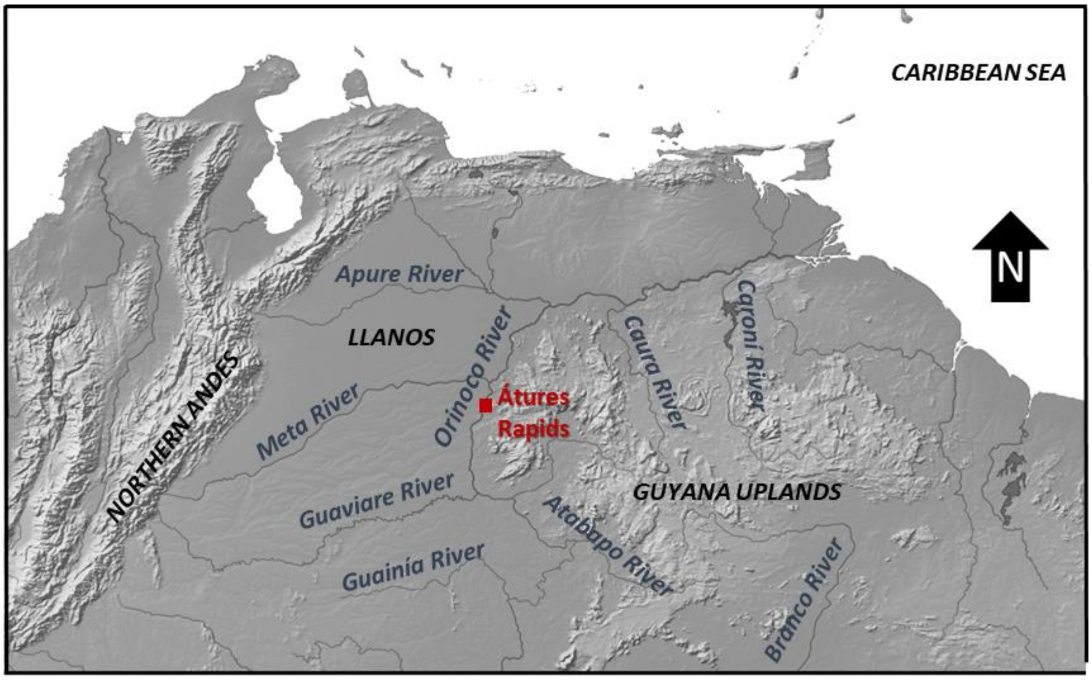


Figure 1-1. *Map of the Orinoco River basin showing the main tributaries and the location of the Átures Rapids. Courtesy of Phil Riris, 2017*.

Aside from the trade reports in ethnohistorical sources, the rapids are also known for their conspicuous and diverse rock art motifs, which have also served as evidence to suggest this as a confluence area. Previous reports suggested the rapids as a hot spot for their unusual concentration of engravings along the large area between the Apure confluence and the Maipures Rapids (Dubelaar, 1986 p.126). However, and only as a by-product of the *Cotúa* research project, we now know the rapids currently have over 209 engravings divided in eight different panels (Riris, 2016 p.1608). These last ones, along with cupules and axe polishers, were documented in Picure island and surrounding bedrock outcrops in the rapids in February 2016. A single panel in Picure island, one of the excavated sites in this study, contained the largest concentrations of figures with over 93 engravings, a few of which had a single size of 5m² (***Fig.1-2***). Common dots, concentric circles and double scrolls motifs present on the panels suggest links with other far-flung rock art representations in the Vaupes River area and the Upper Negro River, reinforced by the appearance of a representation of a flute player, associated with Yuruparí rituals registered in several areas in the Negro basin (Valle, 2012).

Figure 1-2*. Aerial view of east panel on Picure island, at the Átures Rapids. Photo modified with interpretative overlay of main engravings. Courtesy of Phil Riris (2017: 1609).*

Despite the existing historical reports of trade and the great advances made in terms of the study of rock art, this portion of the river is still scarcely known in archaeological terms. The empirical evidence to infer trading activities is mostly based on the co-occurrence of distinct ceramic traditions in the same soil deposits and from beads, recovered from surface collections (Cruxent, 1950) or from the surrounding area (Barse, 1989). The co-occurrence of certain ceramic styles is not unusual and appears through different periods, such that they cannot be taken as a direct evidence for contact and/or trade between groups.

Occupation models of the area are based on a normative classification of material culture, which emphasize decorative and formal attributes in ceramic artefacts in order to use them as chronologically-sensitive attributes, and thus suggestive of periods, migration and population movements (Howard, 1943; Cruxent and Rouse, 1958; Rouse, 1978; Roosevelt, 1978, 1980; Barse, 1989). The same models also tend to focus on the dominant styles for a given period, defining cultural areas based on highly frequent wares, disregarding the presence of minor or rare styles. Finally, these models assume that distinct ethnic identities can be reconstructed for each ware, such that certain mixed wares with different paste recipes and decorative motifs are regarded as a potential evidence of multi-ethnic communities established in the river (Zucchi, Tarble and Vaz, 1984; Zucchi, 2002).

The co-occurrence of ceramic styles in the same depositional units poses a challenge to reconstruct and interpret the social groups responsible for their production and/or use. Even if we strip away the 'ethnic' association behind each style or complex, the question remains on how to explain their co-existence through time and space, as well as their potential role in trade and gift-giving relationships previously known in this portion of the river.

In this context, the questions that motivated the present research gravitated towards the identification of the groups that occupied the area, the nature of their interactions (i.e. contact, cohabitation, exchange) and the ceramic trading networks which could have taken place in pre-colonial times. Ceramic materials, durable and portable objects which could have easily been bartered, were used to understand the ancient contact and exchange dynamics in this portion of the river. Ceramics were also interrogated in terms of their role as identity markers and in expressing and transmitting ideas and meaning in this dynamic and diverse context.

By applying a new ceramic analysis methodology for this area, such as the *chaîne opératoire* approach, using macroscopic and microscopic techniques, the present project enabled the definition of techno-stylistic ceramics traditions (*sensu* Roux 2011, 2016, 2019) which reflect particular pottery making practices in different occupation periods. Modal analysis methodology (Lathrap

1962) was applied to examine every step of the production sequence, as well as each dimension of variability of vessel form.

The identification of specific pottery making protocols allowed to support an empirically-based discussion of processes of transmission, emulation, interaction, innovation and exchange during the pre-colonial period. The distribution of the different production protocols, paste recipes, fashioning techniques and formal modes through time and space revealed historical relations between groups of potters within the Átures Area and the wider Orinoco basin. It also suggests the existence of different kinds of communities and uses of ceramic vessels in the pre-colonial Átures Rapids area.

1.1 Thesis Outline

A historical and archaeological contextualisation of the research area is presented in **Chapter 2**. This section refers to the indigenous groups and linguistic families that occupied the area at the time of contact and the trading network described for the Átures Rapids and the broader Middle Orinoco area. The historic sources are contrasted with the archaeological sources and occupation models that have been proposed for this area are reviewed. These models are first framed within schools of thought of the archaeological discipline, and within the migration debate between Lathrap (1970) and Meggers (1971). Occupation models are then discussed in terms of their classification systems and resulting categories, which are particularly taxing given that they operate in two different chronologies and there are discrepancies on the use of the nomenclature (e.g. style, tradition, series). Particular attention is given to the William P. Barse model (1989, 1999) since it was based on excavations in the surrounding area of the rapids and also because it constitutes the largest research conducted in this portion of the river.

The following **Chapter 3** focuses on theory in which a discussion on the definition of the concept of style and the *chaîne opératoire* approach takes place. Special attention is given to the Rouse's definition of style, which has permeated the archaeology conducted in the Orinoco Basin until this day, as well as the evolution of the *chaîne opératoire* approach and how it relates to the definition of technical traditions and social learning theories.

Once the contextualisation of the research area and the theoretical frame is defined, the research problems and objectives and the chosen methodology are described in **Chapters 4 and 5.** The methodology chapter is divided in four parts, starting with a short introduction which explains the definition of the technical traditions, the data collection and sampling, the methods and techniques and the vessel form terminology applied in this research.

Chapter 6 is the core of the dissertation. It presents and discusses the data and ceramic analyses performed on the excavated sample from three different sites. This chapter opens with analysis of clay and paste preparation, comparing ethnographic, macroscopic and petrographic data. This section contains the paste classification categories or modes used later in the dissertation and offers a broad discussion on the production sequence in the local area. It also presents the arguments for tempering and the distribution of each fabric per archaeological site. Each site is then discussed individually in the next subsections, establishing their particular geographical context, stratigraphy and chronology, artefacts distribution patterns per unit and the identification of different steps of the production sequence through the application of instrumental geochemical and statistical analyses, as well as petrographic, macro-trace and modal analysis. Each chapter ends with the defined techno-stylistic ceramic wares and complexes and how they are distributed in each occupation period.

The concluding **Chapter 7** contains the summary and discussion of the result sections. It is divided by occupation periods and compares the findings from all three sites through time.

2. STATE OF CURRENT ETHNO-ARCHAEOLOGICAL KNOWLEDGE IN THE ORINOCO: A CRITICAL APPRAISAL

2.1 Ethno-Historical Accounts of the Middle Orinoco Indigenous Populations and their Trading Activities

2.1.1 Indigenous Groups in the Middle Orinoco between 16th-18th centuries

Several different groups populated the Middle Orinoco region at the time of contact. According to historical sources, as early as 1531, this region congregated groups with different cultural and linguistic affiliations (Zucchi and Gassón, 2002 p.68; Tarble and Zucchi, 1984 p.44). The accounts of the first explorations of the Orinoco and the establishment of several religious missions in the area show a multicultural scenario with complex social and economic relationships of political alliances and economic interdependence (Morey, 1975; Zucchi and Gassón, 2002).

The early attempts to penetrate the Orinoco frontier sought the alleged sources of gold of El Dorado, an illusory place filled with riches that the Spanish conquistadors believed was found in Manoa, somewhere in the Guyana area. The Spanish crown granted these expeditions as *capitulaciones* (or contracts), which allowed the conquistadors to claim the riches they encounter in exchange for the military subjugation of the territories (Perera, 2000 p.209). Attracted by the reports of gold, the first expedition was organized in 1531 by Diego de Ordaz, sailing from Cubagua Island. He managed to reach the Meta confluence but had to return with his men wounded and defeated (Arellano, 1986 p.604). After Ordaz, a number of expeditions were undertaken but it was only between 1584 and 1591, when Antonio de Berrío made it across the Western Llanos to the Middle Orinoco and founded the first Spanish settlement in the Guyana (Ojer, 1966 p.52).

During the last decade of the 16th century and most of the 17th century, the Spanish tried to colonize the area and secure it from Carib, Dutch and English attacks (Arellano, 1986 p.623-625). The settlements made by Berrío and others throughout these years did not reach a significant population but fairly guaranteed the Spanish control over the Lower Orinoco and Trinidad Island (Ojer, 1966 p.512; Perera, 2000 p.365). Nonetheless, the several attempts to colonize further inland were unsuccessful and the establishment of religious mission towns to pacify and indoctrinate the indigenous groups of the Orinoco area did not resume until the beginning of the mid-18th century.

Written accounts left by explorers and missionaries allow to reconstruct the presence and the distribution of certain indigenous groups that inhabited the Middle Orinoco area (***Fig. 2-1***). Between the years of 1531 and 1720 at least seven different indigenous populations were reported between the Cuchivero river mouth and the Atabapo-Orinoco confluence (Zucchi and Gassón, 2002 p.68-74). These groups correspond to Arawak, Carib, Saliva and independent speaking linguistic families (Gildea, 2012; Durbin, 1977). The Guahibo-Chiricoas and Achaguas are described as part of the Arawakan speaking groups located in the territories surrounding the Meta, Apure, Airico and Casanare rivers and the western portion of the Orinoco river (Rey Fajardo, 1971 p.125; Perera, 2000 p. 383). Inside their territory, two independent speaking groups denominated as the Otomacos and Yaruros occupied the area between the Cinaruco and the Apure rivers (Gilij, 1965 p.67; Perera, 2000 p.376). Adjoining them, at the other side of the Orinoco and between the Maniapure and Cuchivero rivers, were the Tamanacos, Carib speakers (Rey Fajardo, 1971 p.149). Finally, in the rapids of the Orinoco from the Apure to the Atabapo rivers, two groups used the islands and river banks for fishing and trading. The Adoles or Atures were reportedly found from the Apure mouth to the Atures rapids area (Rivero, 1956 [1736] p.42-43; Ojer, 1966 p.54), while the Caberres occupied the Caberres Island, in the Atabapo river (Gumilla, 1944 p.29). In relation to the Adoles, some authors suggest they spoke an independent language (Vega, 1974 [1744] p.78; Durbin, 1977) while others say the spoke Saliva (Ojer, 1966 p.54; Tarble and Zucchi, 1984 p.442). Finally, some have suggested they only used Saliva as a trading language (Gumilla; 1944; Rey Fajardo, 1971).

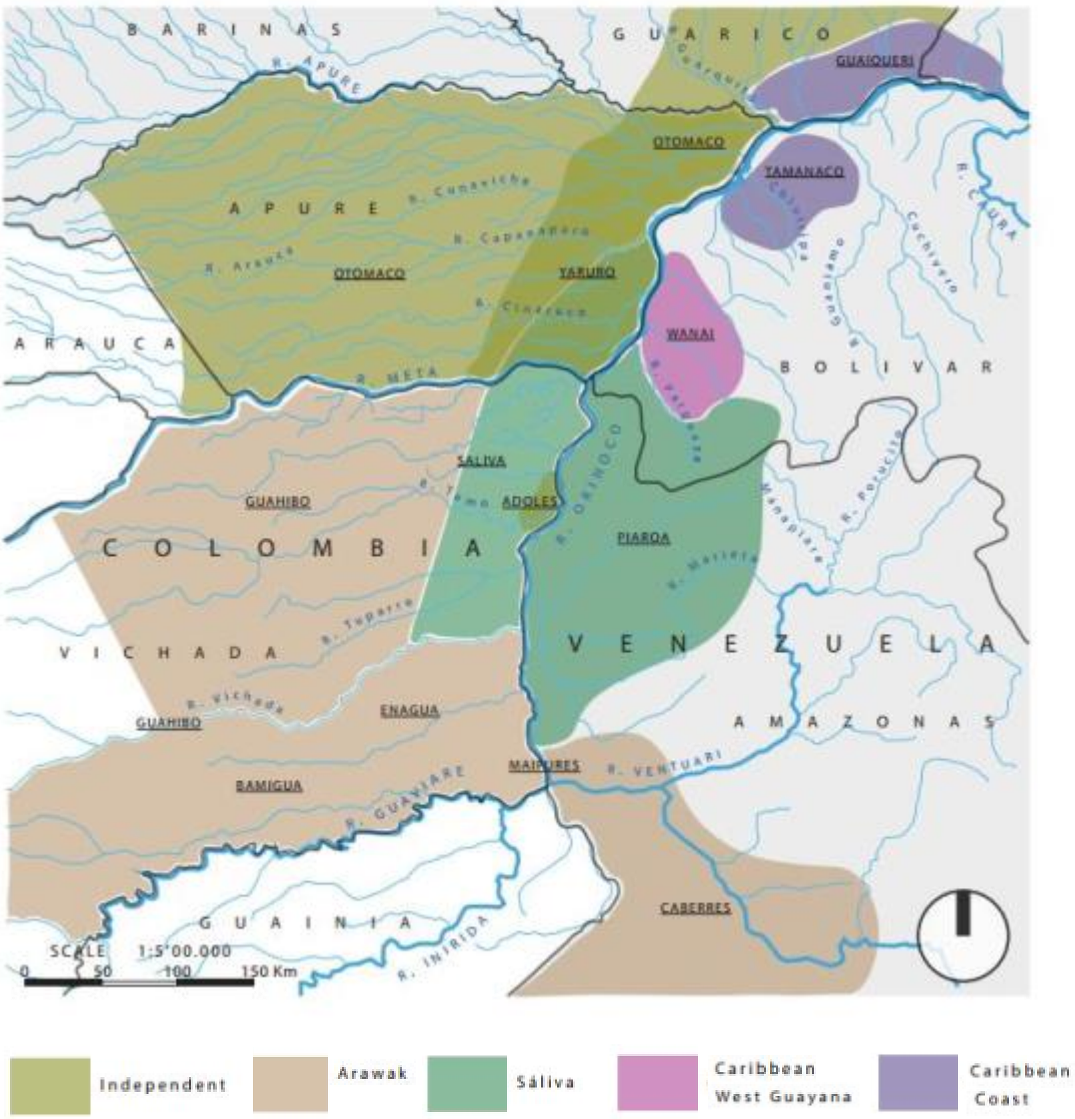


Figure 2-1. *Map with the distribution of indigenous groups and linguistic families in the Middle Orinoco for the 16th –early 18th century. Map by E. Lozada 2017.*

The true conquest of the Orinoco took place with the foundation of long-lasting towns (i.e. *reducciones*) and religious missions, specifically, the first successful Franciscan mission in the Guyana in 1724, followed by the Jesuit missions in the Orinoco effectively installed in 1731 (Arellano, 1986 p.627; Rey Fajardo, 2006 p.11). The *reducciones* congregated several different indigenous groups from surrounding regions to help the indoctrination campaign (Arellano, 1986 p.655). Due to these circumstances, at least six other indigenous groups were reported in the area since 1720 (Zucchi and Gassón, 2002 p.68-74).

Among the new groups were the Saliva, a Saliva speaking group which extended along the Orinoco, northward from the Áture Rapids to the Arauca and Cinaruco Rivers (Rivero, 1956 [1736] p.47). During the 18th century, their territory moved south towards the Vichada River and west to the Casanare Llanos because of Carib attacks and religious mission's resettlements (Rivero, 1956 [1736] p.317). Another saliva speaking group, the Piaroa, were located in the eastern side of the Orinoco, south of the Parguaza river to the Atabapo confluence (Tarble and Zucchi, 1984 p.442). A number of Carib speaking parties settled in the north-eastern portion of the Middle Orinoco, among which we can count the Wanai (Mapoyo), Pareca and Guayquerí (Morey, 1975 p. 28; Tarble and Zucchi, 1984 p.442). Arawakan related speaking groups, such as the Bamigua and Enagua are mentioned to have occupied the Orinoco area between the Vichada and Guaviare rivers (Morey, 1975 p.28). Finally, the Adoles are mentioned again in the island and the Raudal *reducción (*Gilij, 1965. T. II p.289), as well as in the Guyana high plains and river banks in the Upper Orinoco region (Caulin, 1966 [1759] p.129-130). However, their population was severely diminished because of disease and death brought by the conquistadors (Arellano, 1986 p. 577).

The written sources also described approximate locations, although their specific limits are more complex and diffuse. As Morey (1975 p. xi) first stated, some of these groups were nomadic and did not hold exclusive territories and, in some cases, coexisted in the same areas exploiting different resources. This coexistence can be explained, among other things, in terms of economic specialization on certain resources or manufacture goods for self-consumption and trade. For example, the Achagua, Saliva and Otomaco indigenous groups practiced farming in riverine areas. In particular, the Achagua were considered to have a chiefdom type of social integration (Gassón, 1998). Within their territory, foraging groups such as the Guahibo or fishers as the Adole, Yaruro, Guayquierí or Guamo, settled in shelters in inter fluvial zones and camps and temporary shacks in riverine areas. Their specialization and different patterns of spatial distribution, related to their type of social organization, made it possible for different groups to occupy nearby areas, which in some cases developed into alliances or warfare (Morey, 1975 p.28-29; Zucchi and Gassón, 2002 p.69; Tarble Scaramelli, 2006 p.46-48).

2.1.2 The Middle Orinoco as a main interaction and trading centre

The ethnohistorical sources described how various indigenous groups inhabiting the Orinoco maintained long-distance exchange networks with other groups in the Colombian and Venezuelan llanos, the northern Andes, Guyana and Trinidad (Arellano, 1982 p.138). According to Morey (1975 p.556), the complex interaction system involved alliances, marriage exchange, warfare and trading between totally or partially economic specialized societies, which depended on each other to access resources of different ecological settings or specially produced manufacture goods. Exchange was based on both reciprocity and complementarity principles (Perera, 2000 p.383). This model was further developed as the *System of Orinoco Regional Interdependence* (SIRO by its Spanish initials), proposed by anthropologist Arvelo-Jimenez and Biord (1994). The SIRO contemplated that the trading occurred among small, dispersed and heterarchically organized groups that occupied different ecological areas. These groups used the exchange system as a medium to reinforce political relations and avoid conflict over limited resources (Arvelo-Jimenez, Morales and Biord, 1989 p.150).

Among the items that were traded were geographically circumscribed raw materials such as salt, clay, fine grained stone for tool-making and manioc grater teeth (Tarble Scaramelli, 2006 p.50). Some of the most mentioned exchange items were food products, specially fish and turtle oil, along with other manufacture goods such as canoes, hammocks, textiles, cassava graters, pottery and beads (Zucchi and Gassón, 2002 p.68-74). On the other hand, non-food plants used for hunting, ritual and medicinal purposes such as tobacco, *caraña* (resin form the *Euphorbia adinophylla* tree) and *curare* (poisonous plant extract) were also among the most popular trading items (Zucchi and Gassón, 2002 p.68-74).

However, the exchange circuits surpass the ecological interdependence model since they involved the participation of some non-egalitarian and centralized societies interested in prestigious goods for the elite (Gassón, 2000 p.585-586; Gassón, 2014 p.27). Both historic and archaeological evidence revealed status related items such as green stones, quartz crystals, golden artefacts and shell beads or *quiripas* (Boomert, 1987; Langebaek, 1992; Gassón, 2000). For some authors the *quiripas* functioned as a primitive currency with an exchange value, later adopted by the Spaniards (Briceño Iragorry, 1928; Salas, 1971). Even so, shell beads were also used as part of ceremonial relations between chiefly elites and their symbolic and exchange value varied between pre-Hispanic and colonial times (Gassón, 2000 p.598).

On the other hand, the trading described in the documents was already largely transformed in content and magnitude by the demands of the colonial powers; not to mention, certain group specialization is arguably the consequence of contact. Along with the before mentioned goods, most of the historical records also described gunpowder, axes, knives, gunfire weapons and glass beads (i.e. *mostacillas*) as part of the common exchanges between indigenous groups and the Europeans (Gassón, 1996 p.143; Zucchi and Gassón, 2002 p.76-78; Gassón, 2007 p.173-175).

Indigenous groups that took part in the exchange system across the Middle Orinoco acted as intermediaries and distributors of their own products along most of the course of the river and in specialized trading points (Perera, 2000 p.384). The most important trading centres along this area of the river were La Urbana, Carichana, La Encaramada, the Átures Rapids and the Caberres Island. The first three were mainly known for their turtle oil and eggs, while the Caberres Island was the main trading spot for curare (Arellano, 1986 p.728). Additionally, La Urbana, the main Otomaco centre, was recognized for the manufacture of *quiripas* and its fine pottery plates and pots for trading (Zucchi and Gassón 2002 p.70).

In particular, the Átures Rapids is mentioned as one strategic spot, famous in its time for having great amounts of fish all year around, but specially in the rainy season (Tapia, 1966 [1715] p.204-205). It was also well known for being a point to trade slaves, gunpowder and iron weapons (Mercado, 1966 [1685]). First registered in 1584 by informants of conquistador Antonio de Berrío (1527-1597) during his second voyage upriver through the Orinoco, the Átures Rapids were mentioned to have been a mandatory stop for all travellers and traders (Ojer, 1966 p.54; Perera, 2000 p.309); a sort of river toll in which everyone had to 'pay' for the right to cross (Zucchi and Gassón, 2002 p.78).

Historical evidence indicates that in late 16th century the Adoles island and surroundings were inhabited by a thousand warriors (Ojer, 1966 p.54). Its population decreased rapidly, from 500 people in 1705 in the island (Tapia, 1966 [1715] p. 204) to only 20 Adoles in 1767 in the San Juan de Nepomuceno mission town (Gilij, 1965. T. II p.289). The Átures rapids eventually became the location of one of the main four *reducciones* in the Orinoco. Established in the eastern bank of the rapids by the mid-18th century, the small town later known as San Juan de Nepomuceno was inhabited by Adoles Indians, as well as Maipures and Yaruros (Arellano, 1986 p.655-656). In 1747, when it was founded, it was populated by 740 inhabitants from different indigenous groups, but in 1757, it only had 278 indigenous adults registered.

Although the islands in the Átures rapids were the Adoles or Átures main location, their territorial extent and trading activities might have involved a bigger area. Most of the written sources state that the Adoles exchanged slaves and fish for agriculture products and weapons with Caribbean parties that came to their island in the rapids to trade (Arellano, 1986 p. 577; Perera, 2000 p.389). Nonetheless, other sources also mentioned them to be the intermediaries in the llanos slave trade (Mercado, 1966 [1685] p.70) and to have friendly relationships and trading interactions with Sálivas, Achaguas. Caquetios and Yaruros all the way to the Meta river mouth (Rivero, 1956 [1736] p. 243). Moreover, while most of the etnohistorical documents regarded the Adoles as specialized fishermen, it is highly probable that they also had practiced agriculture and other activities such as bead manufacture, just as other fishing groups in the Middle Orinoco, such as the Yaruros (Morey, 1975 p.248). If so, this would have implied other areas for habitation and garden plots in the mainland, near the islands.

2.2 Archaeology-Schools of thought and perspectives in the Orinoco

2.2.1 Theoretical approaches

The history of archaeological studies in the Orinoco river basin reflects the changing theoretical perspectives of the discipline itself. It began with culture history (1930s-1980s) and its concerns with cultural classification and chronology, where diffusion and migration were used to explain cultural change. Culture history theory and methodology was introduced into Venezuela by scholars from the Department of Yale University and Yale's Peabody Museum of Natural History. The key exponents of the culture historic paradigm were Osgood and Howard (1943; Howard, 1943) and, above all, Irving Rouse and José María Cruxent (1958), whose chronological sequence for the region is still used until today.

By the start of the 1970s, a new Marxist and historical materialist paradigm emerged in the form of the Latin American Social Archaeology 'school' (*Arqueología Social*). Sanoja and Vargas (1974) were their key exponents in Venezuela. However, their archaeological work in the Orinoco still involved similar classificatory and analytical methodologies used by normative culture history archaeologists. Thus, whereas Rouse and Cruxent used modal analysis to define and classify cultural styles and series of styles (i.e., formally and historically related styles; see Rouse, 1960; Read, 2007), Sanoja and Vargas applied Megger's taxonomic methodology to identify and classify cultures into cultural phases, horizons and traditions. Megger's methodology grew directly from James Ford's seriation (of types) and from the conceptual categories of (cultural) phase, horizon and tradition formulated by Gordon Willey and Philip Phillips (1958). One crucial distinction between the two pairs is the much greater emphasis given by Sanoja and Vargas to subsistence patterns and the role of environment-human adaptations in shaping both the history and the character of its peoples and cultures. This emphasis stems from the importance accorded to economic production in Marxist theory, but their specific views of environment-human relationships were strongly influenced by Meggers' theory of environmental determinism in the development of societies and cultures. By contrast, Cruxent and Rouse were not particularly interested in pursuing this topic, largely because paleo-environmental, archaeobotanical and zoo-archaeological data was almost non-existence.

Between 1970 and 1971, ‘Upper Amazon’ by D.W. Lathrap (1970) and ‘Amazonia: Man, and Culture in a Counterfeit Paradise’ by B.J. Meggers’ (1971) were published. The opposed views on the environmental potential of Amazonia originated two different interpretations on the history and evolution of the neo-tropical lowlands of South America. Lathrap rejected Meggers (1954, 1971) argument that the Amazonian environment both limited and determined the level of socio-cultural complexity (Stahl, 2002). For Meggers, most of the evidence pointing to cultural complexity within Amazonia (e.g., Marajoara) was the result of migration of peoples and cultures from the Andean region. She further argued that because of the environmental limitations in the Amazonian lowlands, these societies and cultures would devolve (i.e., adapt) into simpler ones, denominated as Tropical Forest type of culture (as defined by Steward, 1948).

Instead, Lathrap (1970) argued rich-nutrient sediments of the floodplains (i.e. *várzea*) and the protein-rich aquatic habitats along the Amazon River and major tributaries flowing from the Andes not only could sustain but also stimulate population growth. Based on both archaeological data and historical linguistics, he proposed a migration model from a hypothesized central Amazon area, associated with an outward expansion of Proto-Arawakan groups that correlate with the Saladoid ceramic series, followed by a later Proto-Maipurean expansion correlated with the Barrancoid/Incised Rim series. Finally, the Proto-Carib expansion from the Guayana plateau was associated to the Arauquinoid/Incised-Punctated series. Given that the Saladoid, Barrancoid and Arauquinoid (ceramic) series were first defined by Cruxent and Rouse for the Orinoco, the polarized debates on the details and merits of Lathrap’s ‘Cardiac Model’ and its antithesis, Megger’s Standard Model were subjected to scrutiny and testing. This debate established two antagonistic tendencies in the archaeology of the Orinoco. Cruxent, Rouse and their students, particularly Zucchi and Tarble, and Roosevelt, were more closely aligned with Lathrap's views. Sanoja and Vargas, and later, William Barse would align more closely with Megger's views

In 1974, Roosevelt began her PhD fieldwork in the Parmana area, on the Middle Orinoco, oriented to document ancient subsistence patterns and human-environment adaptations. Roosevelt's theoretical approach falls into the cultural ecological and evolutionary framework, as elaborated within the New Archaeology (processual) paradigm in North America. In contrast to Sanoja and Vargas, she recovered archaeobotanical remains, enabling her to address questions of agricultural intensification, increased population size and density and social complexity. With her thesis and subsequent work, Roosevelt sought to test the validity of Lathrap's model. She concluded that the formative cultures that produced ceramic styles of the Saladoid and Barrancoid series were characterized by smaller settlements and their agricultural economy was (as Lathrap proposed) based on bitter manioc. However, for her it was when maize-based agriculture became established in Parmana that much larger, denser settlements appeared, some of which she characterizes as chiefdom-level of socio-political complexity (Roosevelt, 1997 p.165). These large settlements were associated with Camoruco tradition ceramics of the Arauquinoid series. Her research has been questioned in terms of chronology, population estimations and the maize-based social development theory (Sanoja and Vargas, 1983; Vargas, 1990; Fernandez and Gassón, 1993).

The Parmana sites excavated by Roosevelt (1978, 1980, 1997) were particularly important because they provided over 70 samples, for conventional ^{14}C, TL and AMS dating method (Roosevelt, 1997), which promised to elevate the archaeological research above the stylistic argument to establish a cultural sequence. Nonetheless, dates obtained from these sites cover a large range that has permitted the existence of two different chronologies in the region. The long chronology, starting around cal.2500 BC, has been championed by Roosevelt and Rouse, and the short chronology, starting around 1000 BC, has been favoured by Sanoja and Vargas. The decision of which dates to reject or accept is largely arbitrary, and dependent upon which model is favoured by the archaeologist. Until today, any historical or evolutionary processes (or models) inferred from the ceramic sequences are undermined by the problems of chronological uncertainty and rely mostly on morpho-stylistic arguments. Much the same has been said of the suite of dates currently available for the Lower Orinoco area (Oliver, 2013).

Between 1976 and 1977, Zucchi and Tarble conducted a survey further upstream in the Middle Orinoco area looking to solve the debate around the basic chronology for the region. Their research, which can be set between the cultural history and cultural ecology paradigms, resulted in the identification of 19 archaeological sites, one of them near the mouth of the Apure River, named Agüerito. From this last site, they identified two new ceramic series: the Cedeñoid and the Valloid series. In Agüerito, Zucchi and Tarble identified six ceramic components, each one corresponding to different social units (Zucchi, Tarble and Vaz, 1984:159). For them, the presence of new ceramic components was not disruptive, neither product of migration nor diffusion phenomena, but rather the result of different groups sharing and/or inhabiting this site at the same time, which can be seen with the exchange of temper techniques and decorative modes. This argument supported a deeper level of interaction, not uncommon in multi-ethnic contemporary indigenous tribes in the Orinocan and Amazonian area (Zucchi, Tarble and Vaz, 1984; Hill, 1996; Hornborg, 2005).

Zucchi and Tarble's research was unable to settle the chronology debate, although it supported Saladoid antiquity over Barrancoid, with an early date for Saladoid and Cedeñoid materials of 2890 ± 145 BP (GX 6269). Nonetheless, their dates for Corozal period of ca. AD 500-1000 are in accordance with the short chronology model (Zucchi, Tarble and Vaz 1984 p.178), which also suggests a longer Saladoid and Barrancoid interaction and a more condensed transition period towards the Arauquinoid series (Boomert, 2000 p.112-113).

In the next decade, Zucchi conducted several campaigns further upstream in the Orinoco and its tributaries, trying to trace evidence of Lathrap's model of an early migration from central Amazon towards the Orinoco, using the Negro river. Contrary to initial expectations, Zucchi's research revealed different ceramic wares associated with a later occupation period between ca. AD 600 to AD 1500 (Zucchi, 1999). Even though these wares were originally related to the Valloid and Cedeñoid series of the Middle Orinoco, the abundant use of fibre temper -more common in Amazonian groups- and the later dates (c.a. 1159 ±122 BP to 544 ± 113 BP -see Gassón, 2002 p.268), makes this initial association controversial.

Tarble's work after mid- 1980's in the Middle Orinoco emphasized new areas of research. She proposed a new model for Carib expansion based on recent results from linguistic studies conducted in the area (Tarble, 1985). Additionality, Tarble and Vaz (1986) explored ancient trading activities using roller stamps, believed to be exchange items. She also did ethnographic work to understand settlement patterns, landscape perception, burial practices and possible interpretation of petroglyphs and pictographs in the region (Gassón, 2002 p.281-283).

During the 1980's and 1990's, ethnographic studies were conducted in the area and their intakes inspired and were actively incorporated to the archaeological research. Frías's (1989) research among the Piapoco revealed an association between the decorative patterns present in ceramic materials and social organization levels, representing individuals, phratries and patrilineages. On the other hand, Vidal's ethnographic study with the Piapoco (1987; 1989), allowed her to reconstruct their mythical/historical migrations and some of the technological and symbolic aspects of their ceramic materials. According to her study, the difference among the Piapoco ceramic assemblages also included vessel forms and sizes, which are linked to their use - either for self-comsumption or trade- or the sex, age, rank or phratrie of the final consumer. Also, the Piapoco women, potters in their communities, are taught their craft from their mothers, but are relocated to their husband's phratrie or sib, which might account for part of the exchange and diversity in decorative motifs and vessel forms found in the archaeological record (Vidal, 1989 p.50-51). This association was also reported in the Warekena basketry, whose geometric designs are thought to communicate laws of exogamy and maintain social balance (Díaz, 1995).

Vidal's reconstruction of the mythical migrations of the Piapoco (1987, 1993) was especially important for the emergence of a new migration model for the Upper Orinoco area. Oral history of Maipuran and Arawakan indigenous groups describes Kuwai – a cultural hero- who followed certain fluvial and terrestrial roads from the Isana area towards the Upper Negro, Lower Guania and Middle Orinoco (Vidal, 1987 p.127). According to Zucchi (2002), these routes, coincide with linguistic glottochronology and archaeological evidence that propose this as the ancient population route followed by Proto-Maipuran groups between 4000 to 3500 BP. The archaeology that supports this claim is based on a new ceramic tradition denominated as the Parallel Lines Tradition, composed by five wares, with both inorganic and organic temper and deep incised decoration, similar to the Cedeñoid series from the Middle Orinoco (Zucchi, 2002 p.201-206). However, no chronological evidence has been found to prove this model.

The most intense work done to date in the Átures Rapids area, in the Middle Orinoco -which concerns this research project-, was interested with establishing a cultural chronology. Barse's research during the 1980's resulted in a larger occupation sequence, with evidence of a pre-ceramic component dated c.a. 9000 BP. For his doctoral thesis, this study included excavations between the Meta River and the Maipures Rapids, an area that only had previous sightings and descriptions of surface ceramics materials and petroglyphs (Cruxent, 1950; Perera, 1971; Marwitt, Morey and Zeidler, 1973; Perera and Moreno, 1984; Perera, 1986). Barse reported two pre ceramic components with hyaline quartz flakes, with a date of 9020±100 BP (Beta 22638), becoming the oldest date on record for human occupation in the Orinoco at the time of its publication (Gassón, 2002 p.265). In relation to his ceramic sequence, he proposed six continuous phases from 3000 BP to 720 BP. This model has undergone some later adjustments, based on new radiocarbon dates and a review of Pozo Azul and Wayuko Island ceramic collection (Barse, 2009); nonetheless, the main argument continues to be stylistic affiliations, and the chronology of the region is still unclear (DeBoer, 1998).

More recently, Perry (2006) studied quartz flakes recovered by Barse at Pozo Azul Norte site for starch analysis. These microliths, associated with Barrancoid ceramics, contained mostly maize (*Zea mays*) but also arrowroot (*Maranta sp.*), yam (*Dioscorea sp*.) and palm fruit (*Attalea maripa*), among other seeds and tubers. Surprisingly, bitter manioc (*Manihot esculenta*) was not present in the sample. Despite the limitation of her conclusions in terms of sample size, Perry's results raised questions regarding subsistence models for the region. They not only suggest an earlier date of maize consumption of about AD450-800, but also questioned models that associated maize consumption with social complexity, which was considered to have taken place later in the Middle Orinoco along with the occurrence of the Arauquinoid ceramics (Roosevelt, 1980).

Finally, the latest work in the region was conducted by Tarble and Scaramelli in the Parguaza area. As part of their doctoral research, in line with a post-processual framework, Tarble (2006) and Scaramelli (2005) expanded the known chronology beyond the contact period. Through the analysis of ceramic and glass materials, they were able to demonstrate how imposed changes from the colonial period were mediated by indigenous practices and interest.

In summary, after more than 60 years of studies conducted in the area, there are various competing models on the population of this region in pre-colonial times. Those models differ in terms of chronology, ceramic complex denominations and their correspondence with ethnic/linguistic groups. They also state different understandings on diffusion, migration and interaction processes that shaped the region into a heterogeneous area where trade, alliances and warfare mediated the relationship between different groups at the time of contact.

2.2.2 Models and debates on the classification of pre-colonial occupations of the Orinoco

Osgood and Howard (Howard, 1943; Osgood and Howard, 1943) conducted the first systematic excavations at Ronquín, Parmana, Camoruco and Corozal archaeological sites, from which they defined the first relative chronology. His sequence is based on the stratigraphic distribution of ceramic groups, defined by the clustering of certain types and modes, understood as morphological attributes as well as technological traits such as paste, temper, surface treatment, decoration and colour (Barse, 1989 p.74). Based on the distribution of three ceramic groups at the Ronquín site, Howard (1943 p.20, 31-21, 58-59) proposed an early and late period. Groups Y and Z are part of the early period while group X defines the late period (Howard, 1943 p.19; Navarrete, 1999 p.41; Boomert, 2000 p. 103). The Y group comprised the majority of the early ceramic complex and was characterized by quartz sand or grit temper inclusions and decorative techniques that included modelling, broad line incised design and white on red painting (***Fig.2-2***). The minority Z group was described as having *cauixí*, ash and/or sand, and a simpler incised decoration. Finally, group X had *cauixí* or sponge spicules temper, narrow line incising and applique punctation (Howard, 1943 p.22; Barse, 1989 p.27; Gassón, 2002 p. 273).

Figure 2-2. *Early Ronquín Y sand-tempered group recovered from Ronquín site by Howard in 1941. Photo courtesy of José R. Oliver, 2015.*

The excavations conducted by Cruxent and Rouse in Saladero-Lower Orinoco in 1950 and 1955, complemented the sequence by relating Howard's finding and their own results with other archaeological sites following a modal analysis methodology (Boomert, 2000 p.104). The Saladero site was defined as a multicomponent midden deposit with five subsequent stratified ceramic complexes: Saladero, Barrancas, Los Barrancos, Guarguapo and Apostadero

(***Fig.2-3***). Each complex or style was tough to correspond to an “isolated type site and replicated in other homogeneous sites, [with] common material, shape and decoration traits, representing the totality of customs possessed by a single group of people during one period in their history (Cruxent and Rouse, 1958 p. 2)”. The Saladero pottery style was closely related to Howard’s Early Ronquín Polychrome complex and with some of the pottery samples collected on the surface of Cotúa Island by Cruxent (1950). According to Cruxent and Rouse (1958), altogether they conformed the Saladoid series, using the term ‘series’ to define “a set of similar and contiguous styles that share many although not all traits (Cruxent and Rouse, 1958 p.22)”, which can be broadly translated into historically and spatially related styles (Barse, 1989 p.32). For Saladero they obtained four radiocarbon dates, with a corrected means of cal. 806-594 BC 2σ (OxA-28167) (Oliver, 2013). The Barrancas and Barrancoid assemblages conformed the Barrancoid series, while the Guarguapo and Apostadero complex became part of the Arauquinoid series, firstly known as the Late Ronquín complex.

Figure 2-3. *Barrancas (Bar-1), Los Barrancos (Bar-2) and Guarguapo and Apostadero (Bar-3) decorated potsherds obtained from Saladero site in the Lower Orinoco by Cruxent and Rouse. All sherds were tempered with sand and grit, except for the last two in the upper row, which also contained sponge spicules. Composite pictures courtesy of José R. Oliver, 2015.*

Cruxent and Rouse's model was modified and extended after the excavations in the Parmana region (Middle Orinoco) by Rouse, Roosevelt and Olsen between 1974 and 1975. In Roosevelt and Rouse's sequence, the earliest tradition is La Gruta (4090±105 BP, I-8970), which corresponds to a local Saladoid complex with a dichotomous ware (Roosevelt, 1978 p.176), including a grit temper ware (***Fig.2-4***) and a minority fibre, sand and crushed sherd temper ware, associated with Howard's Z ceramic group and interpreted by her as a trade ware. Early La Gruta phase shows more affiliations with Saladoid ceramic complex, while latter phase, denominated Ronquín Sombra, has some Barrancoid influence (Rouse, 1978 p. 204; Boomert, 2000 p.107). According to Rouse (1978 p.203), La Gruta represents the ancestral style of both Saladoid and Barrancoid series, which would mean the Middle Orinoco occupation precedes the Lower Orinoco findings, supporting Lathrap's model of an ancient migration from Central Amazonia.

Figure 2-4. *La Gruta complex ceramics excavated by Roosevelt in 1974-1975. This complex is thought to be ancestral to the Saladoid and Barrancoid traditions from the Lower Orinoco. Sand tempered ceramics recovered from this site exhibit incisions and modelling associated with both series from further downriver. Photo courtesy of José R. Oliver, 2015.*

Following La Gruta, the Corozal tradition (2650±80 BP, QC-271A) (***Fig.2-5***) is described as pertaining to a transition period (Roosevelt, 1978 p.178). In ca. 1800 years, the sand, fibre and clay tempered wares with Saladoid and Barrancoid influence traits were slowly replaced by a dominant *cauixí* tempered ware with new vessel forms and decoration. This last ware was associated with the appearance of maize, beans and squash and an increase in the population, interpreted as a by-product of more intensive agriculture and a maize-based economy (Roosevelt, 1997 p.158-162). Roosevelt interprets this transition as a result of a long interaction and adoption of foreign elements, although is still uncertain whether it was a continuous or sporadic interaction, if it was a direct or indirect contact, and/or the cultural implications of this shift. Its chronological length has been questioned from the absence of contact or interaction between both ceramic traditions prior to 1600 BP (Boomert, 2000 p.112). On the other hand, its interpretation by Rouse (1978 p.207-208) as the period concerning the transformation of the Z group into a more Arauquionid ware based on the exponential use of sponge spicule temper has also received criticism, given that this group was defined by Howard as part of the Ronquín assemblage that did not transcend to the later occupation (Barse, 1989 p.35). Finally, the last period was represented by the Camoruco tradition (1150-400 BP) (***Fig.2-6***) which can be defined as part of the Arauquinoid series.

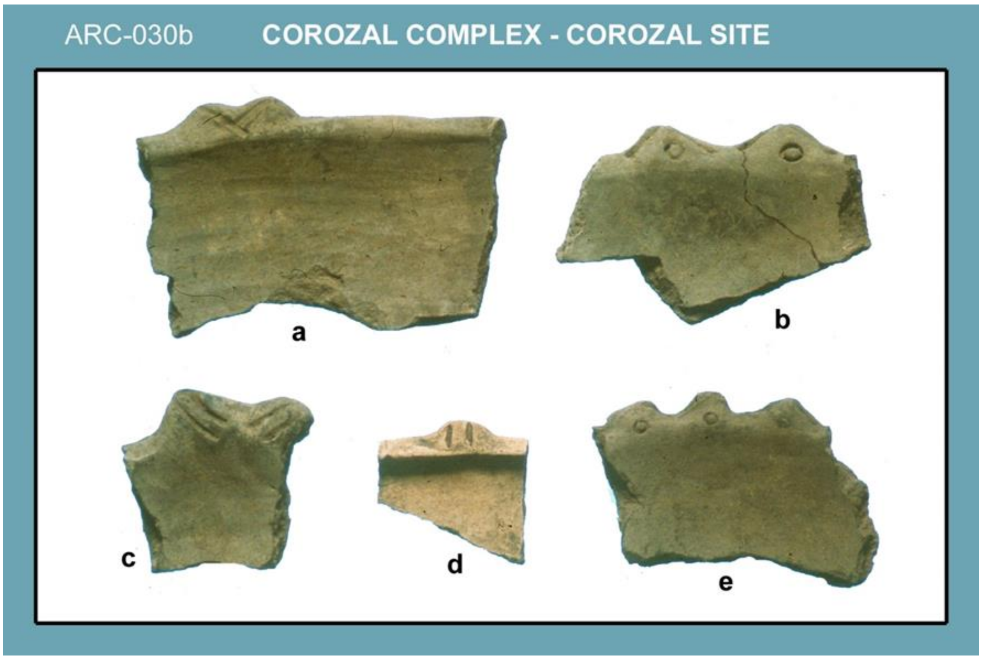


Figure 2-5. *Corozal tradition ceramic rims, tempered with sponge spicules and fibre, obtained by Roosevelt at the excavation site from which they were named after. Photo courtesy of José R. Oliver, 2015.*

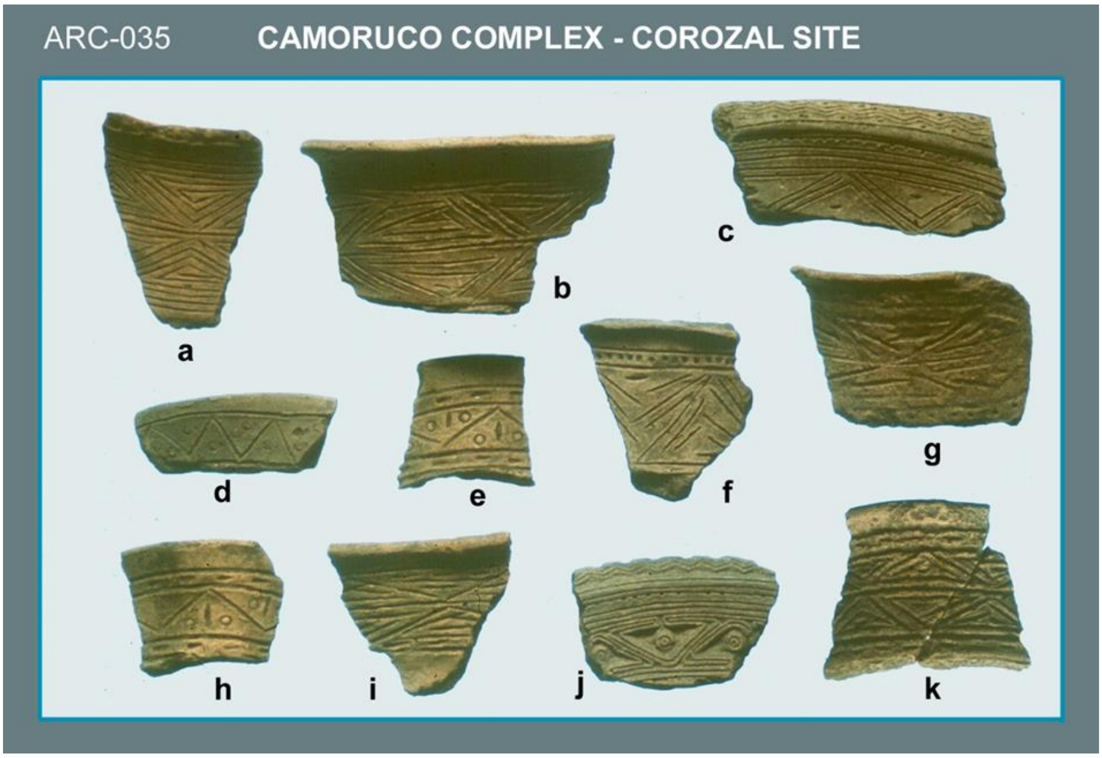


Figure 2-6. *Camoruco complex ceramic rims, which belong to the Arauquinoid series, tempered with sponge spicules and decorated with complex thin linear incisions. Photographed sherds were recovered from the Camoruco archaeological site by Roosevelt. Photo courtesy of José R. Oliver, 2015.*

Zucchi and Tarble defined two additional series (***Fig.2-7***). The Cedeñoid series, a dry clay, fibre and sand tempered and incised geometric motifs ceramics, comprise fibre temper groups mentioned by Howard -Z ware- and Roosevelt (Zucchi and Tarble, 1984 p.305-309). It was dated by TL c.a. 552 AD, but ^{14}C earliest dates range between 3980±150 BP (GX-5180) and 1235±135 BP (GX-5179), making it contemporaneous or even earlier than Saladoid ceramics (Zucchi, Tarble and Vaz, 1984 p.178; Zucchi and Tarble, 1984 p.305-308; Navarrete, 1999 p.46). The Valloid series, a red paste ware with crushed coarse rock inclusions and applique incised motifs, is contemporaneous to the *cauixí* tempered Arauquinoid ceramics, with a general timespan of 950-450 BP (Tarble and Zucchi, 1984 p.443-444). For Cedeñoid materials, early ^{14}C dates have been questioned and its continuous presence through the sequence for more than 2000 years as a minority ware raises doubts about its chronology and stylistic historical evolution (Lathrap and Oliver, 1987 p.279). The similarity between Middle Orinoco and Llanos Cedeñoid materials is also questionable since most of the *llanos* sites are small surface collections without context (Zucchi and Tarble, 1984 p.303). The same problem occurs with Valloid materials, found often in association with Camoruco sherds, leaving to question if it is a trade ware or the product of other kinds of relationships between the makers of these two series (Barse, 1989 p.409-410).

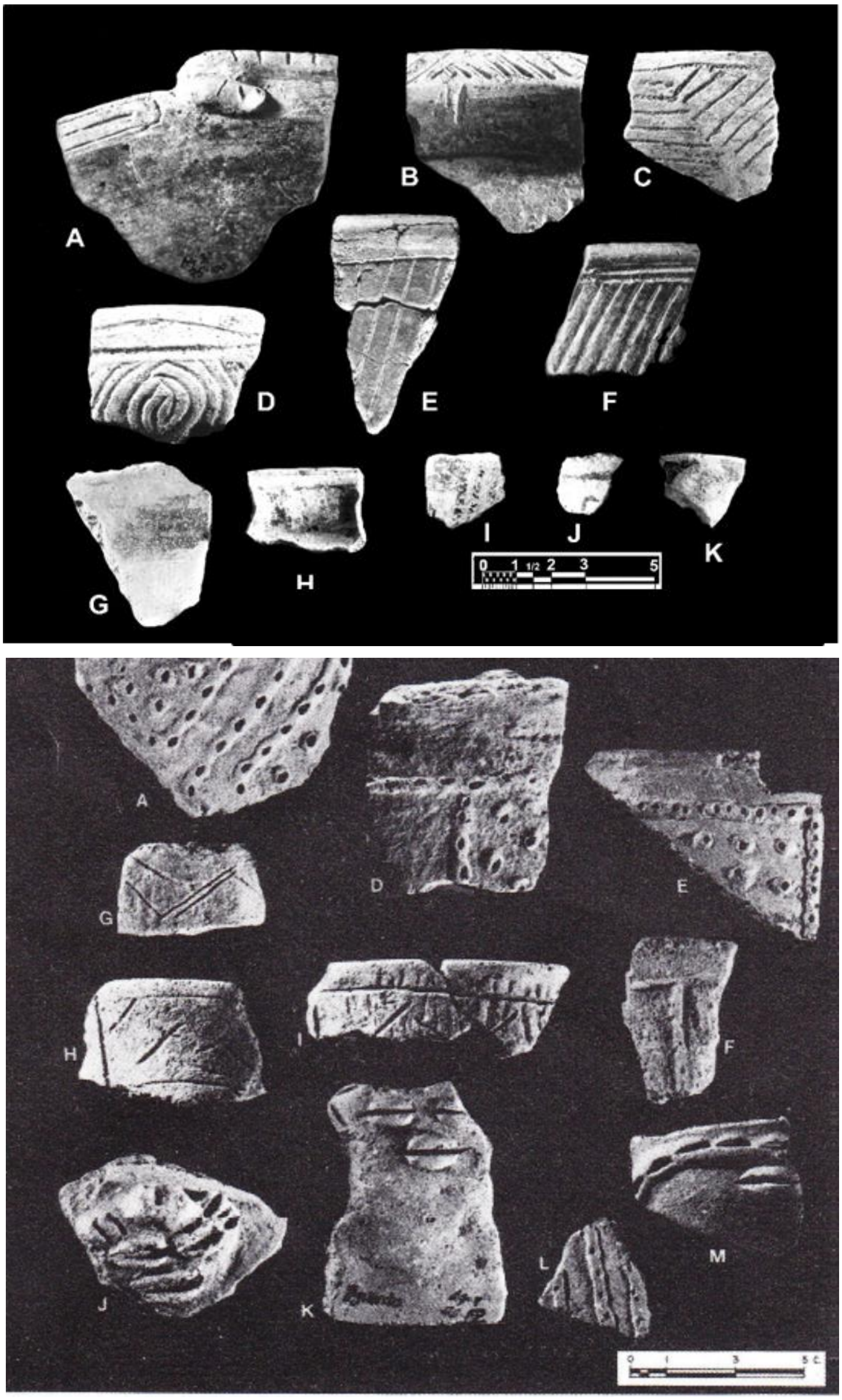


Figure 2-7. *Group of sherds on the top, decorated with linear incisions, correspond to the Cedeñoid series, tempered with sponge spicules, fibre and clay pellets. Bottom ceramic bodies and appendages with punctated applique strips and few incisions belong to the Valloid series, a sand tempered ware. Pictures taken from Zucchi, Vaz and Tarble,1984 and Tarble and Zucchi, 1984.*

Iraida Vargas and Mario Sanoja challenged Cruxent and Rouse's model after their excavations at Saladero, Ronquín and La Gruta sites, between 1968 and 1975 (Sanoja, 1974; Vargas, 1976a; Vargas, 1976b; Sanoja, 1979). Following the Ford-Meggers taxonomic classification approach and seriation methodology, they re-named Barrancas, Los Barrancos and Guarguapo complexes as Pre-Clasical, Classical and Post-Classical Barrancas. This model modified the Saladoid complex definition by making it a distinct ware of the Barrancas complex and changing its chronological position in the sequence as contemporaneous and even placed latter in their Post-Classic Barrancas phase. Modifications were based on more recent radiocarbon dates obtained for the Saladero excavations (Gassón, 2002 p.277). Additionally, their analysis revealed early Saladoid ceramics lacked certain vessels forms as open bowls with flanges, boat-shaped vessels, annular rings and more complex modelling-incision, all of which defined the Barrancoid style (Cruxent and Rouse, 1958 p.219).

Barse supported this model in his research, by placing the earliest three phases of his sequence -Isla Barrancas, Casa Vieja and Pozo Azul- within the Barrancoid series. Even though the period covered by these three phases extends from 1000 BC- AD 870, only four ^{14}C dates were recovered for the last phase, which provided a date range of AD 460-870 (Barse, 2009 p.96). The next phase, considered intrusive, is Cataniapo, with an associated ^{14}C date of AD 260 (1690±90BP, Beta 22641). Culebra, the following phase, is affiliated by Barse to the Barrancoid continuum and two ^{14}C dates within the range of AD 500-730 (1450 ±90 BP Beta 22640, 1220 ±70 BP Beta 2237) (Barse 2009). Finally, for the Arauquin phase Barse obtained two radiocarbon dates form Rabo Cochino Island, between AD 1230-1320 (720±90BP Beta 22642, 630±110 BP Beta 22639) (Barse, 1989 p.388), which corresponds to previous reports in the region.

In the Upper Orinoco and its tributaries, five different ceramic wares have been defined and associated with a later occupation period between ca. AD 600-1500 (Evans, Meggers and Cruxent, 1959; Zucchi, 1999). Two major ceramic phases related to Middle Orinoco series have been described: sand tempered

Corobal phase and *cauixí*, sand and fibre tempered Nericagua phase (***Fig.2-8***). Corobal phase, with thinner bowls and jars with appliques and zoomorphic appendages, has no associated dates, although it has been suggested to be a later occupation related to the Valloid Series of the Middle Orinoco (Zucchi, 1999 p.27). As for Nericagua, the incised, modelled and negative painted bowls and jars have been related to the Cedeñoid series, although its date range corresponds to a later period between 1159 ±122 BP to 544 ± 113 BP (Gassón, 2002 p. 268).

Figure 2-8. *Composite with Nericagua and Corobal ceramic potsherds. Top sherds (a-k) correspond to the sponge spicule tempered and incised decorated Nericagua phase, while the sand-tempered modelled-incised zoomorphic appendages (l-z) correspond to the Corobal phase. Photo from Zucchi, 1996.*

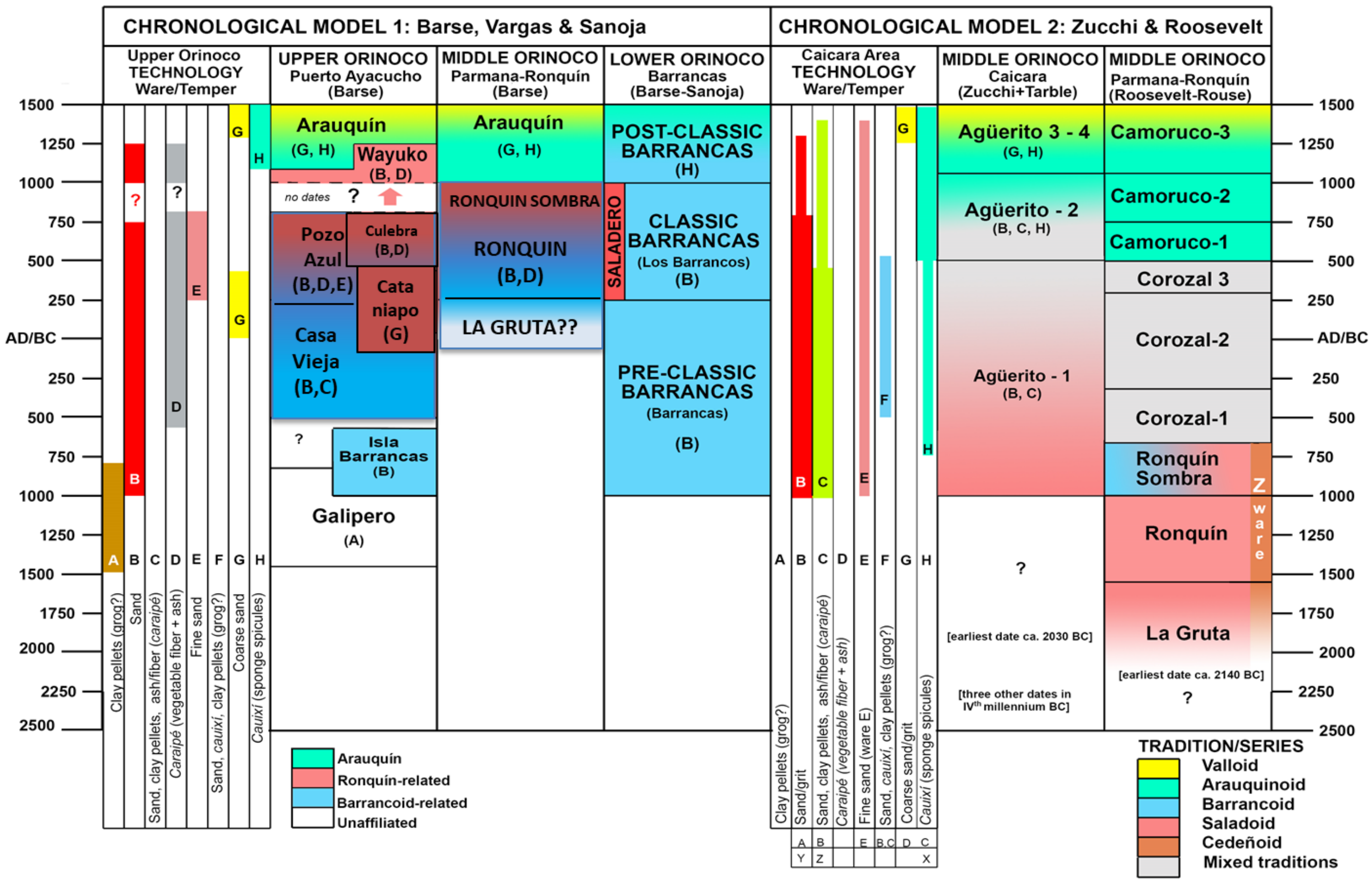


Figure 2-9. *Chronology summary chart with the different ceramic traditions per area and author. Source: José R. Oliver and Natalia Lozada Mendieta, 2017.*

2.3 The Átures Rapids and William P. Barse's Cultural Sequence: Implications and Limitations

A detailed and critical discussion on the current model for the pre-colonial occupation and population of the Átures region is necessary to establish a framework for the upcoming chapters. This time-space model was developed by William Barse (1989), based on his research project for his doctoral dissertation in the 1980's. His cultural chronology scheme for the Upper Orinoco, although briefly mentioned before, is currently the most accepted reconstruction of the chronology and distribution of the ancient groups than inhabited this region in the past. To be able to discuss and compare the results from the *Cotúa Island Reflexive Archaeology Project,* it is crucial to fully understand his arguments, the evidence used to support his conclusions, and to critically examine its strengths and limitations.

The cultural sequence developed by Barse has three fundamental concepts that support its structure: ware, component and phase. He defines ware as a "ceramic entity (or assemblage) that is identifiable by certain shared characteristics (or attributes) of paste and temper, (…), colour and firing, surface treatment, vessel shapes and range of decorative techniques (Barse 1989:77)". Barse relates this definition with the one provided by Howard (1943) for 'ceramic group', the definition of 'ceramic style' given by Cruxent and Rouse (1958) and the 'type' concept proposed by Vargas (1979). However, there are certain aspects of each concept that are not completely equivalent and need to be reviewed.

Howard's 'ceramic group' category refers to shared ceramic attributes observable in an assemblage. For this classification, he considered aspects such as paste, colour, surface finish, shape and decoration (Howard, 1943 p.19). Each group was divisible into 'types', conformed by sherds that shared similar attributes associated with a particular vessel form and/or decorative technique. A ceramic group, in accordance to their discrete stratigraphic distribution, was considered as the product of a culture, with their own manufacturing and decorative technique (Howard, 1943 p.59). However, Howard's classification scheme kept transforming through the decade, when he adopted a classification approach more similar to Rouse's than to the Midwestern Taxonomic System he first applied (see Osgood and Howard 1943). It was then when he implemented the term of 'style' and 'complex'; the former to describe a unit of homogeneous pottery artefacts with shared traits - in the same sense as 'ceramic group'-, and the latter to refer to a subgroup of artefacts within a certain style in terms of their decorative technique (Howard, 1947 p.14-15). Although the complexes defined are followed in their regional distribution as potential markers of historical relationships, the 'styles' or 'ceramic groups' are considered as the ones associated with a cultural dimension (Howard, 1947 p.35).

As a result of a further development of the archaeological theory and terminology in the next years, Cruxent and Rouse present a more concrete definition of 'style' as the recurring pottery traits possessed by a single group of people during one period in their history (Cruxent and Rouse, 1958 p.2), and this last one is contained within what they understand as 'phase', which comprises all the material culture (not just ceramics) that allows to define "a cultural complex possessing traits sufficiently characteristic to distinguish it [from other phases] (Rouse, 1955 p.713 quoting Phillip and Willey, 1953 p.620)".

According to Cruxent and Rouse's classificatory scheme, a ceramic 'style' is contained within or forms part of a certain phase, and it can comprise one or several 'wares'. The 'ware' is then the broadest kind of classification based on specific attributes of paste and/or surface treatment (Rouse, 1986 p.143), but with no direct cultural or social equivalent. To be able to grasp the cultural significance of the ceramic grouping, Rouse proposed a subdivision of wares according to set of features known as 'modes', and kinds of pots or 'types'. While each 'mode' can be identified by following one dimension of attributes, such as rim form or temper, each 'type' refers to the combination of attributes of paste, vessel form and/or decorative technique (Dunnell, 1971). Each style possessed certain modes and types that can be pursued through time and space, and by following their vertical and horizontal distribution, a reconstruction of its particular historical trajectory can be made. Nonetheless, in Venezuela, as in the Antilles, a similar ‘style’ was found in distant geographic areas and at different periods in time (Rouse, 1990 p.56); which is why the higher concept of ‘series’ was later developed, grouping sets of historically associated styles (Cruxent and Rouse, 1958 p. 22), working as both a horizon and a tradition.

The definition of ‘type’ used by Vargas in her previous work in the Lower Orinoco was also used by Barse. For Vargas (1979 p.49), a ceramic ‘type’ represents a group of artefacts with a common decorative technique, surface treatment, paste and firing conditions (1979 p.49). The so called ‘plain types’, which are lacking decorative motifs, are later assigned to a certain ‘type’ primarily based on their vessel shape, similar to Howard’s method for his ‘ceramic group’ classification. In contrast to Cruxent and Rouse, their ‘type’ and not the ‘style’ is used to develop local chronologies within sites or groups of sites.

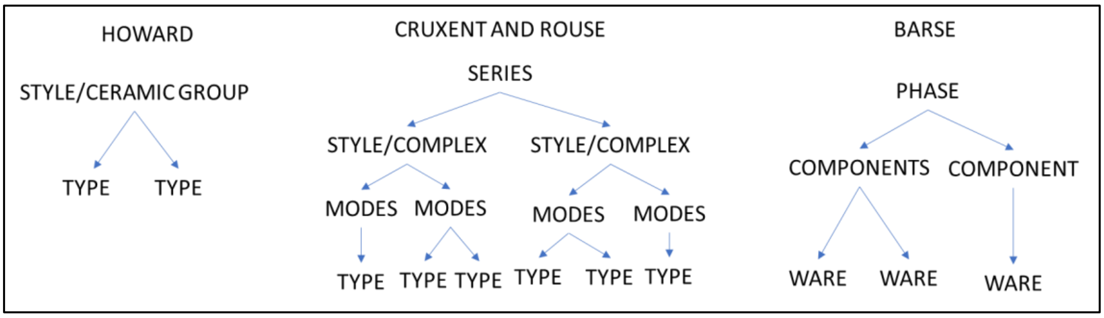


Figure 2-10. *Classificatory system used by Howard (1943, 1947), Cruxent and Rouse (1958) and Barse (1989).*

Despite the previous remarks on the former classificatory models (***Fig. 2-10***), Barse adapted the pre-existing categories and developed a new hierarchy and definition for each term. For Barse, ‘ware’ can be understood in the same sense of ‘style’, to identify the occurrence of a certain ‘phase’, by considering it to be a stratigraphically isolated chronological marker produced by a single ethnic group (Barse, 1989 p.76-77, 83). In this scheme, a ‘phase’ corresponds to a culturally homogeneous archaeological unit regionally localized and chronologically restricted (Barse, 1989 p.82). This unit can be subdivided in ‘components’, which are the product of an occupation by members of one ethnic group, or subset of that group, in an archaeological site. Two different components within one phase can correspond to different ranges of activities or adaptive requirements, when referring to a regional occupation rather than to a specific site (Barse, 1989 p.82).

His regional sequence is then built as a chronological series of phases or 'archaeological cultures' that follow each other through time. Four of these phases are affiliated to the Barrancas tradition, based on their stratigraphic location, vessel forms and decorative motifs. These correspond to the earliest phases in the sequence- Isla Barrancas, Casa Vieja, Pozo Azul and Culebra- which are interpreted as a local development of the aforementioned larger Orinocan tradition. According to Barse, this tradition extended in the Upper Orinoco area for almost 2000 years (ca.1000BC-AD 730), in what is described as a parallel but related sequence to the one proposed by Roosevelt for the Middle Orinoco (Barse, 1989 p.12). Although not explicitly defined, tradition is understood by both Barse and Roosevelt in the same sense of its original definition by Phillip and Willey (1958 p.37), as a temporal continuous unit comprised of culturally related persistent technologies or systems of related forms. Even though the term is primarily associated with a chronological dimension, ceramic traditions are proposed in terms of a rather local spatial scale, varying for each archaeological site or area.

The overall continuity described for the first four phases is tested by the occurrence of the Cataniapo phase, an intrusive pottery related with the Saladoid style described for the Lower Orinoco, and an associated date of AD260 (1690 BP ± 90, Beta-22641). This phase, although prior to Culebra, is considered to reflect a later occurrence of the Saladoid Tradition in relation to the Barrancoid early phases. Finally, the Arauquin phase, from AD 1230-1320, is the last one in the sequence. Recognized by the dominance of the sponge spicules tempered pottery, this phase belongs to the last tradition before contact (Barse, 1989 p.12).

Subsequent excavations in the Orinoco area in 1991, 1993 and 2008 by the same author, brought new data to the discussion and augmented the proposed regional sequence. One additional phase was introduced, and a new complex was added, while the chronology was slightly modified, from the excavations on two different archaeological sites in the region. The Galipero Complex, associated by Gassón (2002 p.266) with the Cedeñoid series, has an accompanying date of ca.1490 ±100 BP (Beta 52136) underlaying a hearth in the Pozo Azul Sur site where it was reported. This pottery has not been analysed, only a brief description mentioning the occurrence of clay pellets as temper and evidence of incomplete firing (Barse, 1999 p.366,368). On the other hand, the Wayuko phase was described as being a later manifestation of the Culebra phase at the Wayuko or Zamuro Island, giving a status of ‘phase’ to emphasize a temporal gap between Culebra and this later component. Only reported in his 2009 article, Barse associates this phase with three radiocarbon dates with a calibrated range of AD1010-1190 (Beta-222913, Beta-222912 and Beta-222911). This represents a problem since it not only reveals a hiatus of almost 300 years between Culebra and Wayuko -separated by less than 6km-, but also it extends the Culebra phase from AD500-1200. He proposed a similar hiatus of 300 years between the Casa Vieja and Pozo Azul phases based on four ^{14}C dates obtained for the last phase alone, and which are very much later (AD 460-870) than the proposed earlier chronology for his Barrancoid affiliated phases.

Besides the chronology debate and the already mentioned limitations associated with the definition of phases from single sites with scarce ceramic material, Barse position on the Barrancoid and Saladoid dispute offers an additional ground for discussion. His support of the early occurrence of the Barrancoid over the Saladoid series replicates the account offered by Sanoja (1979), while contributing with his own evidence from the sites excavated in the Upper Orinoco area. The interpretation of the chronological distribution of these two series is mainly based on stratigraphic and stylistic arguments, both of which present significant inconsistencies.

On his description of the Culebra phase, as derived from the Barrancoid series, Barse mentions as key arguments the presence of thickened rims and modelled appendage on strip handles, a similar vessel range in both Culebra and Isla Barrancas, the co-occurrence of a sandy red ware with a minority fibre and sherd temper ware and, finally, the association with a charcoal stratigraphic layer. However, when discussing the Cataniapo phase and his affiliation with the Saladoid series, the same vessel range is described, only differing in the occurrence of direct rims and flat bases on the latter. Strangely enough, the white on red painting, so characteristic of the Saladoid ceramics, is absent in the Cataniapo materials and is described –although separately along with black painting- for some potsherds found on Isla Barrancas and Pozo Azul, associated with the Barrancoid series (Barse, 1999 p.368, 372). Another major essential element for the Barrancoid series originally defined in the Lower Orinoco are the flanged rims, which are absent in the affiliated materials from Isla Barrancas, Casa Vieja, Pozo Azul or Culebra, although in this last site he describes flat incised thickened rims with a ´T´ shape, which are not entirely comparable in size and decorative motifs. To explain the variation in the Saladoid and Barrancoid series, he uses the argument of geographic distance and a parallel local development in different portions of the river. Finally, the association of certain vessel forms is selective and rather unsystematic since the vessels are identified in terms of whole shapes but not considering each mode and their combination for each period and type of ware.

Beyond the stylistic discussion, Barse uses a pedological argument to support his claim of an earlier Barrancoid occupation, based on the association of Barrancoid ceramic materials with a charcoal stratigraphic layer in several sites along the river. For him, the so called "Ronquín paleosol", is a result of a "wide spread phenomenon of climatic and cultural events from the Lower Orinoco to the Middle Orinoco [following] a relative climatic stability of a larger rainy season [with a] greater regional expose of tropical forest (Barse, 2009 p.96)". This claim is not supported by environmental or geomorphological analyses. Ever more, the Cataniapo phase materials, associated by Barse with the Saladoid series, are present in a deeper stratigraphic layer in the Culebra site, previous to the Culebra phase materials, and with an associated ^{14}C date of AD 260 (Barse, 1989 p.202; 1999 p.373), which would make it an earlier series. They were also reported in Pozo Azul site as a ´trade ware´ associated with the Pozo Azul red ware, although their stratigraphic distribution is not discussed (Barse, 1999 p.373). Nonetheless, both series occur within the same stratigraphic layer in Culebra site, making the paleosol argument flawed and not applicable for certain contexts.

One last point worth discussing is the interpretation of the cultural significance of his model. It has been mentioned that in his scheme the phases correspond to an archaeological culture, regionally localized and chronologically restricted (Barse, 1989 p.82). Just as the preceding archaeologists working in the Lower and Middle Orinoco, his sequence recognizes the coexistence of wares within given phases but his interpretation on this matter is rather different. The persistence of the "dual ware assemblage", a denomination used by Barse to describe the pairing of sandy tempered and fibre or sponge spicules tempered wares through different phases, is explained as the result of a functional differentiation. While sandy wares correspond to vessels used for food serving consumption, most of the food processing pots and griddles seemed to be tempered with fibre or *cauixí* (Barse, 1989 p.383). It is important to mention the analysed fragments were of a small size and heavily eroded, which made it difficult to identify or reconstruct most of the vessel forms, suggesting a cautionary measure when reading his conclusion. Likewise, the pairing of wares persists beyond his Barrancoid continuum and into the Arauquin phase, thought to correspond to a different culture that emphasized sponge spicule tempered ceramic materials with distinctive decorative motifs and vessel forms. For this latter period, the minority sand ware is thought to be the product of trade, which is not sufficiently explored and out of the scope of his research. Taking into account the previous remarks, the argument that uses the existence of dual assemblages to affiliate certain tradition to the Barrancoid series is questionable and most importantly, needs to be systematically proven it was the result of function or trading activity.

Even though the Agüerito archaeological site was well known and discussed in the previous years before Barse excavations in the Átures region, the normative approach he used was grounded on the predominant wares to define the different phases, leaving the minority accompanying wares as part of the description but not of the interpretation of the occupation sequence. Unlike Barse, Zucchi and Tarble interpreted the coexistence of more than one ware in the same period as evidence for multi-ethnic communities. Although they recognize the wares as “a unique combination of paste, form and decoration […] that probably correspond to distinct social entities (Zucchi, Tarble and Vaz, 1984 p.159)”, they are cautious to equate this to a style, as defined by Cruxent and Rouse (1959), given that for some wares the amount of sherds is very low and there are not enough elements to suggest they were made by different people (Zucchi and Tarble, 1982 p.189-190). Even so, the reconstruction of vessel forms at the Agüerito archaeological site allowed them to identify functional overlap in the forms associated with sand, fibre and sponge spicule tempered wares. Along with the increasing popularity of the *cauixí* sherds and the incorporation of new vessel forms associated with the later Arauquinoid series, all seem to suggest close contact. This happened also in the opposite direction, with the incorporation of decorative and formal modes from the sand tempered ware in the sponge spicule tempered ware - e.g. broad-line, shallow incision in curvilinear motifs, out sloping flanged bowls (Zucchi, Tarble and Vaz, 1984 p.170-171). These so called mixed or ´hybrid´ wares are thought to be the result of exchange and interaction between at least two different pottery making traditions (Zucchi, Tarble and Vaz, 1984 p.171). In here, wares are not equivalent to ´people´, nor are they equivalent to ´culture´, but material evidence of plural communities and of an interactive craft, calling for a more dynamic reading of the past beyond the predominant normative approach.

2.4 Issues and challenges of the Orinoco archaeology

Occupation and population models for this region are a reflections of a cultural history theoretical perspectives which still permeate most of the archaeological research. Migration and diffusion arguments based on the presence/absence of certain ceramic wares affects the discussion by directing it towards the identification of cultural areas, and assuming the equivalence between ceramic styles and ethnolinguistic groups, which need to be taken cautiously. Even though several archaeologists agree with the Arawakan linguistic affiliation of Saladoid and Barrancoid traditions (Lathrap, 1970; Rouse, 1978; Zucchi and Tarble, 1984; Oliver, 1989; Boomert, 2000; Zucchi, 2002), the direction of the expansion is still a matter of debate given contradictory radiocarbon dates and contaminated contexts in the Middle Orinoco (Oliver 2013; Roosevelt, 1997; DeBoer, 1998). In the late pre-colonial period, the ethnolinguistic association is less controversial, with the Arauquinoid and Valloid series linked with Carib-speaking groups that purportedly penetrated the Middle Orinoco region around ca. AD 600 from the coast and Western Guyana, respectively (Lathrap 1970; Zucchi, 1999, Tarble, 1985). Nonetheless, areas occupied by the Otomacos, who spoke an independent language (Arellano, 1986 p.489), also reported *Cauixí*-tempered and deep lineal incised ceramics (Zucchi, 1985 p.26-37).

This adds to the fact that denominations of the various ceramic complexes reported in the area vary according to the author, as series, traditions or phases, with their respective cultural and chronological implications. Furthermore, the archaeological coverage of this region is still scant, limited to generally river bank areas along the Orinoco and some main tributaries, and concentrated in the north- western area; leaving inland areas in the Western Llanos and the Venezuelan Guyana still unknown. Overall, chronology, classification and migration models in the region are still under construction and open for debate.

Considering the ethnohistoric and ethnographic data describing Orinoco indigenous groups as multi-ethnic communities who practice long distance trading (Hill, 1996; Hornborg, 2005 p. 591), it is necessary that the archaeology in the region addresses these more complex and dynamic scenarios in a more systematic way. Ceramics and beads, being portable and well-preserved materials, must be analysed beyond their relative chronology value or their rareness, but in terms of their technology and morpho-stylistic characteristics to overcome diffusionistic and speculative statements. This will allow to discriminate among a variety of practices -either locally produced or imported- and to better understand the occupation sequence and interaction processes that shaped this region.

3. THEORY BACKGROUND

3.1 Patterned identities, chronology and mobility

Ceramic material and other ancient artifacts recovered along the Orinoco river basin have been classified following a predominately culture historical approach. This theoretical perspective was rooted in the collections and curiosity cabinets of the 19th century, which first started classifying objects base on their provenance, type of material (e.g. ceramic, stone, textile) and decorative motifs (Orton et al, 1993 p.5). The groups of objects that shared certain formal and decorative patterns were thought to represent ethnic and cultural groups, and soon their occurrence in certain areas and depths was used to define cultural boundaries and relative chronologies.

Groups of artefacts put together were used to define a style. For the cultural historians, a style consisted of a recurring set of attributes produced by the same group of people at a particular moment in time, product of common ideas held by its makers (Dunell, 1986 p.167). In this sense, archaeological objects with shared features were a manifestation of socially defined patterns of thought and customs of the artisan and the culture they belong to (Childe, 1956 p.1). Likewise, their occurrence and disappearance in time served the purpose of defining periods, as if the object were an index fossil that could locate said cultures in a specific time and place.

Within this approach, archaeologists such as James Ford, Irving Rouse and Alex Krieger in North America (Read, 2007), proposed different classification methods to try to apprehend the cultural notions behind the production of the objects themselves. Aware of the difficulty of the task, their methods were rigorous, and their conclusions were often cautious, knowing that the emic meaning of certain attributes had to demonstrated rather than assumed.

In particular, Rouse and Ford had a tremendous impact in South America, and for most of the 20th century their methodologies for classification and interpretation of archaeological ceramic assemblages dominated the discipline. Rouse himself worked in the Orinoco in the 1950's along Jose Maria Cruxent (1958), Anna Roosevelt (1978) and Fred Olsen, where he expanded his classification system, known as ‘modal analysis’. This method was then applied by many archaeologists working in the area until today.

While working in Fort Liberté, Haiti, Rouse (1939 p.21) realized that it was not the artefact *per se* which represented the culture it was made by, but rather the relationship between the artefact and the people that produce and use it which was culturally meaningful. This model considers the material culture as a result of a culturally conditioned behavior which dictates how the objects are made, valued, read and exchanged within their own context. Influenced by ethnographic work with contemporary potters, he then proposed a methodology in which the archaeologist could separate and identify the characteristics of the artefacts which were randomly selected from the ones that were significant, calling the former *attributes* and the latter *modes*. Their distinction was not always consistent and was sometimes unclear whether a mode corresponded to an aspect of the artifact product of a conceptual system or the framework itself (Read, 2007 p.47).

Since the aim of the modal analysis method is to decipher the artisan’s perspective, it tackled the production system and first explored -although sometimes very superficially- stages such as raw material choice, selection of shape and decoration. In here, Rouse preceded some of the later perspectives on technology and production sequences (Lemonnier, 1986, Creswell, 1990, 1994) which understood the artefact as a whole, with its manufacturing process and the choices the artisan had to make to achieve said object (Rouse, 1960 p.116). He also distinguished between two types of transmitted attributes that influenced the production of the artefact: those vertically transmitted -across generations- or horizontally transmitted- between individuals of the same generations from the same communities or a wider circle (Rouse, 1960 p.313). This foresaw what latter became known as the dual-inheritance system and the neo-Darwinian theoretical framework (Cavalli-Sforza and Feldman, 1981; Boyd and Richerson, 1985).

Difficulties in the modal analysis model came during its application. The criteria to define modes and the sub sequent types were not clear and appear to be more subjective to the archaeologist’s judgment of what represented: “a community-wide technique design, or other specification to which the artisan conformed (Rouse 1939:18)". Likewise, the definition of types was theoretically linked to a combination of certain modes – such as paste, vessel form and/or decorative technique (Dunnell, 1971)-, nonetheless, types sometimes contained attributes which were not significant and followed other kinds of criteria, including function- which was not necessarily culturally meaningful (Read, 2007 p.51-52).

Albert Spaulding (1953) provided Rouse's model with an objective base by developing a statistical approach for the definition of artefact types. For Spaulding, types are defined as consistent patterns of associated variables or attributes (1953 p.305) which can be identified through independent frequency counting. Meaningful variables for describing behaviour depended on sample selection and were not necessarily chronological markers (1954 p.392-393).

An important contribution to formal analysis came later from Donald W. Lathrap (1962), who strengthen this model by introducing structural analysis theory. Influenced by structural linguistic and cultural systemics (Kroeber, 1944; Sapir, 1951; Kluckhohn, 1960), Lathrap took further what Rouse and Spaulding had proposed by developing a more flexible model in which both norms and creativity had a place within the same structure. For him, a mode, like a phoneme, was the minimal unit with meaning (Lathrap, 1962 p. 50, 218; Raymond, DeBoer and Roe, 1975 p.5; Raymond, 2009 p.228). Mode combinations followed a set of rules given to an artisan within a certain group for a relatively short amount of time, thus conforming a ceramic complex or style (Lathrap, 1962 p.48). Each mode represented degrees of freedom or culturally approved alternatives within the norm (Lathrap 1962 p.227), whose multiple combinations allowed to create culturally significant artefacts but also allow new combinations from individual sources. This methodology was largely applied by Lathrap's students in South America (see Allen, 1968; Arnold, 1968; Raymond, 1972; Roe, 1973; Isbell, 1977; DeBoer and Lathrap, 1979; Brochado, 1980; Oliver, 1989). Although it had an important presence within the Amazonian Basin, other areas were less receptive and openly criticized this model, claiming it was highly deductive and did not reflect chronological useful units.

Most of the critics of modal and formal analysis came from the followers of the type-variety analysis method. Developed by Krieger (1944) and expanded by Ford and et. al. (Phillips, Ford, and Griffin, 1951 p.219-33; Ford, 1954), type-variety methodology was also highly favoured in South-America. In the Orinoco it was followed more closely by Evans and Meggers (Evans, Meggers and Cruxent, 1959) and Sanoja (1974; 1979; Sanoja and Vargas 1974; 1983) and Vargas (1976a; 1976b; 1979). It originated as a methodology used on refuse deposit sites, and rooted on the notion that types -rather than modes- were executed according to culturally fixed rules. By following their stratigraphic and spatial distribution one could reconstruct culture-historical related periods. By comparing different sites within a wider region, types could present modifications or variations in one or more of their defining attributes, which was often used to outline boundaries and explain change.

Detractors to the type-variety model claimed its basic unit of analysis was not reliable to track historical patterns. The attributes used to construct types were generally aspects of paste and surface treatment (Smith, 1979 p.823) and sometimes firing conditions (Vargas, 1979 p.49). Plain types, lacking any distinctive decorative feature, were assigned to certain types mostly based on their paste, and sometimes small fragments were not even taken into account. As many in-depth reviews have already pointed out (Spaulding, 1953, 1954; Rowe, 1961; Lathrap, 1962; Smith, 1979), this method lacked sample representability and its application to certain context such as the South American Tropical Lowlands were of particular concern. As Raymond (2009 p.225-226) points out, given poor preservation conditions, many of the sherds recovered in archaeological sites lacked distinctive features and would correspond to the so called plain-types. Typologies are based most likely in only two variables, usually paste and/or temper and firing conditions, which are not necessarily culturally meaningful categories. Is unclear then if frequency charts show historical or spatial variation or naturally occurring mechanical displacement phenomena, common in this area known for its complex stratigraphy and marked seasonality changes (DeBoer, Kinthigh and Rostocker, 1996 p.263; Lathrap, 1962 p.40-45).

Similar styles -whether defined from a modal or a type-variety method were thought to corresponded to historically associated groups, product of either diffusion, trade or migration phenomena (Dunnell, 1986 p.31). Diffusionist arguments that rely mostly -and in some instances only- in the ceramic evidence, were used to proposed population movement models between distant regions, without explaining the adoption or recurrence of the style in question. Likewise, change was explained as the result of the arrival or contact with a different group. Cultural areas were shaped throughout space and their distribution over time showed a succession of different 'ethnic' groups in vast regions. Lastly, less systematic studies used objects distribution and transformation shifting patterns as the sole reason to explain social change (Gruber, 1986; Conkey, 1990 p.8).

It would be a fallacy to claim culture-historians were not aware of the complexity behind stylistic variation and did not attempt to explain the shifts in the sequence in terms of people. Macro movements of whole populations replacing previous ones, or small-scale immigration of families or individuals assimilated into recipient groups, were contemplated as part of the various scale-scenarios to explain diachronic change in ceramic styles (see Rouse, 1986; Siegel, 1996 p.684-687). Even though most of the times macro-scale movements were favored to explain spatio-temporal shifts (Curet, 2005; Hofman and Hoogland, 2011 p.16; Mol, 2013 p.6), concept's such as the 'passage area' refer to local scale interactions between groups in a certain period (Rouse, 1982). These group's artefacts presented influences in terms of form and style from their mutual relations, a two-ways influence which contradicts the eventual replacement or assimilation of either one of them (Siegel, 1996 p.685; Rodriguez-Ramos, 2010 p.15).

The autochthonous evolution of styles and plural societies were some of the later arguments used by cultural-historians to explain small-scale interaction scenarios. In both cases, material culture was thought to reflect internal variation, whether functionally or ethnically related. Contexts with more than two wares which appeared consistently associated were a result of: 1) different ethnic groups sharing the same place as part of large population movements, in which they were not able to intermarry or interact directly, 2) immigrants maintaining their customs within a single population, or 3) functionally differing wares used by a single population (Rouse, 1990 p.58- 61).

Despite increasingly complex explanations on which mechanisms were involved in the sharing or shifting of certain styles/cultures, the main focus was long term chronological reconstructions. The normative approach proposed occupation sequences based on the dominant styles that prevailed in a well-bounded time and space. Their definition of culture as a mental construct (Taylor, 1948 p.101) resulted in a monolithic vision of history and artefacts themselves, as unidimensional and homogeneous expressions of rules of the groups that produced and used them. Style was seen as an expression of people's cultural identity, a patterned design or shape, with an explanatory value to tell time (Ford, 1954 p.47; Conkey, 1990 p.8). Worried about classifying materials following emic categories, archaeologists ended up in heated -but rather fruitless- discussions on which types, categories and attributes were better markers of culture. Changes of denominations of types and adjustment of cultural-area's boundaries were often more important than the social meanings behind them (Webster, 2008 p. 21). Although undeniably the cultural historical approach provided the foundations to discuss identities and mobility, it was unable -and uninterested- in explaining how they came to be or the reasons for their transformation and diversity, considering it to be a step too far in the 'reading' of the data (Rouse, 1986 p.163-165).

3.2 Function, ecology and adaptive behaviour

During the 1960's a new definition of culture shifted the archaeological questions and the way in which artefacts were viewed. The culture-as-adaptive-system (Longacre 1963, Binford 1965, Deetz 1965) understood societies as particulate entities, composed of subsystems which interacted between themselves and the environment. Material culture under this procesualist framework was not only a product of a group of people with a distinctive patterned behaviour, it also performed a function within the system. Emphasis on the problem-solving dimension of artefacts and their relationship with their context intended to answer the process behind the selected patterns and their change overtime, instead of just describing and comparing them.

A more paradigmatic view on style demanded to consider not only the final product, but its purpose and the process behind its manufacturing, giving environmental studies and technology a more important role in the discussion (Roe, 1995 p.28). The 'techonomic' dimension of the artefacts was considered relevant because of its adaptive character and it soon became the centre of the debate (Binford, 1962; Lyman and O'Brien, 1998).

Two different ways of approaching the formal dimension emerged, focused on either its environmental or function-related causes. Ceramic ecology studies emphasized how the natural environment influenced technological choices made by potters. Exponents of this approach (e.g. Arnold, 1985, 1993; Matson, 1965; Rice, 1996; Rye, 1976, 1981) claimed the potter's adaptation to their natural surroundings was the primary aspect in determining the physical features of their artefacts. Raw material availability and its quality were crucial factors in pottery production and in their opinion, they were not-culturally motivated. Likewise, all potters have a common sensorial and cognitive basis to identify an appropriate clay source or tempering materials–based on colour, texture, plasticity, among others (Arnold, 1971, 2000)-. Inspired by ethnographic experiences, this Middle Range approach intended to establish cross-cultural principles on pottery practice to interpret the archaeological record (Santacreu, 2014:129).

On the other hand, functionalism addressed the relationship between the vessel's role and how this affects its manufacturing and use. According to this approach, the choices and actions carried out by the potter to make an object are oriented towards the fulfilment of the object's function and use. Its key exponents (Braun, 1983; Rice, 1990; Schiffer, 2004; Schiffer and Skibo, 1987, 1997; Shepard 1986 [1956]; Sillar and Tite, 2000; Van As, 1984; Van der Leeuw, 1984) claim there is a direct relationship between the selection of the raw materials, techniques and fabrics and the vessel's performance. As a result, certain clays and pastes are often restricted to vessels with certain uses (Santacreu, 2014 p.147) –e.g. coarser fabrics associated with cooking wares while finer-wares present a higher variability (see Druc, 1996; Fernández Navarro, 2008; Kreiter et al., 2007; Muntoni et al., 2009; Ortega et al., 2005; Riley, 1982; Steponaitis,1984; Stoltman, 2001; Tite, 2008). Using scientific-based methods, these studies strive for universal principles behind pottery technology adaptation and change.

The strongest critiques came from a different group within processualism who claim the function/style dichotomy principle in which they were based was a fallacy. Instead of considering stylistic elements as residual and passive attributes, they were redefined as part of the formal dimension and given a communicational value. The isochrestic style, as defined by Sackett (1977, 1985, 1990), first addressed the issue of considering style as something accessory to the object. For him, style was a way of making a tool or artefact in a specific time and place. Such way demanded a choice of form -among other elements-, given that there are several possibilities available to perform the same function. Formal variation is then part of the stylistic behaviour, conditioned by a kind of manufacturing tradition to which the artisan belongs. The isochrestic style as referring to a certain way of doing rather than the specific iconological attribute, stresses the fact that not all style means to communicate nor is purely functional.

Formal variability was associated with an ethnic identity and a rather passive style perspective (Sackett, 1985:632). Even though this approach had a significant support within the archaeological community, some raised questions on how to distinguish a socially defined form from a non-social formal variation (Conkey, 1990: Hegmon, 1992 p.518), and whether style can be thought as active or passive based on the use of the artefact rather than its manufacturing or attached meaning (Wiessner, 1985 p.164; Wiessner, 1990 p.107).

The active use of style as a non-verbal communication medium was favoured by others to distinguish social variation and function. Developed further by Wobst (1977), and replicated by others (e.g. Conkey, 1978, Hegmon, 1986; Schortman, 1989) in what was known as the 'information exchange theory', this approach defined style as a part of the formal variability in material culture which intends to convey a message (Wobst, 1977 p.321; Hegmon, 1992 p.519). As a procesualist himself, Wobst attempted to formulate universal principles on how style is used and in what kind of contexts. Two main ideas resonate and are still very much in use until today. Based on a cost-benefit logic, he suggests high cost associated with very elaborate artefacts will prevent the use of complex designs, to maximize efficiency in information transmission (Plog, 1989 p.118). Thus, messages selected would be simple invariant and easily identifiable motifs, enabling long-distance communications (Wobst, 1977 p.327-8). However, as a second principle, he suggested that such coded messages where often located in highly visible artefacts -e.g. style-bearing objects- appropriate for stylistic message transmission (Wobst, 1977 p.330).

Although this perspective reaffirms the active role of style within material culture, the literary metaphor where styles are meant ‘to be read’ and transmitted with the least possible cost does not apply to every case (Conkey, 1990 p.3; Rice, 1987 p.244). Wiessner (1983) built on Wobst theory and suggested different messages could be transmitted from a more multi-dimensional perspective. While some styles might be associated with the ethnic identity of the group where the artefacts are produced -i.e. *emblemic* style- others might be concerned with personal and even artistic expressions -i.e. *assertive* style. In this sense, style is not relevant because of unique meaning but rather because it is instrumental in establishing social relationships, reaffirming a group membership and even marking individual variations (Hodder, 1990; DeBoer, 1990).

Procesualist approaches were instrumental in increasing our understanding of the variables affecting pottery production, transcending the object and addressing its relationship with its context. However, by highlighting the technical effectiveness governing the potter’s choice, they overlooked the non-materialistic variables involved, overestimating the importance given to optimization by ancient societies (Dobres and Hoffman, 1994), and often disregarding the importance of historical processes and structures in the production sequence (Santacreu, 2014 p.145). Even more, recent scientific standards use to evaluate clay paste and/or firing conditions are sometimes not applicable or openly omitted in certain contexts in which the chosen technologies can be thought of as non-adaptive (Livington-Smith, 2000; Schiffer and Skibo, 1987).

Likewise, study cases where complex or ambiguous information was represented and use as a power relations strategy demonstrated that style does not answer to unifying principles (Earle, 1990; Wiessner, 1985 p.162). Contrary to Wobst predictions, style had a different value according to the context; with even some communities lacking express meaning associated to it, investing little time or effort in producing it and/or applying it in ordinary artefacts (Dietler and Herbich, 1989).

In the Orinoco, ceramic studies felt the influence of the procesualist approach, although it did not accomplish great lengths. Within the environmental branch, cultural-ecology had an important impact in South America with the work of Julian Steward (1955), Marvin Harris (1952), Betty Meggers (1976) and Clifford Evans. Archaeologist such as Anna Roosevelt (1978, 1980, 1997) and Alberta Zucchi (1975; 1978; 1980; 1991a; 1991b) applied this perspective in their works in the area. Meanwhile, chronological sequences for the Middle Orinoco and North-eastern Amazonian region kept using the modal analysis method. They were also particularly concerned with ancient agriculture technologies, demographic intensification processes and social complexity and how they are reflected on material culture. Marxist and materialist scholars Mario Sanoja and Iraida Vargas (1974), also worked in the Middle Orinoco and were interested with subsistence patterns and environment-human adaptions as a way to explain social change. While using types classification methods to organise ceramic artefacts, they interpreted their change through the sequence as entangled with broader social and economic processes.

Despite the interest in environmental and economic causes behind cultural phases and social structures, very few studies were aimed towards the recovery of direct evidence to sustain or reformulated the existing models. Ceramic sherds were interpreted following a functional perspective, using specific forms to infer diet and subsistence patterns. Presence of griddles (flat circular plates with upturned rims) and *aripos* (flat circular plates with flat lips) -both traditionally associated with manioc consumption-, and/or *chicha* jars and *metates* for maize-based drinks and food; were used to argue different starch-based systems throughout the occupation periods (Zucchi, Tarble and Vaz, 1984; Tarble and Zucchi,1984; Barse, 1989).

Only recently, in Parmana, Corozal and Pozo Azul archaeological sites, researchers have recovered archaeobotanical evidence of carbonized maize kernels (Roosevelt,1980; 1997) and starch granules of several roots and seeds (e.g. cucurito (*Attalea maripa),* yam (*Dioscorea cf. trifida*), arrowroot (*Maranta cf. arundinacea*), guapo (*Myrosma cf. cannifolia*), ginger (*Cf.Zingiberaceae*), and maize (*Zea mays*)) (Perry, 2004, 2005). These results proved a more complex use of artefacts and a wide-ranging diet in both earlier and late occupation phases, which could not be directly associated with a single ceramic form or tradition.

A more technological understanding of archaeological materials included a detailed examination of paste preparation recipes to define wares. Inspired by an environmental framework, some researchers in the Orinoco described more thoroughly the inclusions present in ceramics (Vargas 1974; Roosevelt 1968; Zucchi, Tarble and Vaz, 1984; Tarble and Zucchi 1984; Zucchi and Tarble 1985), with even some recent petrographic analysis conducted in the Parmana area (Tarble-Scaramelli, 2006). The former helped distinguish wares, which combined tempering materials in different proportions that helped to shape the argument of ancient group interaction further, beyond the shared aesthetic features. However, most of the work is highly descriptive and does not enquire on resource availability and/or distribution. Even though Roosevelt (1978) and Zucchi and Tarble (1984) suggested different tempers can be associated with different ceramic manufacturing techniques, their argument on how to define a ceramic tradition is still heavily based on decorative motifs and forms, sustaining the equivalence between a style -understood as a unique combination of temper, forms and decorative techniques- and historical social groups (Conkey, 1990 p.11).

Regardless of the major developments under this new theoretical perspective, ceramics continued to be viewed under the cultural historical approach and the archaeobotanical and petrographic data were used as additional information on how to describe their related uses and composition, perpetuating the former chrono-stylistic sequence. Ethnohistorical and ethnographic accounts on the indigenous communities of the Middle Orinoco area are still the main source to relate different styles with ethnic groups, leaving unanswered the reasons behind the observable heterogeneity of ceramic assemblages, the co-existence of different tempering and decorative techniques, and even more, their social meaning.

3.3 Style as *praxis*: *Chaîne opératoire* and technological choices

As seen in the previous section, the discussion on the meaning and roles of style has broadened, including technology as part of its defining elements. Bearing in mind most of the artefacts recovered on fieldwork have no decorative features, it is agreed by now that identifying a style based only on shape and/or surface treatment and decoration represents a significant bias, ever more so in defining a culture area or group. On the contrary, feeding from the procesualist debate, style was redefined as a 'way of doing' (Hodder, 1990 p.44), encompassing the manufacturing process, end-product and communicational aspects of the artefact in question (DeBoer, 1990 p.103). In this post-processual definition, style is seen as multidimensional, acting in many levels simultaneously, serving both functional purposes, as well as acting as a medium to communicate identities, power relations and/or group memberships (Plog, 1980; Wiessner, 1990).

This conceptual shift came motivated by a self-reflexive exercise on the archaeological practice and the questioning of the limits of the knowledge produced by archaeologists (Wylie, 1985). The assumptions that culture could be seen as identifiable patterns or form variations as representing a group (Conkye, 1990 p.12), was questioned by the culture-as-text metaphor (Geertz, 1973). In this new approach, culture is not a thing to be apprehended, but rather to be interpreted: non-static, contested and emergent (Clifford, 1986). More than a set of rules, culture is a flexible framework in which individuals could reproduce the norms, but also manipulate, innovate and transform them (Bentley, 1987; Fernández Götz, 2011).

The epistemological crisis that lead to the re-evaluation of the archaeological discipline was heavily influenced by sociology and the debate on structuration, most notably by Anthony Giddens and Pierre Bourdieu. Gidden's *New Rules of Sociological Method* (1976) was a seminal book in discussing social structures and institutions as reproductions of recurrent practices. The 'duality of structure' is based on how "social structures are constituted by human action, and yet at the same time are the very medium for their constitution (Giddens, 1976:21)". Contrary to traditional structuralism, Giddens (1976) claims structures exist only through the actions of the individuals, giving them the power to create, replicate and to transform their reality.

The same claim was made by Bourdieu in his *Outline of a Theory of Practice* (1977), were he further develops the relationship between individuals and society. In this work, Bourdieu suggests a more complex interplay between structures and individuals. With the concept of *habitus* as a set of acquired dispositions of thought, behaviour and taste (Scott and Marshall, 2009), he refers to conscious and unconscious rules which reproduce the social order in which the individual lives (Bourdieu, 1977 p.72). Both explicit norms and embodied principles are learned and transmitted form an early age, ensuring the maintenance and reproduction of the established order. However, the relationship between the individual and its context is dynamic and it can change depending where it takes place -in which '*field of pressure*' -e.g. politics, law, art- and the agents own interests and abilities -or *capital*- (Bourdieu, 1997 p.146). Therefore, *praxis* or social action interplays with both structural principles and human agency.

As a result of this new approach, *agency* as a driven transformation force was emphasized in the discussion of past societies. Style disentangled itself from the definition of cultural group, allowing other interpretations which highlighted authorship, contextual uses and polysemic meanings. More than identifying groups or environmental adaptations, style responded to traditional ways of doing which are not limited by group association and can be imitated and transformed. By reconstructing traditional ways of making researchers were able to refer both to their normative component, as well as the innovative or creative elements that transgress them.

The concept of 'technological style' proposed by Heather Lechtman (1977) was one of the first to highlight the importance of addressing both the object and its production stage as a reflection of larger social context. Lechtman and a group of material scientists and archaeologists at the Massachusetts Institute of Technology (MIT) argued that technology, function and decoration cannot be understood separately and that it is the “synthesizing action of the style, the rendering of the performance, that constitutes the cultural message (1977:14)”. She applied this approach in her studies in Andean archaeometallurgy, were she reconstructed surface treatments in gold and copper alloys and used them to address Andean value systems and symbolic beliefs (Lechtman, 1984, 1993), alluding to the social role of technology (Hegmon, 1998 p.267-268).

While the MIT group was particularly influential among North American scholars, in France, research by anthropologists Marcel Mauss and André Leroi-Gourhan was decisive in liking technological aspects to cultural practices. In his article, ‘*Les techniques du corps*’ (1934), Mauss associated bodily techniques with socially learned movements, adapted to the usage of certain tools. More than tools or artefacts, technology was a part of traditional knowledge, which is learned and transmitted. By associating technological activity to its social and historical context, its analysis comprehends both the technical aspects and the society in which they take place (Edmonds, 1990).

Leroi-Gourhan, one of Mauss’s students, proposed a more systematic description of the technological production process, providing the first framework for comparative technological analysis. He is credited for introducing the term ‘*chaîne opératoire’* to refer to the ‘enchained operational cycle’ of every technical activity (Sellet, 1993, Martinón-Torres, 2002). As part of his analyses, he described the concatenated techniques as:

> *“[...] gesture/motions and tools, organized in sequence by a true syntax which gives the operational series both their stability and their flexibility. The operational syntax is generated by memory and is born from the dialogue between the brain and the material realm (Leroi-Gourhan, 1964 p.323)”.*

Focusing on the process of manufacturing, his detailed reconstruction of technological systems combined physical and cognitive processes (Bril, 2002), building a bridge between both naturalistic and humanistic approaches (Schlanger, 1990).

A compartmentalized analysis of the production sequence, similar to the *chaîne opératoire,* had an independent origin in the United States under

Michael B. Schiffer's "behavioural chain" (1972,1975). Inspired by ethnographic research, it was defined as a successive series of activities during the object's 'life cycle' (Schiffer, 1975 p.106). These activities consisted of patterned interactions between raw materials and humans, such as procurement, manufacture, use and discard (Sellet, 1993). Even though the reconstruction of the object manufacturing process was part of the analysis, the main forces that guided the way in which the object was constructed were the function and the available resources.

In contrast to the behavioural approach, the *Techniques et Culture* school placed the driving forces in the cognitive and cultural contexts in which the craftsperson is embedded. Rooted in ethnographic studies and concerned with intra-cultural aspects, this approach focusses on the technological knowledge or 'know-how', it's internal variations within a group, as well as the gestures, tools, and sequence of actions followed by a specific group to transform raw material into a product (Dobres and Hoffman, 1994). Based on the former, it generated highly contextual discourses framed within a universal discussion on techniques and knowledge generation.

Since Leroi-Gourhan, the definition of the *chaîne opératoire* has changed. Initially considered as the production sequence and the tools, materials and techniques involved, it has broadened to encompass a set of cultural representations of reality (Lemonnier, 1986 p. 68;1990 p.27; Creswell, 1990). By recognizing the conceptual level of the manufacturing of an object, the sequence cannot be disentangled from the technical knowledge of a certain group (Pelegrin et al., 1988). Therefore, production involves both the physical and cognitive dimension, a coordination of body (gestures) and mind (knowledge and know-how) (Bril, 2002).

The introduction of the production sequence concept in the archaeological research represented a major shift from the normative and functional approach, by reconstructing socially significant techniques and gestures involved in the manufacturing of an object by a particular group. However, such reconstruction does not in itself answer on the causality of the choices and is rather by considering the overall context that it will be possible to explain the decision-making process, its constraints and its effects. This context involves the environmental availability of the materials, the technological limitations, the economic and socio-political organization system, as well as the ideology of the social group under study (Gosselain and Livingstone Smith, 1995; Sillar and Tite, 2000).

Technological choices behind the "different ways of doing the same thing (Lemonnier, 1983 p.17)", are crucial when reconstructing a technological practice. Either constraint by socially defined productions (Lemmonier, 1990 p.27) or ecological/functional variables (Arnold, 1985), the production sequence is meant to reflect an active process of negotiation between culture, environment, function and identity (Conkey, 1990 p.71; Chilton, 1998 p.133-134). Both the final object and the process of its making are considered to define a style, beyond the decorative motifs and vessel forms used by normative approaches to establish cultural boundaries (Dietler and Herbich, 1989 p.157).

3.4 Technical traditions and social learning

The *chaîne opératoire* also implies the learning and transmission process of a craft. In a broader sense, 'technical traditions', defined from motor and cognitive shared skills of a specific way of doing, are associated with conscious and unconscious bodily practices, transmitted through successive generations (Sellet, 1993; Inglod, 2001; Roddick and Hastorf, 2010 p. 160-162; Roux, 2011, 2016). The process of learning a specific practice, such as the craft of pottery making, requires a social environment where the transmission of knowledge takes place (Lave and Wenger, 1991 p.266). These groups' identities are based on shared knowledge of proper ways of doing, mutually recognized by its members as significant (Wiessner, 1983 p. 273; Bowser and Patton, 2008. p.108; Joyce, 2014 p.418). Transmission is based on observation and emulation processes, which start at a very young age and will be learned through repetition (Herbich, 1987). The replication process discourages variation and thus contribute to the maintenance of traditions or the persistence through time of technical practices and 'unquestioned assumptions' about techniques within certain social groups where the potters are living and working (Van der Leuw et al., 1991; Gosselain, 2002 p.26; Roux, 2016).

The regularity and variability of technical traditions can be explained in different ways, depending on the theoretical framework. Behaviourists agree it depends on the compromise between cultural and functional factors (Schiffer and Skibo, 1987, 1997), while culturalists rely on cultural and identity forces (Latour and Lemonier, 1994), and evolutionists explain it through a neo-Darwinian cultural adaptation model (Richerson and Boyd, 2005; Shennan, 2013). Either way, the choices made by potters, as seen with the style as *praxis* debate, are framed within the the dynamic interplay between the social structure and the agent, who both reproduces and transforms the wider 'system of dispositions' to do in a certain way or *habitus* (Bourdieu, 1977). In this sense, potters, understood as social actors, not only transmit and reproduce the patterned and regulated ways of doing of their group -internalized as 'natural' or 'correct'- they also explore different strategies and experiment within a certain range of possibilities (Dietler and Herbich, 1998). This last force, individually driven, must be considered as part of the transformations observed in the material evidence to account for variability.

Following this approach, micro-styles or intra-cultural variability could be linked to how flexible or standardized is the formal instruction or learning context (Longacre, 1991 p.8), in which idiosyncratic styles could be produced. Such stylistic variations within a broader technical stylistic tradition could be explained as the result of different competence skills, workshops, as well as produced for different age or gender groups (Dietler and Herbich, 1989). Ethnographic studies conducted in the research area support the notion of high internal variability in pottery production within certain indigenous communities, associated to multi-ethnic identities and different social organization levels. As seen in Frias (1989) study with the Piapoco, decorative patterns in ceramic vessels changed according to their phratries and patrilineages. Vidal's (1989 p.50-51) work with the same indigenous community revealed potters also customize their vessels according to the age, gender, rank or ethnic affiliation of the consumers. Lastly, the virilocal household relocation associated to exogamic alliances meant women's transfer to their husband's phratry or sib, taking with them their pottery making tradition, which can account for some variability in terms of decorative techniques and vessel forms (Vidal, 1989 p.50).

The identification of specific protocols of making pottery will allow the characterization of social groups based on their technological and morpho-stylistic preferences, chosen as a product of a socially learned skill practice (Stark, 1998; Bowser, 2000; Gosselain, 2002). The reconstruction of the *chaîne opératoire* and the context in which its associated technological choices are made, will allow to recognize the steps/gestures in the production of pottery and hence, be able to infer the group of potters behind specific ways of doing. The distribution of the technical traditions will indicate the boundaries into which the making protocols are transmitted, giving an empirical base to discuss historical relations within a certain area. By using this approach, I can discuss identity-based ways of production that are not restricted to cultural centres and respond to different scales of social actors and learning base transmission processes.

4. RESEARCH PROBLEM AND OBJECTIVES

4.1 Towards a New Analytical Approach in the Orinoco: Research Questions and Contribution to the Ancient Occupation Sequence of the Middle Orinoco Area

Ethnohistorical and archaeological evidence suggests that the Átures Rapids acted as a multi-ethnic crossroad during colonial and, likely, the pre-colonial periods; however, why and how it became so remains unaccounted for by archaeological evidence. The study of the interaction of various groups during the pre-colonial period, through its ceramic materials, should contribute to a better understanding of the character of such encounters, their relations with trade and/or exchange and how they affected identities, potentially informing discussions about local ethnogenesis. The research project seeks to elucidate the roles and meanings that the technological and stylistic aspects of pottery had in expressing and negotiating territorialities and/or group affiliations, both locally and within a regional trading network system, described in the early written sources.

In order to track how local and long-distance interaction processes and group identities operated in the Átures area, this research focuses primarily on the study of pottery, chosen because it constitutes an abundant material, well preserved archaeologically and because they are portable and can potentially circulate long distances. Pottery can also inform about how individual and group identities are inscribed, displayed and changed through time and space. A techno-stylistic analysis of these artefacts can reconstruct strategies and stages of production (e.g., raw material collection, manufacture and use) associated with specific skills and technological and cultural transmission processes. The variability of the ceramic assemblages will allow us to discriminate among a variety of practices that led to their presence: either locally produced or imported, faithful copies of exotics, or even innovations resulting from trade or other interaction processes. It also allows to discuss the co-occurrence of several ceramic traditions in one site beyond migrations or territoriality, and more as part of the occupation and interaction dynamic of the riverine settlements along this portion of the Middle Orinoco.

To summarize, this project seeks to answer: 1) How did diverse networks of potters in the Átures region operate in pre-colonial times? 2) In what ways did ceramic technological styles contribute to expressions and negotiations of social/ethnic identities in time and space? 3) What causal explanations can be offered to account for temporal changes in ceramic identity configurations and relationships in the study region? and finally, the project seeks to learn 4) whether and since when the Átures region acted a key centre of trade, if induced by colonial imposition or did it emerge from pre-colonial roots?

Specific objectives and their corresponding aims are as follow:

(1) To establish an empirically-based chronological techno-stylistic sequence for the Átures Rapids study area.

(2) To elucidate the changing historical relationships that local ceramic complexes and their producers/users had with each other and, to some extent, with the broader region of northern South America.

(3) To evaluate the role and meaning that pottery had in embodying, expressing and transmitting individual as well as communal identities.

4.2 Original Contribution of the Proposed Research Project

Even though the questions regarding the population and interaction in the Middle Orinoco in pre-Columbian times have been addressed previously, the originality of the present research rests on the theoretical and methodological approach adopted to answer these queries. First, a techno-stylistic analysis, not yet applied in the archaeological research of this area, promises to facilitate structuring the analysis and interpretations beyond the traditional normative, cultural history approach. At the same time, because the archaeology of this area is scarcely known and the current excavations are the first to be conducted in the region in over 30 years, this project's new data and techno-cultural framework will constitute a significant contribution in sorting out the ancient aboriginal history of the Orinoco and its relationships with the broader lowland regions of South America.

5. METHODOLOGY

5.1 Modes and Learned Making-Protocols: Defining Technical traditions

To define technical traditions is to identify the protocols of making that are transmitted within a certain social group. The choices made by the potters are not entirely idiosyncratic since they follow socially learned and transmitted procedures (Herbich, 1987). By combining modal analysis and the *chaîne opératoire* approach, this research will aim to reconstruct traditional pottery-making protocols by identifying modes in each one of the production stages. A mode, as defined by Lathrap (1962 p.49-50), is a "distinction (or trait) which is consistently made in the minds of potters of a particular 'face to face' social group". According to Rouse (1960 p.313), modes were the product of a conceptual framework in the mind of the artisan, which dictated how they were supposed to make their pots, acting as the "minimal unit of meaningful behaviour" (Lathrap, 1962 p.218). These meaningful attributes were handed down from generation to generation and could have spread between communities (Read, 2007 p.50).

Just as in structural linguistic analysis, modes elicited from artefacts behave as phonemes, the basic sound unit which bears a meaning (Rouse in Siegel, 1996 p.675). By identifying phonemes, the ultimate goal is to explain the encoded rules of performance of the native speaker of a certain language (Chomsky, 1966). The same exercise is applied in pottery, where modal analysis intends to construct an emic model, which elicits the norms or standards of pottery production within a certain group (Rouse, 1960 p.313-314). As with language -where phonemes are interchangeable in different words- the same modes can be used in different kinds of vessels, depending on how standardized is the production procedure. Even though modes are mutually exclusive and have distinct patterned attributes, they can also present a range of variation, depending on how culturally significant is the attribute in question (Lathrap, 1962 p.236; Raymond, 1995 p.229).

In contrast to analytical approaches, taxonomic classification includes all or various attributes in one single ceramic type, treating it as an indivisible unit. Types are generated by choosing distinctive attributes, which together can be used as a powerful tool to define chronologies (Rouse, 1967 p.171). These attributes might not necessarily constitute a mode since these can be chosen according to the classifier's criteria. The latter can be considered as an etic construct "imposed on the collection" by the analyst (Rouse, 1960 p.317); therefore; it sharply contrasts to the emic perspective intended in the analytical approach. Despite their differences, both forms of classification are not mutually exclusive and can be use together. According to Rouse (1960 p.317-318) types can be composed of the combination of modes. While types are most often used to define time periods and make large regional comparisons, modes are better suited for reconstructing or eliciting a meaningful technical and formal grammar, making them complementary approaches.

Although it has long been debated whether modal analysis can give an insight on how ancient populations thought about their own artefacts (Krieger, 1944; Ford, 1954), its approach does intend to identify the rules behind their making. Rather than decoding a 'mental template', it intends to distinguish culturally meaningful rules followed by potters by objectively analysing choices made by the artisans in every step of the production chain. Significant attributes are distinguished in the sample as patterns within dimensions of variability (Raymond, 1995 p.228). These dimensions, initially defined by Spaulding (1960 p.438) as "an aspect or property of the subject matter which requires its own special measuring device"- and later by Lathrap (1962 p.223) as "axis or range within ceramic materials which show variability" –e.g. clay, rim shape and inclination, temper, firing or decorative techniques- constitute the basis on which to measure modal behaviours.

Modes will be identified in each one of the technological, formal and decorative dimensions articulating them to reconstruct the production sequence of a particular ceramic complex. The latter is understood as "the body of pottery made by a face-to-face group over a relatively short period of time (Lathrap, 1962 p.48)" and is composed by a "finite number of modes" (Lathrap, 1962 p.223). It might also vary through time showing continuous or discontinuous variation. According to Lathrap (1962, p.244-245), continuous variation can occur when either the number of modes or modal combinations remain constant while their popularity (frequency) varies. On the other hand, discontinuous variation results from the addition or removal of modes, dimensions or mode combinations. If there is continuous variation, it can be said that the potters only recognized one norm within all the possible choices, whereas discontinuous variation suggest there are two or more options available within one given dimension (e.g., vessel size). Continuous variation which includes all available modes proves such dimension was not culturally significant, while discontinuous variation can be interpreted as a result of more than one norm being applied in the assemblage (Lathrap, 1962 p.226).

Since a ceramic complex, as defined by Lathrap, can be identified from discrete attributes within dimensions of variability in every production stage, its characterization is directly linked to the reconstruction of the *chaîne opératoire* and its reproduction through time. A distinct production sequence is the result of a learned craft in a given context. As stated by Roux (2011 p.81-82), a technical tradition is a "technical practice [which] results from a process of learning from actions observed within a social group; [an] emanation of a way of doing and thinking". This approach associates the production with physical and cognitive skills acquired through apprenticeship, which are assimilated by the end of a learning process (Bril, 2002). In this sense, a tradition is the reproduction of a particular 'way of doing', which is maintained by the strength of repetitive actions embodied and incorporated from a learned model as a member of a group.

While both Lathrap's ceramic complex and Roux's technical tradition emphasize a distinct production sequence followed by a certain group, the latter does not entail a cultural identity to explain its origin, transmission or association to similar styles or over an extended area. Tradition within American Archaeology, has been largely used following Willey and Phillips (1958 p.37) definition in which is explained as a "primarily temporal continuity represented by persistent configurations in single technologies or other systems of related forms." The underlying assumption is that such single technologies and/or systems are produced by a specific culture. In this scenario, tradition acts mainly as a diachronic unit, employed to identify a culture 'X' over long periods of time.

Even though Roux's definition of tradition is concerned with the transmission and reproduction of a certain practice through generations, the social group responsible for its making is not necessarily *a* culture. By referring to social units, Roux distants herself form the culture 'conceptual straightjacket' (Roux, 2011 p. 80) and embraces a more social-anthropological interpretation of the materials, in which differences within the same assemblages are thought to respond to other groups (social segments) more directly linked with pottery production systems, such as clan, family, cast, lineage or linguistic groups (Roux, 2011 p.80). Once a given practice is identified as corresponding to a specific group, it can be traced and explain how it extends through time and space, even within the same culture or beyond its boundaries (Stark et al., 2008; Roux, 2015). Nonetheless, to achieve this analytical scale, it is necessary to acquire regional and intra site information, accompanied with detailed chronological, environmental and multivariate data using several proxies -not only ceramics. Unfortunately, this is seldom the case in the Orinoco, because of poor conservation of different materials, logistical issues to open large area excavations and sometime even security reasons which prevent extended areas from being studied in detail.

Adding the technical tradition approach to the analytical method used in the past in the Orinoco and Amazon basins emphasizes two main principles which will guide this research. First, it highlights the importance of a systematic reconstruction of the *chaîne opératoire* to define a ceramic complex. A production sequence is considered the result of a learning process within a face-to-face group, where a specific technology is established, transmitted and reproduced. On the other hand, it encourages a discussion on the character of the group and of the ceramic production to which the ceramic complex can be attributed. Influenced by ethnographic studies and a sociological reading of the past, the technical tradition approach does not equate ceramic complex or styles to cultures, but rather refers to social units or segments. This association aims to identify ceramic production systems, and circulation and distribution network (Roux, 2011 p.80; Roux, 2016 p.224-236), which can all co-exist and/or overlap within the same group o across a certain area, allowing a broader and more complex reading of the past, beyond chronological and migration models.

5.2 From Potsherds to Ceramic Complex: Identifying Technical Traditions

A ceramic complex can be composed of one or several wares. Following Rouse (1986 p.143), wares are identified by specific attributes of paste and/or surface treatment, making them the broadest classification unit. An *in-situ* classification of all ceramic sherds recovered in the excavation was performed to define wares, considering paste colour, grain size and type of inclusions (all of which refer to paste preparation features). The resulting groups, named macroscopic fabrics, were confirmed and further characterized by conducting petrographic and geochemical analysis with a selected sample brought to UCL Institute of Archaeology laboratories. Macroscopic analysis of traces and gestures associated with manufacturing techniques were also conducted on the selected samples at UCL. The resulting techno-petrographic groups constitute the basis of the present ceramic study to which the modal analysis is applied.

For each techno-petrographic group, patterns are identified in each one of their production stages, as well as with their associated vessel forms and decorative elements, which may have a modal values. Modes can be identified by applying descriptive and multivariate statistics. Even though Rouse did not specify an objective method to distinguish modes from attributes (Read 2007:52), patterns in the cluster of data can be recognised by observing their frequencies and distributions and how they relate to each other. According to Spaulding (1960), attributes within every dimension can be defined as qualitative or quantitative, depending on how they are measured. While quantitative attributes can be measured using ordinary scaling tools (e.g. rim diameter, thickness), qualitative features correspond to properties that can just be accounted by stating their presence (or absence) in the sample, such as a kind of temper or painting. Meaningful attributes are confirmed, and even new theoretically possible combinations can be described, so the ceramic complex can be defined (Lathrap, 1962 p.231).

Decorative techniques follow a different structural analysis since different modes of decoration -e.g. incision, modelling and painting- can occur in the same vessel, making them not mutually exclusive within the same dimension of variability (Raymond, 1995 p.229). In this case, both techniques will be recorded for the same vessel, and their combination and location within the vessel will be specified -i.e. rim, neck, body, base- in order to identify the rules behind their execution. The analysis of the formal dimension (i.e. vessel shape) and the decorative techniques and motifs are presented according to each one of the techno-petrographic groups identified in each site.

Results of the pottery analysis performed in this research will follow the sequential steps of the *chaîne opératoire* for each ware (i.e. macro group) as stated by Roux (2011 p.80-81) and Sillar and Tite (2000 p.6), these being: 1) raw material procurement, 2) paste preparation or processing, 3) fashioning or forming, 4) finishing and 5) firing. In each one of these production steps, modes will be described as present in each ware, and the sequence for each assemblage will be summarized for every archaeological site.

Once each individual mode is described and tabulated, modal combinations will be analysed in terms of their variability and distribution in all three archaeological sites excavated on the Cotúa Archaeology Project. A broader comparison with regional sites previously reported will allow to present an empirically based discussion on how technical traditions behaved in the past, evaluating their persistence or transformation. The goal is to identify and compare different manufacturing techniques, decorative choices and vessel shapes used by ancient people in the Átures Rapids to assess transmission of knowledge, standardization and interaction networks.

5.3 Data Collection

As part of the *Cotúa Island-Orinoco Reflexive Archaeology Project* (RPG 2014-234) (Oliver et al., 2014) three campaigns were conducted in the Middle Orinoco area between 2015 and 2017. My research database was acquired during these fieldwork seasons, in which I took part (2016-2017) in the excavations and the *in-situ* analysis of the ceramic materials. Three archaeological sites located in the Átures Rapids and its surroundings were sampled through surface collections and stratigraphic excavations. Two of the sites are located in two islands in the Orinoco river: Picure (AM-2), one of the biggest islands in the Átures rapids, and Rabo de Cochino (AM-3), located 18.6km downstream. The remaining site, Culebra (AM-1), is located 4km upstream of the Átures Rapids, in a mainland area at the confluence between the Orinoco and Cataniapo rivers (***Fig 5.1.***).

A total of 22,041 potsherds were recovered from surface collections and excavation units at Culebra, Picure and Rabo de Cochino Island. Other archaeological materials from the excavations include lithics and beads, which will not be fully part of the current discussion since they are still being analysed but would eventually constitute other lines of evidence to discuss occupation and interaction processes in the region.

The advantage of working on recent data means that collections have been secured from controlled archaeological contexts. By contrast, archaeological collections from older excavations held at the Archaeology Laboratory of the Instituto Venezolano de Investigaciones Científicas IVIC (Caracas, Venezuela) and the Enzo Ceccarelli Museum (Puerto Ayacucho, Venezuela) are unfortunately incomplete and poorly documented. However, the 23 collections from the Middle and Lower Orinoco which are found at the laboratory (***Table 5.1, Appendix 1***) would serve as reference and to compare with the broader region.

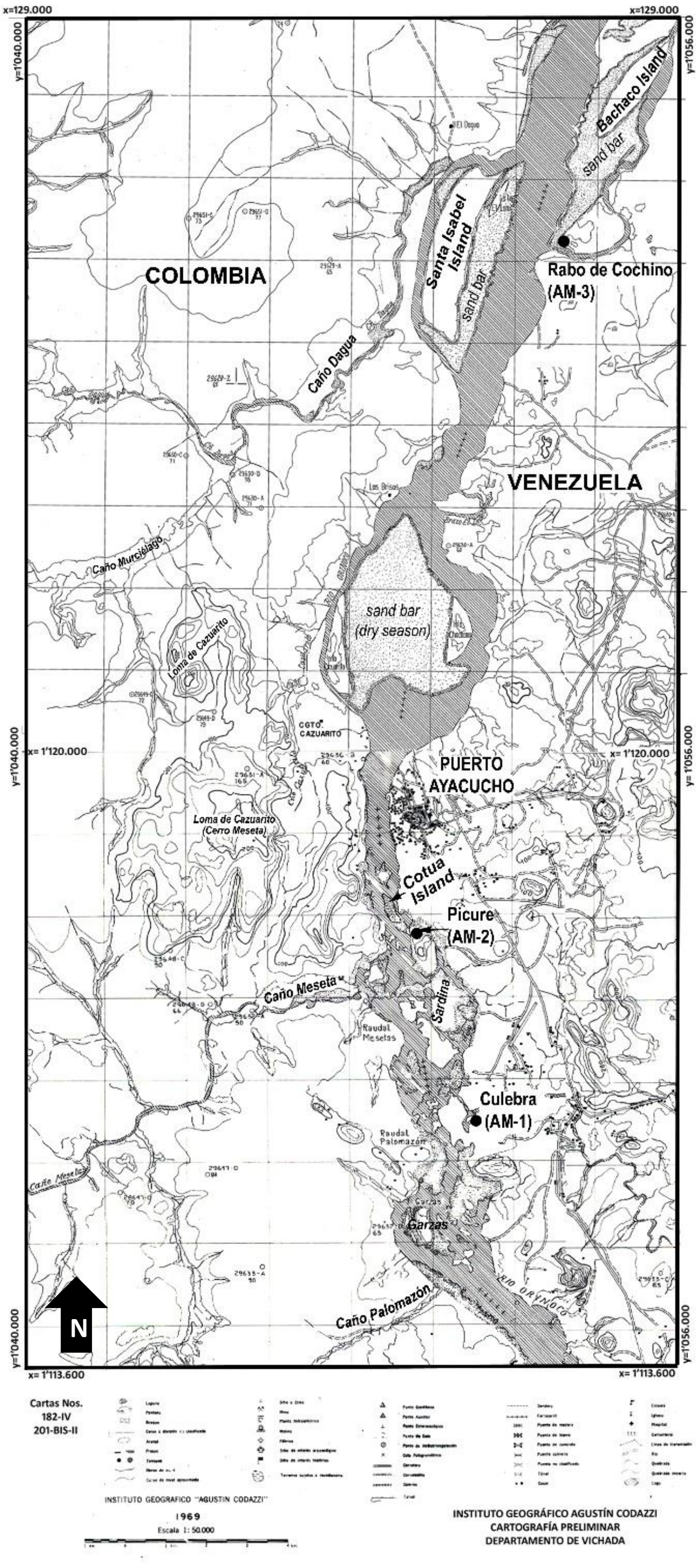


***Figure 5-1**. Map of the Átures Rapids region in the Middle Orinoco with the location of the three excavated sites during this project. Courtesy of José R. Oliver, 2017.*

Collection location	Middle Orinoco	Upper Orinoco and Ventuari River
Instituto Venezolano de Investigaciones Científicas-IVIC (Caracas)	Átures Bocas del Parguaza Cerro Aislado Matajey Rincón de los Indios La Urbana Buena Vista Arauquín Agüerito Capuchino Cedeño Arenosa Tucuragua	Yagua San Antonio Pueblo Viejo Minicia Nueva La Punta Iboa Panaven Patacame Cascaradura Nericagua Chamuchina
Enzo Cecarrelli Museum (Puerto Ayacucho)	Rabo de Cochino	

Table 5-1. *Archaeological collections revised and photographed, February 2016 by location and archaeological area (defined by Cruxent and Rouse (1958:209-233).*

5.4 Sampling

All ceramic fragments excavated from all three sites during our campaign were classified *in-situ.* Decorated or diagnostic rims for form projection (e.g. rim, body, base and appendages) were counted by level and unit. They were also hand-drawn, photographed and digitalized, for which all ceramic potsherds were quantified, sorted and the diagnostic ones were illustrated. Further analyses were only performed on a sub-set of samples which was analysed at UCL. This sample contained potsherds from each macroscopic fabric, as well as a representative range of the forms and decorative techniques. An important part of the sub-set was chosen based on their larger size, looking to explore the macroscopic traces and gestures associated to their production, ideally visible in large or semi-complete vessels. Likewise, rims and diagnostic sherds were chosen because they can be associated with specific forms and previously defined ceramic series and/or traditions, which will allow to relate techno-petrographic groups to previous classification schemes in the Orinoco.

They also belonged to different stratigraphic contexts and units, so as to provide a framework for a discussion on the vertical distribution of certain paste recipes, forming, fashioning or finishing techniques. The subset sample comprised a total of 333 potsherds (68 from Culebra, 105 form Picure and 160 from Rabo de Cochino), including ceramic artefacts such as roller stamps.

CULEBRA	**No. Ceramics**
Surface Collection	1,253
Trench A	1,644
Trench B	449
Trench C	32
Total	*3,378*
PICURE	**No. Ceramics**
Surface Collection	3,176
Test Unit 1	3,435
Test Unit 2	1,228
Test Unit 3	302
Test Unit 4	4,856
Test Unit 5	164
Total	*13,161*
RABO DE COCHINO	**No. Ceramics**
Surface Collection	554
Trench A	3,410
Trench B	106
Trench C	1,432
Total	*5,502*
TOTAL	**22,041**

Table 5-2*. Total ceramic materials recovered from Culebra, Picure and Rabo de Cochino archaeological sites, discriminate by surface collection and test/trench units.*

5.5 Methods

A number of macroscopic and microscopic analytical techniques were employed on ceramic materials recovered from the Cotúa Project’s new excavations to classify and to reconstruct their production sequence. Characterization of their mineralogical and chemical characteristics, as well as the technology used for their manufacture, was obtained by conducting visual examination, thin section petrography, portable X-Ray fluorescence (pXRF), Scanning Electron Microscopy (SEM) and macro trace analysis. Chemical data was further subjected to statistical analysis such as Principal Component Analysis (PCA) and Hierarchical Cluster Analysis (HCA), processed with the S-PLUS 2000 software. Likewise, a short ethnographic visit was made to a Hiwi potter in the nearby indigenous community of La Reforma during our fieldwork season in 2017. Using the information from several techniques and *in-situ* experience with a local indigenous potter is key to have more detailed results to sort, classify and distinguish compositional differences with more accuracy (Quinn et. al,. 2010; Stoltman et.al, 2005).

5.5.1 Visual examination

As a first step, an *in-situ* classification of all the ceramic sherds recovered in the excavations was performed. Macroscopic fabrics groups were identified using an eye-loupe (10X magnification). The observed characteristics were paste colour (Munsell, 2000), grain size or texture and type of inclusions. Even though colour depends on many factors such as firing conditions and temperature, clay composition also responds to mineralogical and geochemical differences and so it is a key element to consider when classifying ceramics. Other characteristics were recorded during this first evaluation such as friability, degree of oxidation (after Rye, 1981), presence of firing clouds and/or remnants of carbonized patches on the surfaces, which might be associated to combustion. All of the former was considered during this first approach to define the paste mode, which would be further confirmed and advanced with the petrographic analysis. In particular, the distinction between naturally occurring/intrinsic inclusions versus intentionally added inclusions/temper. Evidence to support such argument cannot rely only on their relative abundance, which is why petrographic analyses serve to confirm their incorporation to the clay based on its size, shape and matching composition in relation to the clay base matrix (Quinn, 2013 p.156-171).

5.5.2 Thin section petrography

To address technological questions, petrographic analysis examines compositional, microstructural and textural characteristics of the ceramics sherds to recognize raw material processing choices, tempering, vessel-forming techniques and atmosphere and degree of firing (Quinn, 2013. p. 4). Alignment and distribution of the mineral inclusions, as well as their grain size and shape, are observed under the optical microscope to determine possible source, processing and forming methods (Freestone, 1991; Quinn, 2013). In relation to provenance questions, petrographic analysis can also identify plausible geological sources for raw materials, and from their distribution, associat them with possible population movements and cultural interaction (Quinn et, al 2013; Quinn and Burton, 2009; Braun, 2012; Quinn and Burton, 2015).

Thin sections were prepared at UCL with a standard 30 μm thick slide (Quinn, 2013 p.3-33). A total of 185 ceramic sherds were thin sectioned (46 from Culebra, 61 from Picure and 78 from Rabo de Cochino). Each sample was given an analytical number composed by the initials of the excavation site and a consecutive number (e.g. PIC 001). Clay samples obtained from the participant observation experience with Hiwi potter, Aura Chipiá, were also made into briquettes and thin sectioned for petrographic analysis. They were given an analytical code name (CS-) followed by a consecutive number. After each section was finished, they were analysed and clustered in compositional groups, later organized as petrographic fabrics and families. Each fabric is described in detail in ***Appendix 2,*** following a system detailed by Quinn (2013), with a modification of Whitbread's (1989) descriptive system.

5.5.3 Instrumental geochemistry

A total of 161 ceramic sherds (40 from Culebra, 50 from Picure and 71 from Rabo de Cochino) were analysed with portable X-Ray Fluorescence spectroscopy (pXRF), in order to characterise their bulk geochemical composition. This technique has several advantages since it is non-destructive, it can be done *in-situ* and is relatively rapid (Speakman et al., 2011; Hunt and Speakman, 2015; Holmqvist, 2016; Wilke, 2017a, b). It also allows better resolution of clay composition components that will complement the identification of inclusions achieved in petrographic analysis (Quinn, 2013. p. 128-129). By using both approaches, the study can identify fine-grained differences in procurement and paste preparation procedures. Sampled sherds to be analysed with this technique were first prepared by having one surface (usually flat and big enough to cover the window of the hand-held device) abraded with silicon carbide to remove possible contamination.

There have been concerns with data quality obtained from the pXRF hand-held device (Speakman and Shackley, 2013), especially considering the limited range of elements which can be confidently used for the analysis and heterogeneity of coarse ware sherds (Tykot, 2016). However, the applied procedure intends to enhance the data by correcting Fe absorption/enhancement of each element, as well as specific spectra interferences.

Following the routine designed by Wilke (2017a; Wilke et al., 2017), irradiation was performed with an Olympus Innox-X Delta Premium device with a Rh source and a 2 mm Al filter, at 40 kV for 120 seconds live time using only beam II. The spectra was deconvoluted in the Brukker ARTAX software to correct individual interferences, including Rb Kß/Y Kα, Y Kß/Nb Kα and Sr Kß/Zr Kα. Finally, a Rayleigh scatter distance correction was implemented to correct the curved shape of pottery sherds. Obtained net counts were converted into concentrations using an in-house calibration (UCL Ceramics 1 pXRF calibration), developed by using homogeneously fired spiked clay samples with concentrations of the elements Fe, Ga, Nb, Rb, Sr, Ti, Y and Zr (Wilke et al., 2017). These samples were manufactured specifically to serve as reference material with one element at a time in a fixed amount (Wilke, 2017). The clay matrix used for the bespoke samples have a mass absorption of mid-Z elements in a range of clay and other aluminosilicates with a composition of O, Al and Si over 90%. In addition to the nine spiked elements, the calibration also measured Ca, Co, Cu, K, Mn, Pb and Zn, providing data of a total of 15 elements.

The Olympus Innox-X Delta Premium performance, as well as the in-house calibration UCL Ceramics 1 for the 15 recorded elements (Ca, Co, Cu, Fe, Ga, K, Mn, Nb, Pb, Rb, Sr, Ti, Y, Zn, Zr), was assessed by analysing 14 powdered certified reference materials (CRMs) of rock, ore, sediment, soil and ceramics (***Table 5-3***) and compared to that of the manufacturers factory 'Soil Mode' calibration. The CRMs were placed in a cuvette with a 4 μm prolene film, analysed five times and calibrated using the protocol described above. The standards were also analysed with the machine in the Soil Mode using Beam-II for 120 seconds.

Code	Name
CGL 111	Rare earth ore
CGL 002	Alkaline granite
CGL 006	Nepheline syenite
CGL 007	Basalt
GBM306-12	Certified Ore Grade Base Metal
SARM 1	NIM-G Granite
SARM 41	Carbonaceous Shale
SARM 42	Soil
SARM 44	Sillimanite Schist
SARM 45	Kinzingite
SARM 48	Fluorspar Granite
SARM 50	Dolerite
SARM 52	Stream Sediment
SARM 69	Ceramic-1

Table 5-3. *Certified Reference Materials (CRM's) by code and name use to assess UCL- Cal Ceramics 1 calibration*

The averages of the five measurements were compared to the certified values for the standards (***Appendix 3***) and accuracy was calculated as percentage relative difference using the formula: (measured-certified)/certified) x100 (***Appendix 4 and 5***). Average accuracy for Soil Mode and UCL Cal Ceramics 1 calibrations was also calculated for each element, but using the measurements of earthenware archaeological ceramics standards (***Appendix 6 and 7***) and data published in archaeological geochemical studies, including Quinn et al. (2010), Day et al. (2011), Trave et al. (2014) and Quinn and Burton (2015). As a result of the comparison, nine elements with an accuracy of less than 26% of error under the UCL Cal Ceramics 1 (K, Sr, Zr, Ti, Fe, Rb, Nb, Ga, Co) were considered for multivariate statistics (***Table 5-4***).

Element	Average accuracy all CRM's (%)		Average accuracy for ceramics range (%)	
	Manufacturers Soil Mode	UCL Cal Ceramics 1	Manufacturers Soil Mode	UCL Cal Ceramics 1
K	-	18.62	-	11.65
Sr	7.85	13.28	4.44	8.56
Zr	31.2	8.47	31.15	8.31
Ti	98.89	19.66	23.96	10.22
Fe	19.53	10.89	16.88	12.6
Ca	-	43.17	-	39.32
Zn	14.35	28.59	14.35	28.59
Rb	10.93	15.91	12.57	15.06
Mn	33.95	64.91	33.95	64.91
Nb	22.11	22.11	22.11	22.11
Ga	-	22.34	-	22.34
Co	-	25.53	-	25.53
Y	8.92	28.49	8.3	27.24
Pb	16.87	46.4	17.69	50.15
Cu	240.86	239.37	273.86	271.97

Table 5-4. *Comparison of average accuracy of the Soil Mode and UCL-Cal Ceramics 1 for 15 elements.*

Although both calibrations yielded similar results for certain elements, UCL Cal Ceramics 1 performed better for Fe, Ti and Zr, and also broadened the measured elements by including major and trace elements which were not present at the Soil Mode such as K, Ga, Co. The chosen nine elements used for statistical analysis, although limited in number, are reliable based on the previous assessment, providing accurate results which can be compared with other data sets. This protocol has been recently applied (Wilke et al., 2016; Burton et. al, 2019), showing than reliable compositional data can be obtained from hand-held devices.

5.5.4 Statistical Analysis

Elemental concentrations obtained with portable X-Ray Fluorescence spectroscopy (pXRF) was used to explore the chemical variability of the samples from three different excavated sites in the Orinoco. Based on their accuracy, nine elements (K, Sr, Zr, Ti, Fe, Rb, Nb, Ga, Co) were chosen to generate a Compositional Variation Matrix (CVM) per site. This analysis was used to calculate the total variance (*vt*) of the assemblages per site, as well as to identify least and highest variable elements to perform bivariate scattered plots and log-ratio transformation. Such plots are useful to understand the main grouping tendencies within the assemblage previous to the multivariate statistical analysis. The logarithmic transformation of the raw data obtained by the pXRF was performed to correct relative values dominated by the variables with the largest variances (Aitchison, 1986; Buxeda i Garrigós, 1999; Aitchison et al, 2002; Baxter and Freestone, 2006). The transformed data was used to preform Principal Component Analysis (PCA) and Hierarchical Cluster Analysis (HCA) using S-PLUS 2000 software. HCA was calculated using a centroid agglomerative method and the square Euclidean distance. Scatter plots and dendrograms produced using both kinds of statistical analysis combine elemental data to cluster the analysed samples into meaningful compositional groups.

5.5.5 SEM

Scanning Electron Microscopy (SEM) was used to identify sponge spicules inside sponge-tempered ceramics and to compare them with a collected sponge sample from the neighbouring area of the Rabo de Cochino site, on the Bita River, in the opposite river bank. The high resolution provided by this method was thought as ideal for recognising relevant structures which could lead to their taxonomic identification.

5.5.6 Macro trace analysis

Macro trace analysis, based on topographic features associated with technical gestures and forming methods, was performed on 203 sherds (22 from Culebra, 77 of Picure and 104 from Rabo de Cochino), selected because of sherd size and state of conservation. To record the relevant features associated to the production of the vessel, each sherd was observed using a Dino-Lite and macro photographs with custom lighting, this last to emphasize certain topographic features. Observations were recorded in a data base divided by type of traces observed in the radial section and both surfaces and how they relate to each stage of the *chaîne opératoire*. This recording system is based on conventional methods in ceramic studies developed by the Prehistory and Technology Laboratory at the CNRS (French National Centre for Scientific Research) and Université de Paris Ouest (see Manem, 2008; Ard, 2008; Giligny, 2010; Martineau, 2010).

The parameters used in the identification of traces are divided in three main areas (Livingstone Smith, 2010; Roux and Courty, 2013): 1) Walls and radial section (topography, thickness and uniformity), 2) surfaces (trace orientation, morphology, organization, texture, porosity, granularity, and clay hygrometry) and 3) type of fracture (orientation). The study also includes quantitative data such as thickness measurements of vessel walls and coils with a calliper.

Fashioning and finishing stages of the *chaîne opératoire* stages recognized using this technique will be identified as follows:

- ***5.5.6.1 Fashioning***

The fashioning stage "includes a series of operations which transform the clay paste into a hollow form (Roux, 2016 p.4)". The desired shape can only be achieved by parts at a time which are later joined together, these being the body, rim and neck and base, here analysed separately. Fashioning can be broadly divided into two phases, each one with its own operations and techniques. First phase is denominated as roughing out, which only constitutes the hollow form without the final shape. This is followed by the preforming phase, which constitutes the final desired shape without any surface treatment. The parameters which are evaluated as part of the techniques used in each phase are as following:

(a) Energy source (muscular energy vs. rotative kinetic energy)

(b) Clay mass (homogeneous/single vs. heterogeneous/multiple)

(c) Type of force (pressure vs. percussion)

(d) Type of pressure (discontinuous vs. continuous)

(e) Hygrometry of the clay paste (humid vs. leather hard vs. dry)

Since there is no evidence of wheel or any other rotative device for pottery making in the study area, the techniques here studied correspond to the ones employed with muscular energy source. To reconstruct such techniques, gestures and tools, the sherds are examined in terms of their profile, radial section, fracture and topography of both faces. Depressions and protuberances are examined, as well as their orientation. Both granularity, porosity and inclusions are considered to identify which technique is implemented. Whether hammering or modelling for a single clay lump, or coiling or slabs for the heterogenous clay mass, each technique will be described as well in terms of their application method -by pinching, crushing, or drawing [i.e. *étirement*]-. It is worth mentioning that coiling and slab building are also observable in thin section (Quinn, 2013 p.174), which will serve as an independent proxy to reconstruct fashioning techniques. As to preforming techniques and methods, they depend on the degree of hygrometry, whether in wet clay (scraping, preforming with continuous pressures, beating) or leather hard clay (shaving, *repoussage*, paddling, hammering).

- ***5.5.6.2 Finishing***

This stage refers to the transformation of the surface of the vessel through rubbing or coating techniques, as well as through decoration techniques (Roux, 2016 p.6). Depending on the hygrometry of the shaped vessel, smoothing or brushing- with or without additional water- can be applied on wet or leather hard clay. The directionality, intensity and homogeneity of the applied technique is also documented.

5.5.6.2.1 Surface treatment

As part of the finishing stage, surface treatment refers specifically to the phase after the flattening of the surface, which involves techniques of either friction (softening, burnishing/polishing, shining), or coating (slips, glazes, organic materials, graphite, silica, carbon).

5.5.6.2.2 Decoration

Decorative techniques are subdivided in superficial, sub-surface and over-surface techniques. While painting is considered as a superficial technique; impressions, incisions and excision techniques are part of the sub-surface category. Finally, appliques are considered as over-surface decorative techniques. The hygrometry degree when performed, as well as the probable tools (instrument or finger/nail), and the gesture (directionality and continuity) are evaluated in each form dimension (i.e. rim/neck/body/base) as part of this stage.

5.5.7 Participant observation

The visit to La Reforma community was used to document the process of contemporary pottery making within a local indigenous community, close to La Culebra site. Bearing in mind the evident transformation this craft has suffered due to access to steel and iron tools, as well as to plastic vessels, some of the techniques and material procurement strategies have remained constant for at least four generations, according to our potter's own testimony. Aura Chipiá and her mother are currently the only two women potters inside this community who still make traditional ceramic vessels, mostly for tourists. The clay samples obtained from our collaboration with the clay procurement process were used to compare them with the petrographic and macro trace analysis of the archaeological samples. Even thought we were only able to see them for a couple of days and a proper ethnographic study of pottery making practices could not be fulfilled, due to time logistic limitations, their testimonies and the documentation of their craft has crucial value since they represent some of the few potters left in Puerto Ayacucho area after the massive displacement and humanitarian crisis experienced in Venezuela in these last five years.

5.6 Vessel form terminology

To analyse the formal dimension this research will follow the terminology proposed by Shepard (1968 [1956]). Based on contours and association with geometrical shapes, Shepard (1968 [1956] p.226) defines four main points to recognize a form: 1) end points of the curves at the base and lip, 2) vertical tangents on the maximum diameter point, 3) corner points where direction changes and 4) points of inflection. Once the points are located, the contour of the vessel can be identified as part of single continuous shape or a composite discontinuous form with corner and/or inflexion points.

Both single and composite forms can be divided into three structural classes according to the projections of the contour from the last corner or inflexion point unto the orifice (see ***Fig. 3.3***). According to the latter, there are: 1) unrestricted vessels with projections that do not touch, 2) restricted vessels with intersecting projections and 3) necks. While unrestricted vessels are well adapted for display or service functions, restricted vessels are better suited for storage and necks help liquid pouring and prevent spillage (Shepard, 1968 [1956] p.228). This categorization allows an inductive approach to infer function.

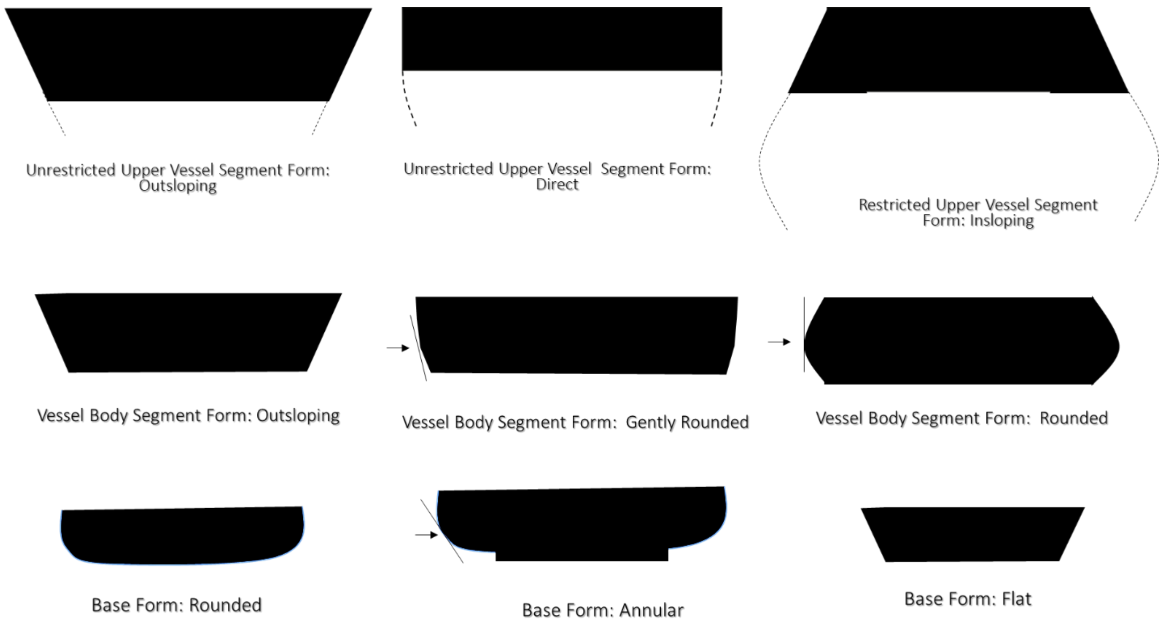


Figure 5-2*. Rim, body and base form contours divided by unrestricted and restricted. Arrows point to corner and inflexion points when present. Source: N. Lozada 2018.*

Unrestricted forms can occur without sloping or direct tangents, while restricted occur with in-sloping ones (Shepard, 1968 [1956] p.229-230). Contours can be simple, composite, inflected or complex. Simple contours have continuous and unbroken lines, while composite includes an angle. Inflected vessels combine convex and concave sections separated by a point of inflexion or curve. Finally, complex vessels, which are not part of the observed vessels in this assemblage, have two or more inflection points (Shepard, 1968 [1956] p.232).

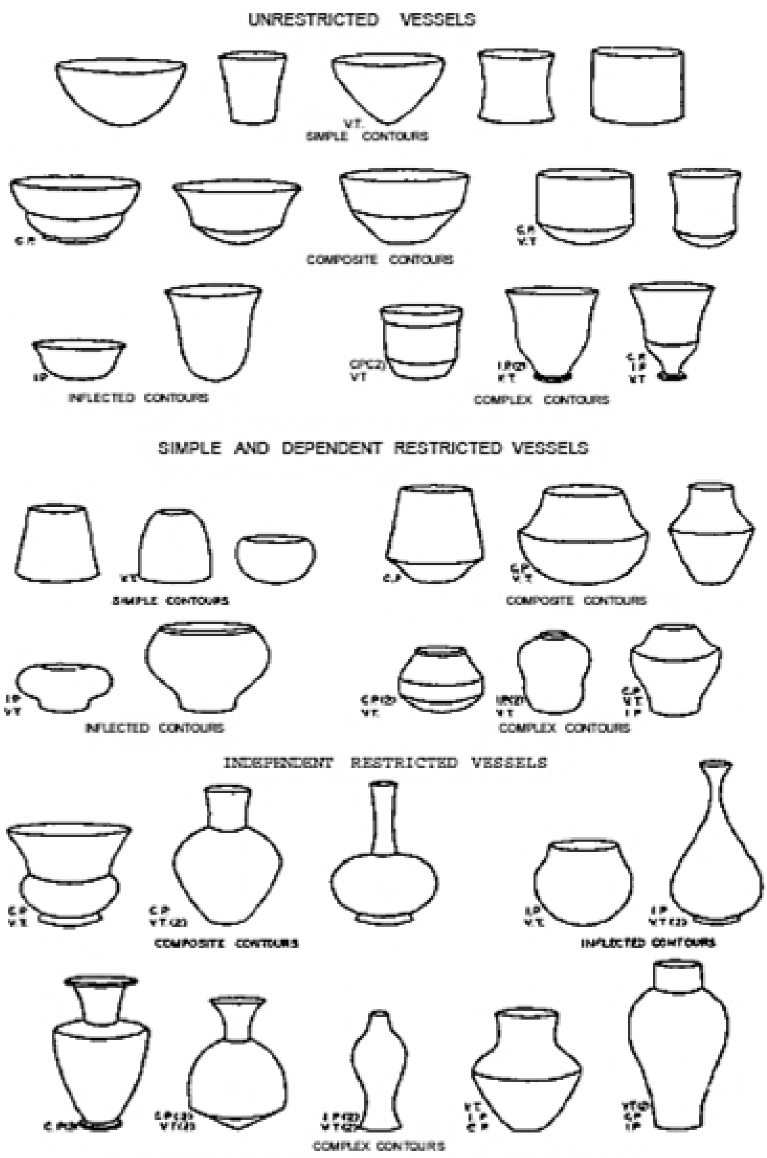


Figure 5-3. *General system of shape classification proposed by A. Sheppard (1968:231), divided in unrestricted and restricted vessels depending on their contour and dependent/independent silhouettes.*

Restricted and unrestricted vessels can also be further identified by referencing geometric solids. Spheres, ellipses, cylinders and ovals can be combined to form simple and complex contours (Shepard, 1968 [1956] p. 233). Spherical shapes are traditionally referred as 'globular' in South American archaeology, and so here we will choose this last term. Solids which are terminated above their equator correspond to simple restricted contours, while the ones who terminate at or under the point of maximum diameter are unrestricted contours (Shepard, 1968 [1956] p.233). Form description will be done individually and also as part of a vessel set, depending on the available data.

6. RESULTS OF THE CERAMIC ANALYSES

This chapter will be divided in two different sections. First section will present the clay and paste preparation stages, which will serve as a framework to interpret the findings in each archaeological site. The second part focuses on the results of ceramic analyses obtained *per* site, each one containing a description of the respective studied area, an analysis of the excavations, stratigraphy, chronology, materials distribution and ceramic production and vessel forms. The concluding remarks in each chapter will define the techno-stylistic complexes per occupation period.

6.1 Raw Material Procurement: Clay extraction and preparation

Clays are fine-grained aluminium silicates deriving from the chemical weathering of older rocks, which become malleable when moistened (Rice, 1987 p.36). Depending on where they are deposited, they can be classified as primary or secondary. Primary or residual clays are located in close proximity to the parent rock from where they have disaggregated, while secondary or sedimentary clays have been transported and are at some distance from the original source. The latter usually contains a larger amount of organic matter (5-10%) and its inclusions are more rounded from erosion due to transport and friction (Rice, 1987 p.37).

Due to their small size particles (<2μm in size), clay minerals are too small to be identified under the polarizing light microscope (Quinn 2013:39). Despite its limitations, important information of the clay matrix can be obtained from petrographic analyses which, combined with geochemical composition techniques, can be used to understand their nature of origin, source, and manufacturing technology. The colour of the matrix can be used to decipher its mineral composition and firing atmosphere, while its homogeneity is associated to blending techniques (Quinn, 2013 p.94).

Confirmation of possible clay sources and/or variations must result from a comparison with *in-situ* samples and with ethnographic information on clay recollection within indigenous communities in the area. Clay deposits in the study area are located on the margins of the Orinoco river and in a lesser extent, in the Parguaza and Cataniapo tributary rivers, overlaying the Parguaza Granite Formation (***Fig. 6-1***). The alluvial deposits on the river margins are composed of clay sized and coarse-grained sand particles derived from the weathering of the pegmatite and mineralized veins in the granitic geological formation (US Geological Survey and Corporación Venezolana de Guyana, 1993 p.89). According to ethnographic sources, indigenous communities such as the Palikur in the French Guyana rely on alluvial clays located in flooded savannas, shallow lake bottoms and dry creeks and coves (Nimuendaju, 1926; Ven de Bel, 2009 p.44; Rostain, 2016 p.100). The same patterns for clay extraction on river banks is reported among the Hiwi (Metzger and Morey, 1983 [1966] p.235-236) and Piapoco potters (Vidal, 1989 p.43), both of which inhabit the Orinoco river basin.

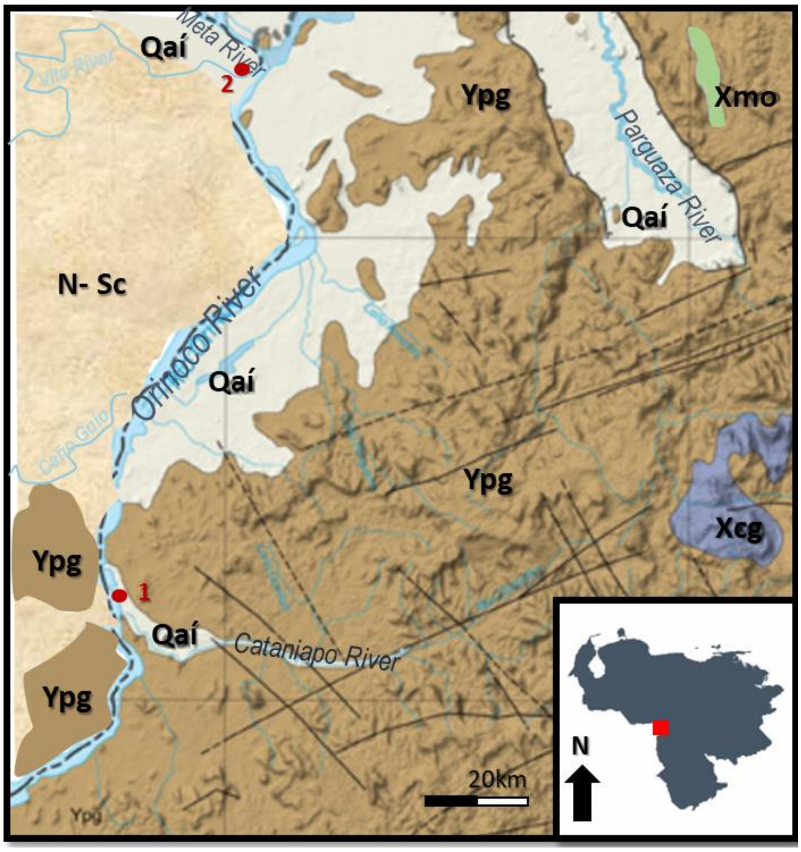


Figure 6-1*. Geological map of the research area. 1. Puerto Ayacucho, (Amazonas, Venezuela); 2. Puerto Carreño (Vichada, Colombia). Conventions.* Qaí: Alluvium deposits (Pleistocene to Holocene); *N-Sc: Sedimentary rocks (Miocene); Ypg: Parguaza Granite (Middle Proterozoic); Xcg: Medium coarse biotite granite and granodiorite -Cuchivero Group (Early Proterozoic); Xmo: Sedimentary and metamorphic rocks –Micaceous quartzites, conglomerates, phyllite and schist -Moriche, Cinaruco and Esmeralda formations (Early Proterozoic*). *Source: Composite map using Hackley et. al., 2005 and Gómez Tapias et. al,. 2006).*

Despite their ubiquity, these deposits can only be accessed during dry season, between December and March, when they are not underwater. Ceramic production during these months guaranties easier access to clay deposits, as well as better conditions to work, preservation of ceramic production materials -such as clay and wood for fuel- and better regulated firing conditions (Arnold, 1985). While the previously mentioned Hiwi and Piapoco indigenous communities produce ceramic vessels during the dry season in this area, there are always some exceptions. Ethnoarchaeological studies in the Andes described specialists who worked during the wet season as part of a wider exchange network, where trading involved not only artefacts but potters themselves, and their participation in complementary production spheres, such as agriculture (Sillar, 2009 p.105).

The visit to La Reforma indigenous community helped in obtaining *in-situ* samples of clay deposits from a clay quarry used by contemporary indigenous potters, to compare with archaeological samples. As part of the participant observation experience on January 2017 with Aura Chipiá and her mother, we collected three different clay types, following their own criteria (***Fig. 6-2***). The clay pit where they obtained their raw material is located at the margin of the Orinoco river, 6.8 km from their household at La Reforma, and 7 km upriver from La Culebra archaeological site. This pit was first discovered by Auras´s great-grandmother, and according to their oral tradition, a bird led her to it with its melody, indicating its unique character and importance for the community. For more than four generations, they have continued to extract clay from the same pit, even after one fatal accident took place there, when one of the pit-walls collapsed over one little girl from their community.

Aura's testimony reinforces the dry season argument since she declared that they collect clay for their entire ceramic production between January and February. Whether there is clay that can be stored and used later in the wet season is not specified. However, it is worth mentioning that the men that accompanied Aura to the clay extraction process -brothers and brother-in-law, took this opportunity to bring their fishing rods while doing the extraction, since they planned to do an excursion to the river bank. Parallel activities such as fishing or hunting can certainly be associated with parts of the ceramic production system and must not be ignored.

Figure 6-2. *Clay collection with Aura Chipiá and family at the Orinoco river bank. Insets (top left to right): Red clay sample; Dry creek from where Yellow clay was obtained; Bagging process and extraction by hand of the Black clay; Landscape view of the clay pit where the Black clay was obatined from.* Source:Jose R. Oliver. January 2017.

The clay pit's location is worth discussing since it is particularly far from the production site. Usually, clay quality and distance to the production site are the main elements to choose a quarry (Arnold, 1985, Lévi-Strauss, 1988). However, Aura and her mother continue to collect clay from a much further clay deposit, almost 7 km south from their household. Most of the potters obtained their clays from within 1 km distance radius from their production sites, although there are reports among the Shipibo-Conibo, in the Peruvian Amazon basin, where potters move between 5 to 40 km to collect a certain type of clay (DeBoer and Lathrap, 1979 p.112-113). When clay deposits are closer, clay can be transported on foot by individuals or groups. In Aura's case, her family used textile bags to carry the hand-picked clay and piled them in the back of the truck we used for transport. In pre-industrial societies, smaller amounts of clay could have been transported using canoes, textile bags or even their hands in the form of a lump or 'ball' (DeBoer and Lathrap, 1979; Van der Leeuw, 1984, Van der Leeuw et. al. 1991; Gosselain, 2008). The constant use of the same clay pit, despite its distance, seems to surpass the matter of convenience/efficiency, and rather respond to the meaning behind the bird's melody and its symbolic power, a sort of 'supernatural sanction'. Closer clay pits are in this sense not blessed or good pots could not come from those unsanctioned sites.

This clay quarry has been in use for at least 80 years, which agrees with ethnographic accounts of broad deposits that can be exploited for extended periods of time and by different groups (Buxeda and García Iñañez, 2010; Santacreu, 2014 p.65). Inside the clay pit, Aura and her mother recognized three different type of clays, which they denominate as 'Black', 'Red' and 'Yellow', according to their colour when collected. Red clay is found closer to the river bank (c.a. 2m below surface), while Yellow clay is at the bottom of a nearby dry creek (ca. 1m below surface) and Black clay is further inland (c.a. 1m below surface), all within the same exposed quarry. They both mentioned a 'White' clay which is found on another pit in the Cataniapo river bank, but for logistic reasons this sample was not collected during our visit. Aura's clay categories are reminiscent of the ones mentioned by DeBoer and Lathrap (1979 p.110) among the Shipibo-Conibo, where potters recognized three kinds of clays: Black (rich in organic matter), White kaolin clay and Red clay. This distinction is not common in all groups in the area. For example, among Piapoco potters only one clay is recognized: a 'Brown' clay called *i´bâi,* from river bank clay deposits along the Guaviare and Uva rivers (Vidal, 1989 p.43).

A fourth sample was collected during this exercise, which consisted of a non-fired tree bark-tempered Black clay prepared by Aura to make traditional Hiwi pots. Likewise, two additional and smaller clay samples were obtained from the Museo Etnológico Enzo Ceccarelli on our 2016 fieldwork. These last samples were registered with their common names and uses according to the indigenous communities from Caño San Miguel, from the Rio Negro river basin, who donated them to the museum.

All six samples were latter made into briquettes, fired and analysed using petrographic and geochemical data. Although a more systematic clay sampling should had been performed to confirm the use of local clay sources in the archaeological samples, logistic problems with permits and transport prevent us from doing a larger sampling. However, these results constitute the first detailed information on clay sources in the area and will certainly constitute a valuable contribution from the present study to future archaeometric analysis on ceramic production.

In order to produce thin sections for petrographic analysis, clay briquettes were manufactured from each sample (***Fig. 6-3***). All six samples, except for the mixed clay, were ground and sieved. According to Aura, this technique was used by Hiwi potters to 'clean' the clay, by employing a grinding stone and textile meshes, nowadays replaced by metallic sieves. After grinding, water was added to make a paste and then shaped it into briquettes. Samples from the Enzo Ceccarelli Museum obtained in 2016 fieldwork weighted less than 4 gr of clay, and so the briquettes for those samples are significantly smaller. However, they were all subjected to the same procedure, being carefully measured and weighted before and after firing.

Figure 6-3. *Clay samples obtained at Museo Ceccarelli and during fieldwork 2017 with Aura. Inset (top left to right): Clay sample from Galito-Upper Rio Negro; Ground clay samples from Aura's excursion -Black, Yellow and Red clay respectively-; Wet briquettes befofe firing (left to right: 4,2,1,6,5); Dry briquettes after firing (Top to bottom: 6,5,4,3,2,1). Source: N. Lozada 2017*.

Important information was recovered in terms of performance and shrinkage of all clay samples. After being fired at a max. temperature of 700ºC, no significant size reduction occurred in any of the samples. In fact, only half of them presented a minor size change after firing. Clay sample CS 001 'Mujpe' from Caño San Miguel, was reduced by 1 mm, while CS 004 'Red Clay' and CS 006 'Black Clay' decreased between 1.2 to 1.4 mm (***Table 6-1)***. In terms of weight, all samples from the Hiwi clay pit lost about 4 gr, most likely due to water evaporation. More importantly, the tempered Black clay or 'Mixed', with burnt tree bark, lost only 1 gr after firing and did not show any shrinkage, which can be argued is because of tempering enhancement techniques, or perhaps the use of less water as part of its preparation. Samples from the Rio Negro basin both lost only 1 gr after firing.

		BEFORE FIRING				***AFTER FIRING***			
ID	Name	cm (L/W)	gr	Colour		cm (L/W)	gr	Colour	
CS 001	**Mujpe**	0.9/0.7	0.7	2.5Y8/8	White	0.8/0.6	0.6	2.5Y8/8	White
CS 002	**Galito**	1.8/0.8	3.9	2.5Y6/6	Yellow	1.8/0.8	3.8	5YR5/8	Yellowish Red
CS 003	**Mixed**	3.1/2.1	14.1	25Y7/3	Pale Yellow	3.1/2.1	13.1	7.5YR6/4	Reddish Yellow
CS 004	**Red**	5.6/2	58.4	7.5YR6/4	Reddish Yellow	5.5/1.8	55	7.5YR6/4	Reddish Yellow
CS 005	**Yellow**	7.9/1.5	64.1	7.5YR6/6	Reddish Yellow	7.9/1.5	60.4	5YR5/8	Yellowish Red
CS 006	**Black**	5.5/2.3	59.2	7.5YR7/2	Pinkish Grey	5.5/1.7	55.2	5YR7/4	Pink

Table 6-1*. Clay samples with size, weight and colour before and after firing***.**

The most conspicuous change is associated to paste colour. A third of the sample turned Reddish Yellow, likely from iron rich components on the clay. The difference previously visible between the Yellow and Red clay when they were extracted at the pit become less evident after firing. While the Mujpe White clay sample remains the same colour it is the Black clay sample from the Orinoco which is more noticeably transformed, turning pink after firing. This change was known to Aura, who claimed it turned 'grey' after firing.

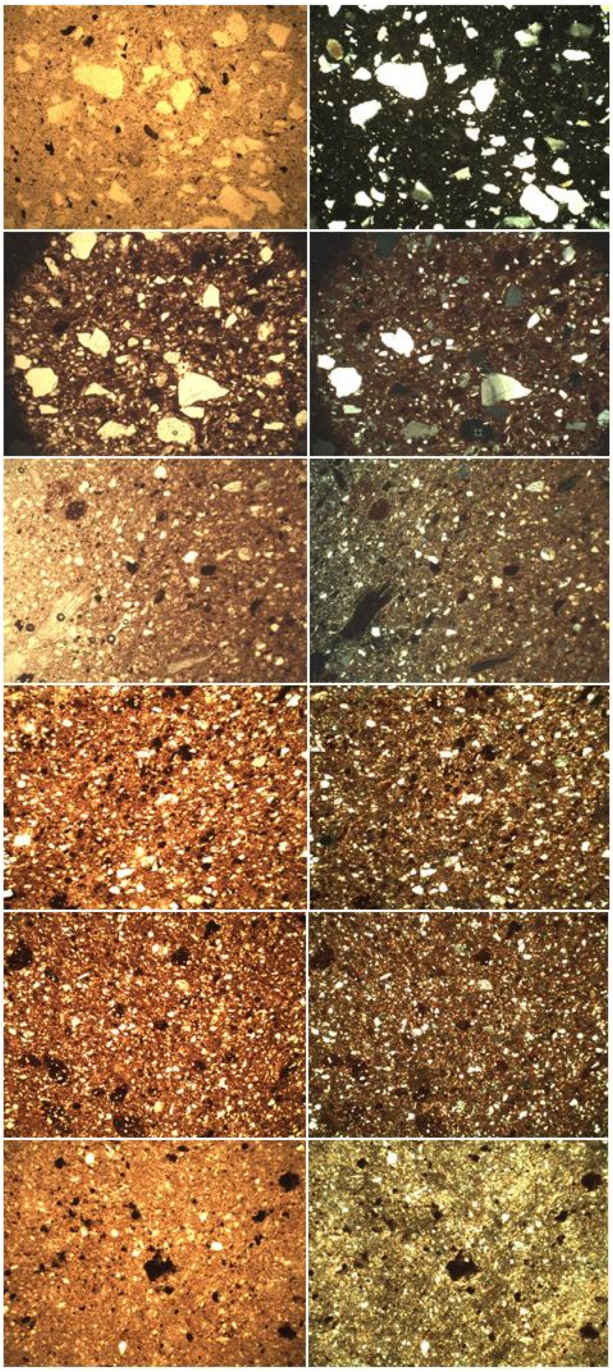


Figure 6-4. *Microphotographs under Plane Polarizing Light (PPL) (left) and Cross Polar Light (XP) (right) of Clay Samples (CS-001 to CS-006 from top to bottom). Image width: 3mm. Photos taken by Natalia Lozada, 2017.*

Petrographic analyses of the clay samples showed strong similarities in terms of texture and composition between samples CS 003 to CS 005 (***Fig.6-4***). These samples are characterized as a coarse to medium grained fabric with sorted angular mineral and rock inclusions deriving from a granitic acid igneous rock. Main mineral inclusions comprise quartz, microcline, microcline perthite and biotite. Sample CS 003 to CS 005, presented smaller size inclusions, product of a more thorough sieving process which resulted in a homogeneous size distribution of all inclusions. Finally, sample CS 006 or ‘Black Clay’ from the Orinoco river Hiwi clay pit, presented a rather different composition. While also reporting sorted quartz and microcline feldspar inclusions from a previous sieving process, sponge spicules were spotted in the clay matrix. These last ones were rare inclusions, comprising less than 2% of the composition.

6.2 Ceramic Material classification

As a first step to analyse ceramic artefacts found on the Átures Region, an *in-situ* sorting of all potsherds was made considering their paste texture and colour. This initial classification follows the logic of the ceramic production chain, in which the paste preparation process is one of the first steps in the sequence, only preceded by the raw material procurement. It is necessary to emphasize that this initial classification served as a basis to distinguish the differences in production sequences, but it was not a definitive category. Macroscopic fabrics formed during this initial sorting were complemented and modified with further petrographic analyses to build the petrographic families and fabrics. Once the paste preparation modes were set, macro trace and modal analysis were applied to recognize other steps in the production chain in each petro family and eventually recognize steps for each ceramic ware and complex.

The paste categories here proposed must be differentiated from a ‘fordian’ ceramic type, where paste and colour were joined arbitrarily to serve as an index to establish a relative chronology. On the contrary, their identification does not entail a prioritazing of the paste dimension over other attributes and/or processes in the chain. Their definition here aims to identify the paste preparation modes present in these sites, which will be compared with additional modes from other dimensions (i.e. rim, lip base) to define co-occurring attributes. Once the modes’ binding association are proven, ceramic wares and complexes for each site will be defined and not assumed from the paste differences acknowledged in this first classification.

This remainder of the chapter focus on the definition of macroscopic and petrographic fabrics from all three archaeological sites. It provides general descriptions on their main characteristics and processing differences. It also discusses how macroscopic and petrographic fabrics are related. This section is complemented by a more detailed discussion in the corresponding chapter for each archaeological site, where their occurrence will be discussed in relation with the particular stratigraphy, chronology and abundance per units.

6.2.1 Macroscopic fabrics

Macroscopic fabrics were identified using an eye-loupe (10X magnification), considering paste colour, grain size or texture and type of inclusions. Nine macro-fabrics were identified in the ceramic potsherds from all three sites. Five of these fabrics were characterized as having a single type of inclusion, while the remaining four exhibited two types. Single inclusion macro-fabrics contained either sand or cauixí (i.e. sponge spicules). Sand-based fabrics are separated on the basis of their paste colour and texture, as detailed in ***Table 6-2.*** For the mixed inclusion fabrics, dominant and secondary inclusions are mentioned in the name of the fabric, according to their relative abundance (larger to smaller). The macroscopic fabrics are depicted in ***Fig.6-5.***

MACRO FABRIC	COLOUR	COLOUR	GRAIN SIZE	TYPE OF INCLUSIONS
Fine Sand	Light reddish brown –Reddish yellow	5YR 6/4-6/6	<0.2mm	Quartz, grit
Coarse Sand	Reddish brown-Yellowish red	5YR 5/4 – 5/8	1-3mm	Quartz, grit
Black Coarse Sand	Dark reddish grey-Reddish brown	5YR 4/2-4/4	1-3mm	Quartz, grit
Cream Coarse Sand	Yellow	10 YR 7/6	1-3mm	Quartz, grit
Cauixí	Light Brown	7.5 YR 6/3-6/4	<1mm	Sponge spicules
Cauixí and Sand	Light Brown	7.5 YR 6/3-6/4	1-2mm	Sponge spicules and quartz
Cauixí and Fibre	Brown	7.5 YR 5/2-5/4	<1mm	Sponge spicules and carbonized bark/and or fibre
Cauixí and Red Clay pellets	Light Brown	7.5 YR 6/3-6/4	<1mm	Sponge spicules, quartz and clay pellets
Cauixí and White Clay pellets	Light Brown	7.5 YR 6/3-6/4	<1mm	Sponge spicules, quartz and clay pellets

Table 6-2. *Macroscopic fabrics detailed by name, colour, texture and type of inclusion.*

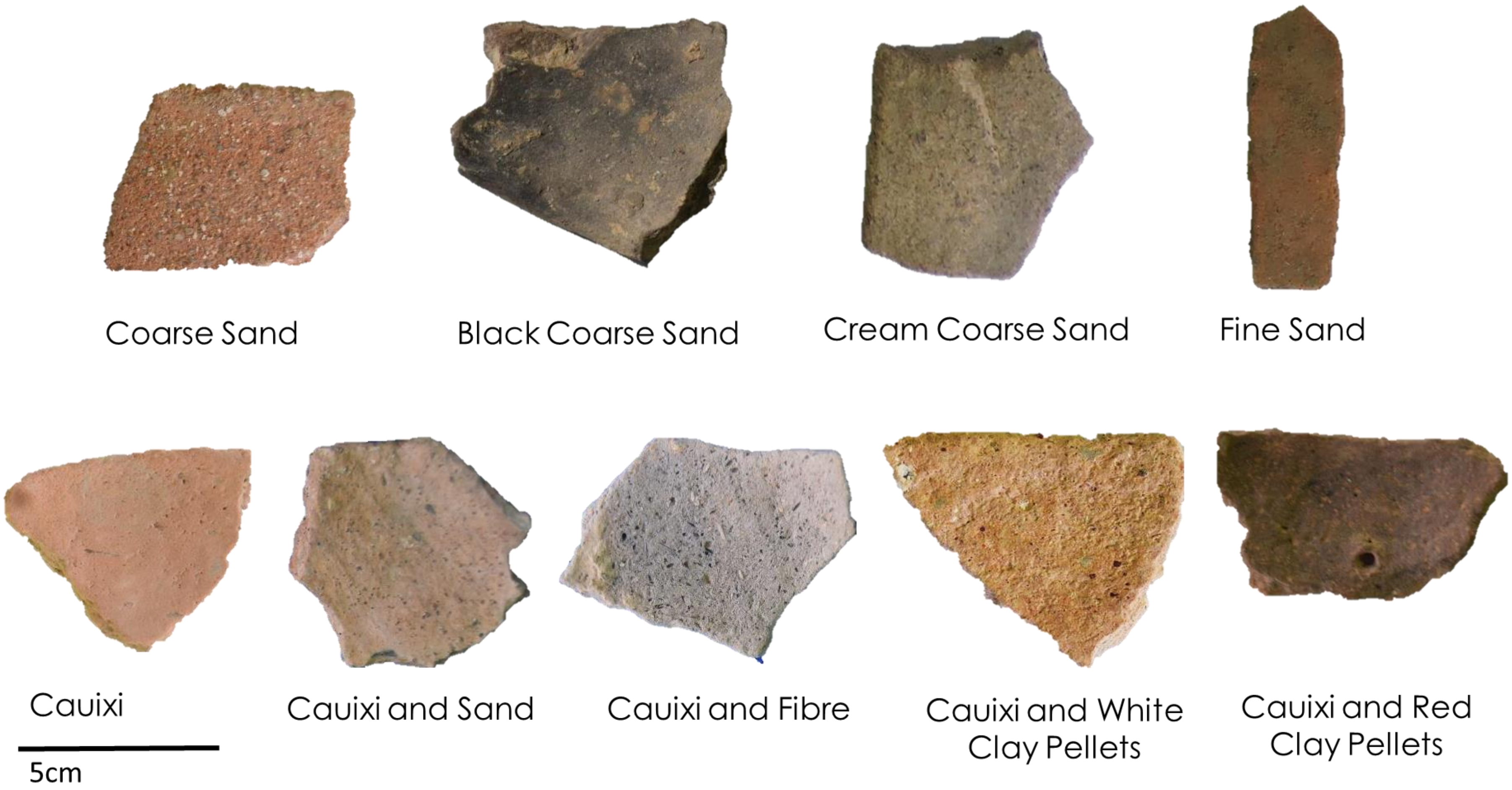


Figure 6-5. *Macroscopic fabrics sorted by paste colour, grain size and type of inclusions. Photos by Natalia Lozada, 2017.*

This macroscopic classification permits the identification of at least three main tendencies within the ceramic sherds based on their inclusions, those being sand-based fabrics, cauixí fabric and mixed fabrics. Sand-based fabrics include a fine-grained fabric and three coarser fabrics, each of which has a different paste colour. Cauixí fabric is also fine grained, while mixed fabrics have similar textures ranging from medium to fine grain size inclusions. Sponge spicules are not measurable by eye, and so the size in the cauixí and mixed groups refers only to grit and/quartz seen on the radial fraction of the sherds.

Aside from the type of inclusions and texture differences, it was also possible to recognise clear differences in paste colour. Even though colour depends on many factors such as firing conditions and temperature, it also corresponds to a particular mineralogical and geochemical composition, and so it is a key element to consider when classifying ceramics. Sand-based groups were divided between light reddish (Coarse Sand and Fine Sand), dark reddish (Black Coarse Sand) and yellow (Cream Coarse Sand) paste colours. These categories are similar to the ones used by Aura Chipiá, the Hiwi potter, who divided her clays between 'Red', 'Black' and 'Yellow'. On the contrary, cauixí fabric and the mixed fabrics are all similar in paste colour, with a light brown paste colour range, suggesting they are most likely using a similar clay but adding different tempers.

The distinction between inclusions and tempers is a problematic subject since the latter implies *intentional addition* of certain materials. Since macroscopic examination alone cannot distinguish between intentional addition (temper) and incidental inclusions, petrographic analyses serve as a way to confirm their incorporation to the clay based on their size, shape and matching composition in relation to the clay base matrix (Quinn, 2013 p.156-171).

A discussion of their distribution per archaeological site considering their corresponding stratigraphy and chronology is found on the subsequent chapters, where sites are discussed individually.

6.2.2 Petrographic fabrics

The petrographic analyses performed on 182 ceramic sherds from all three sites allow for an independent proxy to identify paste recipes with higher accuracy. Thin sectioned ceramics analysed under an optical microscope provided a more detailed assessment of the raw materials and technology of the potsherds, for which the resulting fabrics are not only sorted by their main inclusions but also from the way in which they were prepared (Quinn, 2013 p.77). These results were used to confirm the macroscopic paste classification and to determine naturally occurring or intentionally added inclusions. It also served to reconstruct other manufacturing stages beyond the paste preparation, such as forming and firing techniques, which will be discussed in the corresponding sections of this stage for each site.

From the 182 thin sectioned ceramics, 25% (n=46) were found at Culebra site, 34% (n=61) at Picure site and 41% (n=75) in Rabo de Cochino site. These sections were analysed, resulting in 18 different petrographic fabrics (detailed description in ***Appendix 2).*** These fabrics were grouped under larger categories known as 'fabric families' (Quinn, 2013 p.77), which in this case cluster fabrics according to their main inclusions and preparation process. In total, seven different families were identified in the sample.

Under the modal analysis approach, petrographic families will be addressed as paste modes. Even though fabrics are more accurate when describing all the choices involved in the paste preparation process, families have a meaningful modal value, given that each represents a distinct standard for paste preparation. Their definition based on different main inclusions indicates a discrete treatment of the clay and in some cases, it identifies additional steps such as grinding, sieving and/or tempering. They are also statistically more meaningful, considering the size of the petrographically analysed sample.

The first family group is the Granitic Family, which comprises the Granitic and Weathered Granitic fabrics. Both fabrics contain coarse-grained poorly sorted rock and mineral inclusions which comprise abundant angular and sub angular quartz, microcline, microcline perthite, plagioclase and biotites, some still merged. This composition is indicative of a possibly weathered medium-grained igneous rock of acid composition, most likely micro-granite. Unlike the Granitic Fabric, the Weathered Granitic Fabric present heavily weathered quartz and microcline with quartz blebs in intergrowths and ghost myrmekite. These last ones are most likely the product of a late development in the rock, perhaps during the cooling of magma in granite or during a volatile phase. From this difference, it is possible to suggest these two groups comprise rock minerals and inclusions from different stages of breakdown of a granitic parent rock. The high abundance and even distribution of angular grit and mineral inclusions also suggest they are naturally occurring. The former indicates the use of a residual clay source, which was non-tempered and/or processed aside from a superficial cleaning of the coarser inclusions.

The Granitic Tempered Family only includes the Granitic Tempered Fabric, a medium-fine grained fabric with sorted sub-angular mineral and rock inclusions. Among these last ones there were medium-sized rounded quartz and microcline inclusions, most likely from a weathered granitic parent rock. Sub-rounded shapes of the mineral inclusions indicate a transported source, possibly sedimentary. The bimodal grain size distribution of the quartz inclusions and uneven presence within the clay paste are both arguments to claim tempering.

On the other hand, the Sponge Spicule Family contains three different fabrics: Sponge Spicule, Coarse Sand Sponge Spicule and Sponge Spicules with Argillaceous Inclusions fabrics. All three share a similar composition, with conspicuous sponge spicules, very few silt-sized rounded quartz inclusions. Other inclusions, such as microclines, muscovite and biotite appear in very rare proportions. The Coarse Sand Sponge Spicule Fabric is an exception, with slightly larger and more common quartz. This composition suggests a heavily weathered sedimentary clay derived from a micro-granitic parent rock. Significantly more abundant than the mineral inclusions, the siliceous-rich sponge spicules (with an average 0.021mm in length) that give the name to this fabric constitute between 40-50% of the clay matrix. Based on their abundance and uneven distribution, they are thought to be added as temper.

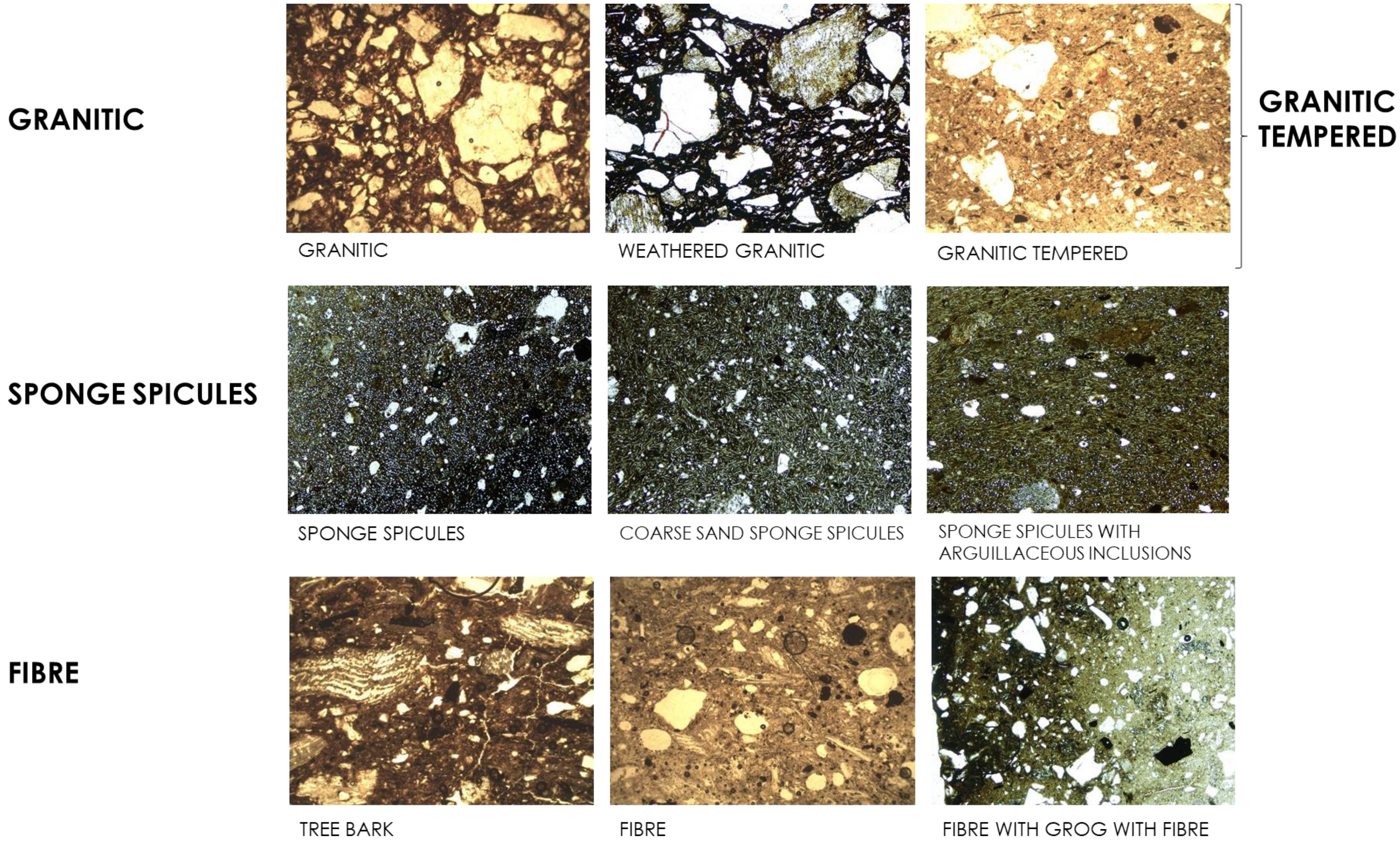


Figure 6-6. *Microphotographs of petrographic families with a single type of inclusion/temper under Plane Polarizing Light (PPL). Individual image length: 3mm. Composite by Natalia Lozada, 2019.*

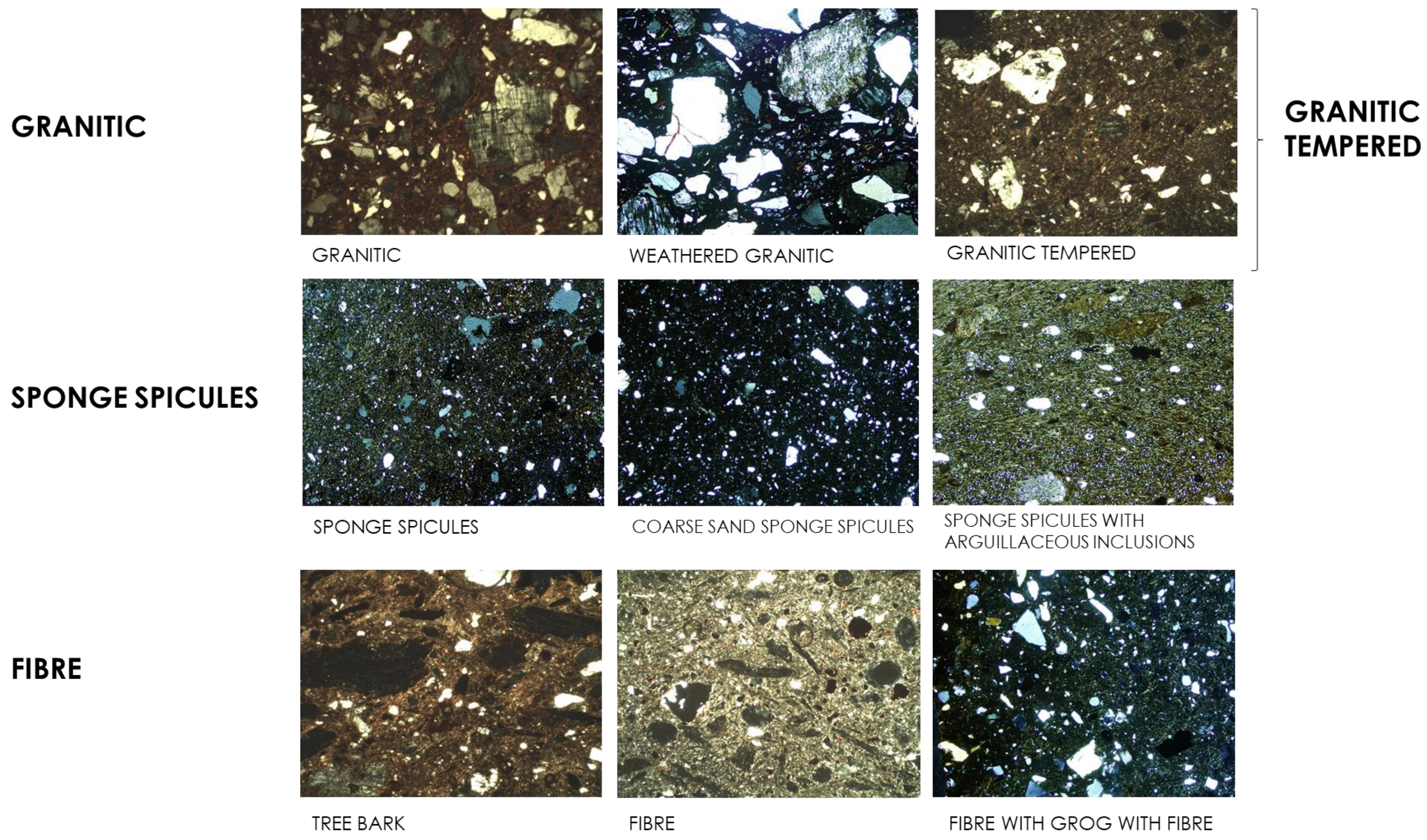


__Figure 6-7__. Microphotographs of petrographic families with a single type of inclusion/temper under Cross Polarizing Light (XP). Individual image length: 3mm. Composite by Natalia Lozada, 2019.

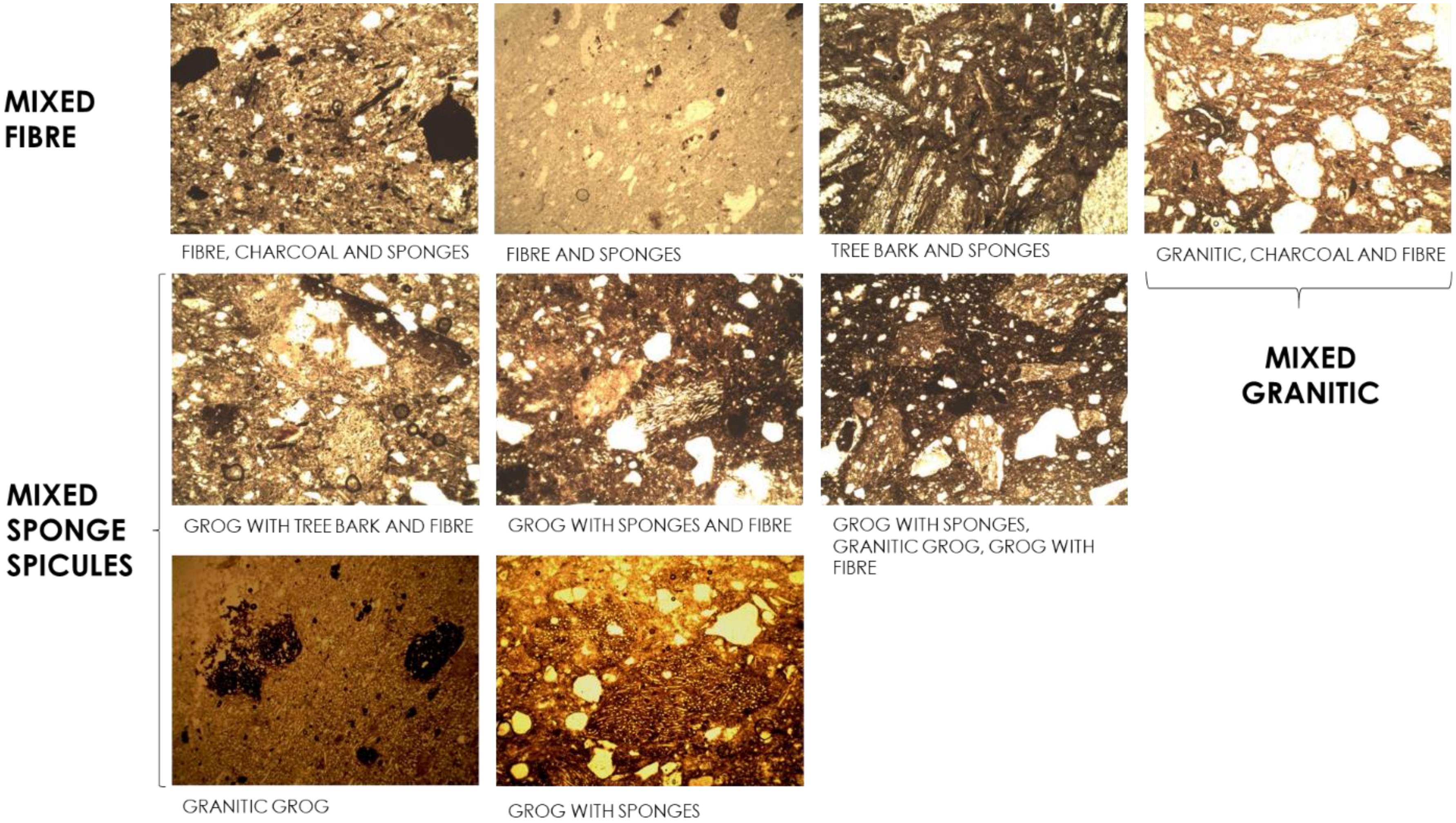


Figure 6-8. *Microphotographs of petrographic families with a more than two types of inclusion/temper under Plane Polarizing Light (PPL). Individual image length: 3mm. Composite by Natalia Lozada, 2019.*

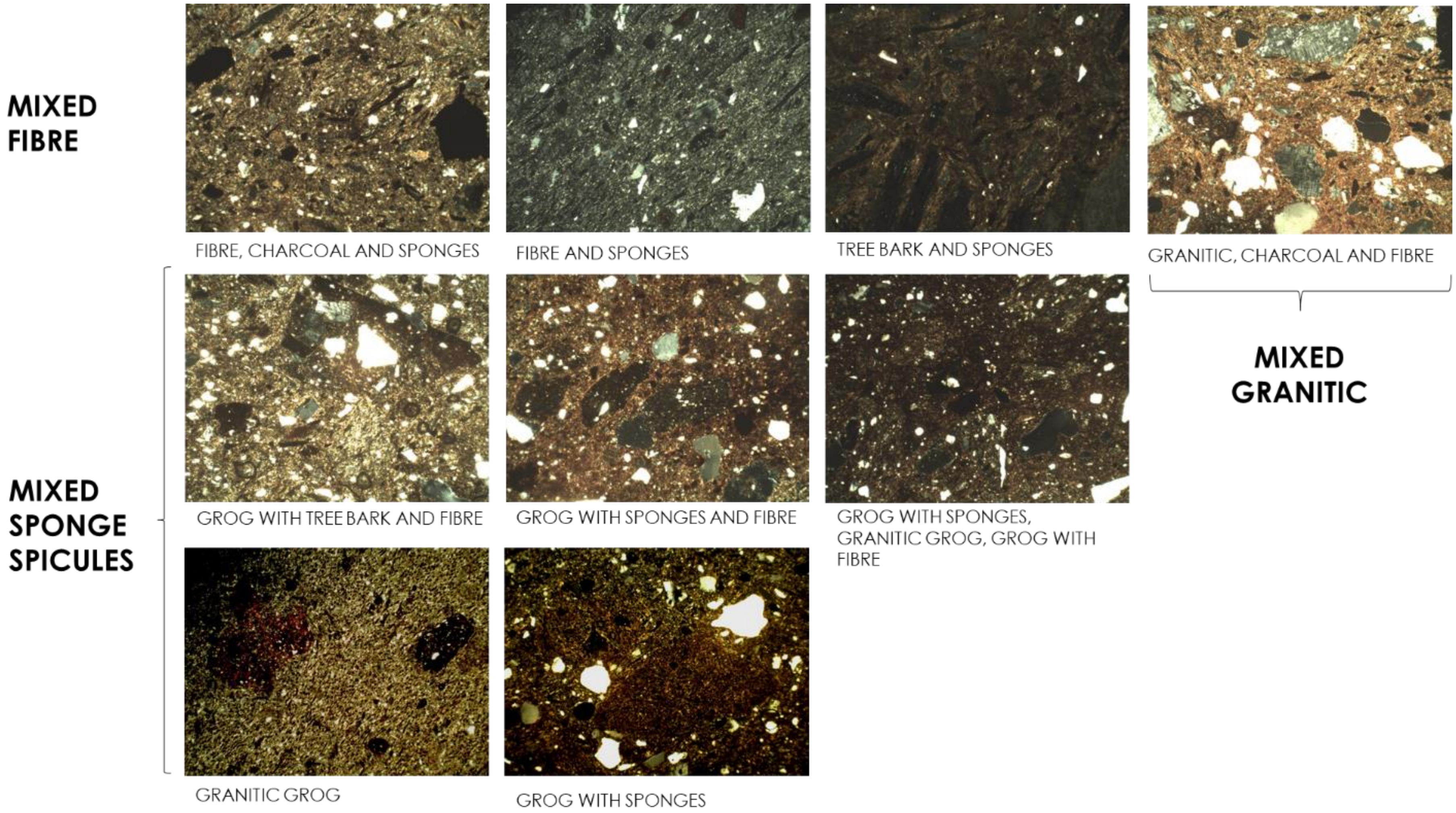


Figure 6-9. *Microphotographs of petrographic families with a two or more types of inclusion/temper under Cross Polarizing Light (XP). Individual image length: 3mm. Composite by Natalia Lozada, 2019.*

The latter is also supported by the appearance of large areas within the base clay without spicules, and argillaceous inclusions or porphyroclasts without these elongated structures. Both of these could be explained as the result of incomplete mixing and poor hydration of the paste,

The Fibre Family, as its name indicates, contains three fabrics characterized by the conspicuous presence of elongated siliceous structures denominated as fibres and/or tree bark. Fibres correspond to lose cell vessels from the xylem structure, the water conducting tissue of most angiosperms or flowering plants. It also refers to phytoliths and small angular siliceous elements in the matrix. Tree bark is also siliceous-rich, and it can be found both charred and un-charred. Both of them are commonly found on the base clay, unevenly distributed, for which they are believed to be used as temper.

Fibre fabrics —-the Fibre Fabric, the Fibre with Grog with Fibre Fabric and the Tree Bark Fabric— also present medium to fine quartz and microclines are also reported. Based on their sub-rounded shape and composition, it could be argued that they used a weathered clay source derived from an acid igneous rock, possibly granite. Their moderately sorted inclusions help infer they could have applied some sort of grinding or cleaning to refine the clay and to crush the fibre inclusions before incorporation. It could also suggest the use of a fine clay source.

Mixed families, which combine more than one main inclusion, are common fabrics within the sample. The Mixed Fibre Family merges fibre, tree bark and sponge spicules together. It comprises the Fibre and Sponge Spicule fabric, the Tree Bark and Sponge Spicules Fabric and the Fibre, Charcoal and Sponge Spicules Fabric. Names of this family’s fabrics follow the order of abundance of the different siliceous-inclusions, with either fibre or tree bark as the predominant temper. Charcoal inclusions, also reported in various samples, correspond to burnt tree bark and/or wood without anatomical features for proper identification. Sponge spicules in this family are found in very few proportions for which their addition as temper is not conclusive. However, samples from this family also exhibit argillaceous inclusions, probably formed during the mixing of the paste, perhaps when the bark and fibre were added.

Aside from the temper, paste from this family contains common to frequent silt and fine sand-grained sub-rounded quartz and rare sub-rounded microcline feldspars. Even though the amount and size of mineral inclusions varies, the composition and shape of the latter indicates the use a sedimentary clay derived from a heavily weathered granitic parent rock. Variation in quartz sizes and abundance suggest different cleaning processes of the clay or the use of both medium and fine coarse clays.

Among the mixed families there is also the Mixed Sponges Family, which comprise five minority fabrics in which all the samples have predominantly sponge spicules. Unlike the families from the Mixed Fibre Family, they also appear together with different grog inclusions, from granitic potsherds or tempered with tree bark, fibre and/or sponge spicules. Fabrics such as the Sponge Spicules with Granitic Grog Fabric and Sponge Spicules with Grog with Sponges Fabric have grog from a crushed granitic potsherd, or from a sherd tempered only with spicules. In contrast, the Sponge Spicules with Grog with Tree Bark and Fibre Fabric and the Sponge Spicules with Grog with Sponges and Fibre Fabric have grog tempered with two different siliceous inclusions form crushed Mixed Fibre potsherd. The remaining fabric, named as Clay Rich Sponge Spicule grog, Granitic grog and Fibre grog Fabric has three types of grog inclusions, each tempered with either spicules or fibre and also from a granitic fragment.

Angular and sub-angular grog inclusions used in samples from this family have a medium to coarse-grained size and appear in common proportions. They are accompanied by medium-grained sub-rounded quartz and microcline inclusions along with rare biotites, which indicate a sedimentary clay with inclusions from a weathered and transported granitic parent rock.

Last family among the mixed category is the Mixed Granitic Family, which contains the Granitic with Fibre and Charcoal Fabric. This fabric shares the same texture and composition of the Granitic Family potsherds with the addition of fibre and burnt bark or wood inclusions. Based on the coarseness of its mineral inclusions, clay was not further processed (i.e. ground, cleaned) but was rather mixed in with the siliceous rich structures. Fibre and charcoal are added in very few amounts from which it could be they did not have enough material, or the sectioned potsherd chosen for the analysis did not have enough temper.

Additional fabrics reported in the sample correspond to hardened clay lumps found in Culebra and Rabo de Cochino sites. Lumps from both sites presented a similar composition with silt-sized rounded and sub-rounded quartz and microcline feldspars. Based on its mineral inclusions shape and size, it might be derived from a heavily weathered microgranite parent rock. Samples from Rabo de Cochino also presented very rare sponge spicules in the matrix. Their low numbers indicate they might be naturally occurring in the clay.

6.2.3 Correspondence between macroscopic and petrographic fabrics

Although a more detailed discussion on the correspondence of macroscopic and petrographic fabrics is detailed in ***Appendix 8*** regarding their behaviour per site, a broad comparison between the two forms of classifications is necessary to compare and confirm conclusions reached with both. In this section we will address how macro and microscopic analysis relates in each site as a guide that will help to interpret the distribution of the fabric groups in each trench and site (***Fig.6-10***).

In all three sites, Coarse Sand and Black Coarse Sand macroscopic fabrics have a strong correspondence with the Granitic Family. While Coarse Sand macro fabric has a perfect match with the Granitic petro fabric, the Black Coarse Sand macro fabric mostly belongs to the Weathered Granitic Fabric. Nonetheless the Cream Coarse Sand Fabric –only found on Culebra site- showed a strong equivalence with the Granitic Tempered Family. As mentioned before, the Granitic Family samples have poorly sorted coarse-grained mineral inclusions derived from a granitic parent rock. Its coarseness, angularity and variable size of its mineral inclusions indicates the use of a non-tempered residual clay source. In contrast, Granitic Tempered sherds have well sorted mineral and rock inclusions, whose shape, size and distribution suggest they were added as temper to a sedimentary clay source. Such difference is key in our understanding of the Cream Coarse Sand as a naturally sand-based fabric. It also indicates sand-tempering was not as common given that it only appears in Culebra site.

Cauixí and Fibre macroscopic group had similar results in all sites, with all samples belonging to the Fibre and Mixed Fibre petrographic families. These families were tempered predominately with elongated siliceous structures, most of which corresponded to the xylem structure of angiosperms, and/or charred or uncharred tree bark. Sponge spicules were also observed in this samples in frequent to very few proportions. Base clay use was sedimentary, based on the roundness and size of its mineral inclusions, as well as for the predominance of quartz. While in Culebra, all samples from these families exhibited charred tree bark and fibre inclusions with very few spicules, potsherds from Picure and Rabo de Cochino did show both fibre, charcoal and sponge spicules in similar proportions. The macroscopic identification in this case agrees with the optical microscopy evaluation, which revealed the expected presence of both types of siliceous inclusions. Nonetheless, the scarcity of sponges in Culebra does not allow to confirm if the spicules were intentionally added.

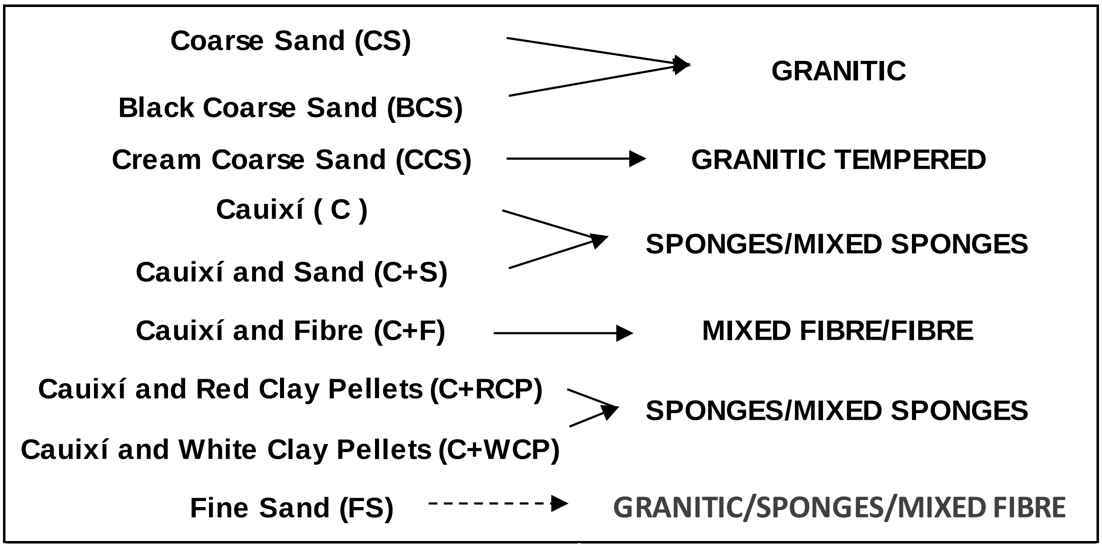


Figure 6-10. *Main tendencies on the correspondence between macroscopic fabrics and petrographic families for Culebra, Picure and Rabo de Cochino sample.*

Cauixí and Cauixí and Sand sherds do not show important differences between them when analysed under the microscope. Both fabrics were positive for sponge spicules but the spotting of medium sand-sized quartz inclusions in the Cauixí and Sand samples was not exclusive of this fabric, leading to the merging of both categories. However, the petrographic analysis did reveal some important differences between archaeological sites.

Potsherds from these macro-fabrics from Picure and Rabo de Cochino corresponded both to the Sponge Spicules and Mixed Sponges families, as expected, while the fragments from Culebra belong to the Fibre family. In all sites, the identified families were manufactured with a sedimentary clay derived from a weathered granitic parent rock and tempered with siliceous elongated structures, however Culebra samples did not contain sponge spicules but rather fibre and tree bark temper.

The misleading macroscopic identification of sponge spicules with fibre can be attributed to size and porosity. While sponge spicules, fibre and uncharred tree bark are too small or translucent to be identified macroscopically, sponges are often associated with other characteristics such as lightness and high porosity, which are used to infer their presence. However, since fibre and tree bark are also light siliceous inclusions and appear in highly porous ceramic sherds, their macroscopic differentiation from pure or predominantly cauixí is haphazard and demands a petrographic confirmation. Likewise, the presence of granitic grog and sponge spicule-tempered grog inclusions in some samples from this macroscopic fabric found at Rabo de Cochino were not identified during the macroscopic evaluation and could only be detected by using a higher resolution method.

The remaining sponge-tempered macroscopic fabrics, Cauixí and Red Clay Pellets and the Cauixí and White Clay Pellets fabrics, showed strong similarities under the microscope, despite the colour differences of their pellet inclusions. Both fabrics corresponded with the Sponge Family, specifically to the Sponge Spicules with Argillaceous Inclusions Fabric, although some sponge spicule fabrics with tempered grog inclusions where also identified in the Picure sample. This correspondence resulted in the merging of these two macro-fabrics and confirmed their sponge spicule tempering and the presence of porphyroclasts, most likely due to incomplete mixing and poor hydration of the paste.

Finally, the Fine Sand macroscopic fabric showed the most surprising results, with different compositions in each archaeological site. Samples from the Culebra site did correspond predominantly with the composition described for the Granitic Family but with fine sand-sized mineral inclusions, as expected from the macroscopic definition of this group. However, Picure samples were mostly tempered with sponge spicules while Rabo de Cochino sherds had both sponges and tree bark tempering. Both fibre and sponge spicules, present together in the mixed family fabrics, are very difficult to recognized by the naked eye, considering their size. Even so, the predominance of siliceous rich inclusions as sponges and fibre in the Fine Sand macro fabric in two of the three archaeological sites represents a strong argument to question the reliability of this category and of the macroscopic classification method.

Petrographic analyses confirmed the macroscopic classification of seven of the nine macro-fabrics, merging in a few cases some categories which did not show the expected differences. Sand-based fabrics confirmed their non-tempered poorly sorted grit and mineral composition, derived from a granitic parent rock with different breakdown and weathering stages. Sponge Spicule fabrics did show sponges in almost all cases, although they were accompanied by fibre and tree bark inclusions more often than expected. The former can be explained from a scale limitation, in which the naked eye cannot perceived the small siliceous inclusions or clearly distinguish them from each other. Mixed macroscopic fabric Cauixí and Fibre did show both sponge spicules and fibre and/or tree bark, which in this case were easier to spot due to the conspicuous inclusion of charred tree bark, more visible than the translucent bark and microscopic xylem vessel structures (i.e. fibre) found in the other sponge-tempered fabrics. Nonetheless, in the Culebra sample, the spicules were very rare, and their intentional incorporation remains disputed. Lastly, Cauixí and Clay pellets fabrics did have sponges and argillaceous inclusions, which are most likely associated to the preparation of the paste.

In contrast, two fabrics showed a radically different paste composition than expected from the macroscopic analysis. Petrographic results on samples belonging to the Cream Coarse Sand macro fabric revealed it was a sedimentary clay with grit and mineral temper, derived form a granitic parent rock. This result contradicts initial associations of this fabric with the Coarse and Black Coarse Sand fabrics, bringing it closer to other sedimentary clay tempered recipes such as the Cauixí and Cauixí and Fibre fabrics. On the other hand, the Fine Sand macro group presented three different compositions, one for each site, ranging from the Granitic Family, to the Sponges and Mixed Fibre families. Once again, the fine-grained inclusions of this fabric proved to be hard to distinguish with a naked eye or the use of a low-resolution eye-loupe. The inconsistent results which associated this fabric to three different paste modes makes is an unreliable category. However, data on this macro fabric can still be used on a site scale level, considering the petrographic family correspondence for each case. In Culebra, Fine Sand macro fabric corresponded with the Granitic Family, while in Picure it matched the Sponge Spicule Family and in Rabo de Cochino the Mixed Fibre Family.

6.3 Paste preparation and processing

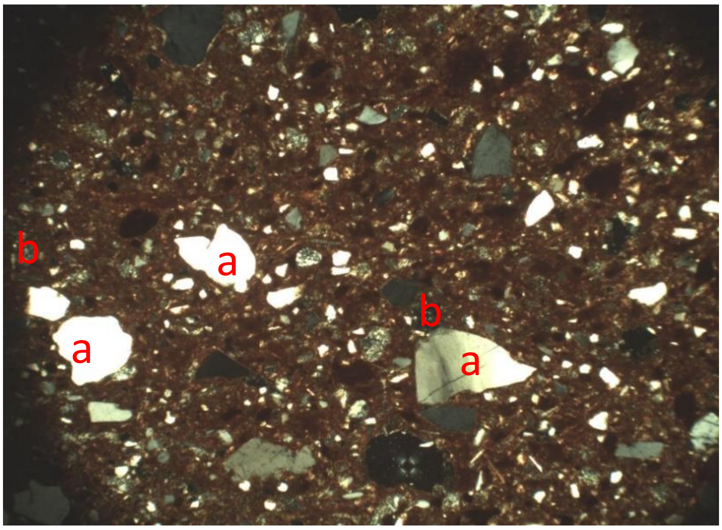
Paste preparation and the technology behind the making of certain recipes is crucial to understand pottery making practices. From the previous fabric modes, certain paste recipes require further explanation on how they processed and added certain ingredients. The following section will be divided into the main four different types of inclusions to explain the associated steps in the use of each type.

<u>6.3.1 Sand and grit inclusions and sand tempering</u>

Non-tempered Granitic Family fabric sherds were most likely cleaned in a superficial way, by hand-picking larger quartz and grit inclusions. This process has been reported in previous ethnographic studies, where potters partially removed or hand-picked larger grit and/quartz to make the clay suitable for ceramic manufacture [Rogers, 1936 p. 6; Wilken, 1982 and Hohenthal, 2001 p.170 cited by Quinn and Burton, 2009 p. 282]). Poorly sorted minerals in samples from this family serve as evidence to claim there was not sieving or heavy crushing, suggesting this particular clay was selected for its ideal natural properties for pottery making and did not require further tempering and/or processing. This is not as rare given that potters know nearby clay sources and choose their quarries based on the performance of the material and its natural conditions. This was documented in an ethnographic study closer to the to our research area. Wayana and Wayapi potters, located in the south of the French Guyana, collect clay with natural sand inclusions from river banks and creeks, where it is easier to access the clay fraction without having to dig. This type of clay is preferred because it has naturally occurring sand inclusions and does not require tempering (Rostain, 2016 p.100).

Clay samples obtained from a pit close to the Orinoco river bank provided evidence of a non-treated clay especially suited for pottery. During a clay extraction outing with Hiwi potter Aura Chipiá in 2017, three clay samples obtained in an exposed quarry at the margins of the Orinoco were collected for petrographic analysis and to compare them with archaeological pottery samples. The quarry has been used by the same community for over 80 years and it can only be exploited during the dry season, when the low level of the river exposes the clay banks.

One collected sample (CS-002) presented medium grained poorly-sorted angular mineral and rock inclusions. Among the minerals found on the samples the most common were quartz, microcline, microcline perthite and biotite, some of which were found still merged. The former description agrees with the one registered for the Granitic Family samples recovered from the archaeological sites (e.g.CUL-005). As seen in ***Fig.6-11***, the texture of the collected clay sample is slightly finer, and the inclusions are better sorted since they were crushed and sieved to make a briquette. This procedure followed Aura´s own technique to clean the clay. Despite these steps, which are not as visible in the archaeological samples, the similarities in terms of composition, shape and colour between archaeological and ethnographic thin sections suggest the Granitic family sherds could have been made by using a clay obtained from the local river bank, which was cleaned and “somewhat” crushed before use.



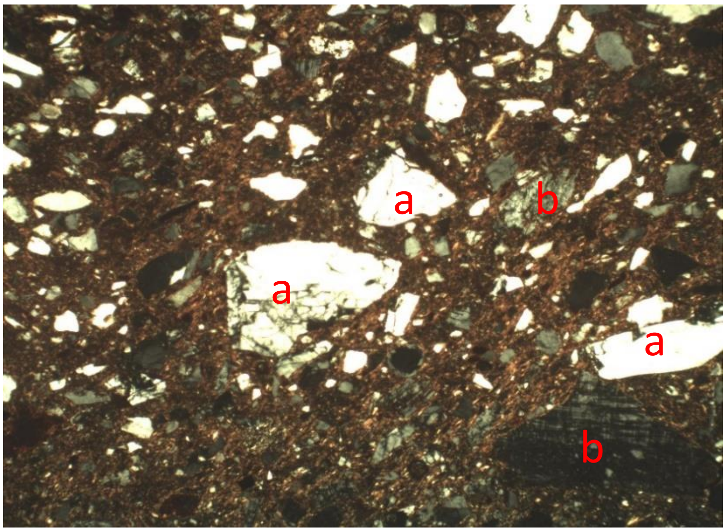


Figure 6-11. *Microphotographs in Cross Polar Light (XP) of the Galito sample CS-002 (top) and a Granitic archaeological sample CUL-005 (bottom) (Culebra site-Trench A-Cx. 101-Lv.4). a) Quartz; b) Microcline feldspars. Picture size: 3mm width. Source: Natalia Lozada 2017.*

In contrast, Cream Coarse Sand potsherds do show evidence for tempering. The uneven distribution of larger sub-rounded quartz and the very few microcline feldspars in Granitic Tempered Family potsherds indicates that the used clay was most likely enriched with larger mineral inclusions derived from a granitic parent rock. Few fine to silt-grained rounded quartz on the base clay also indicate the used clay was probably a sedimentary clay. Since the clay was naturally thin, the addition of larger quartz inclusions could have taken place to make it suitable for pottery making. Quartz are most likely found on sandy beaches along certain parts of the Orinoco river banks and its tributary rivers. Before adding sand into the clay, it needs to be processed to even its grain size and remove organic materials. Its addition it most likely associated to augmenting the silica fraction, which makes the pots more refractory, reducing their shrinkage and drying problems (Rice, 1987).

6.3.2 Sponge Spicule tempering

Sponge spicule tempering is known to be a common technique practiced by some Amazonian groups since early 20th century. First reports of this practice were made by Fritz Krause (1911, p.282), who in his travel accounts, paraphrased by S. Linné (1957 p.156), described the burning and crushing of freshwater sponge spicules by Carajá potters in the Araguaia River (Brazil) before adding them to the clay. Years later, Alfred Métraux (1942 p.67-68) published his notes from his travels in Eastern Bolivia and Western Matto Grosso, where he described a similar procedure performed by the Mojo and Bauré potters, Arawak speakers located in the Mojos Province, who burned the freshwater sponges and used the ashes to mix it with clay, giving the material a great resistance. He also talked about the Moré potter's (Métraux, 1942 p.86-95), located in the same province but from the Chapakuran linguistic family, who also made their pots by mixing a dark clay with the ashes of sponges that floated in flooded forests.

Since then, sponge spicules tempering has been reported in other areas of the Amazonian basin such as the Orinoco river, the mouth of the Xingu and Tapajós rivers, tributaries of the Madeira river, the confluence of the Mamoré and Guaporé rivers, the lower Ji-Paraná river, middle Araguaia river and the lower Uruguay river (Moraes, 1944). Sponge spicule-tempered ceramics has also been found outside of Amazonia in Matto Grosso do Sul (Wüst, 1991; Volkmer-Ribeiro and Viana, 2009; Volkmer-Ribeiro and Gomes, 2002) and in Goiás (Oliveira, 2009; Viana et al., 2011), and even further away in the central Gulf Coast of Florida (USA) (Borremans and Shaak,1986) and the Nile river (Adamson, Clark and William, 1987; Mcintosh and MacDonald, 1989).

The ubiquity of the sponge tempering technique is associated with the distribution of this freshwater organism, particularly abundant in the neo-tropical region. Siliceous-rich sponges are usually found along flooded meadows in the margins of rivers and/or lagoons (Volkmer-Ribeiro and Pauls, 2000) (***Fig.6-12***), where they adhere to tree branches and leaves, or even rocks or floating-rods, depending on the species (Volkmer-Ribeiro and Viana, 2009). Needle-like and sharp external spicules protect the sponge from predators, making it almost impossible to touch them directly. Direct contact with a large number of spicules can result in allergic reactions, inflammations and even serious eye injuries (Magalhães et al., 2011; Volkmer-Ribeiro et al., 2006). During the dry season, sponges lose their humidity, making them more fragile and easier to break and/or detach from the tree and/or surface where they grow, sometimes with the help of fire (Heckenberger, 1996).

Figure 6-12. *Drulia sp. sponges observed in the Tiestero site, on the Bita river bank, opposite to the Rabo de Cochino site beach area. These sponges were photographed during dry season, in January 2017 fieldwork. Sponges adhere to tree branches which are seasonally flooded. Photo courtesy of José R. Oliver, 2018.*

Despite the ethnographic data on cauixí tempering by some modern indigenous groups, it remains debatable whether the ancient indigenous potters knew this technique. In particular, some researches have argued that the presence of sponge spicules in the clay is not necessarily the result of tempering but rather that they can be natural inclusions (Borremans and Shaak, 1986; Silva, 2000; Moraes, 2006, 2013; Rodrigues et al., 2017). This is based on the occurrence of spicules in clay samples and inside hardened clay lumps found near or associated to archaeological sites where cauixí sherds occur. The former suggests ancient exploitation of rich-spiculate clays, which do occur in certain areas, such as at the bottom of closed lagoons or swamps. Reports of sponges from the *Spongillidae* and *Potamolepidae* families, such as the *Trochospongilla paulula* or the *Oncosclera navicella* in these types of sediments can be explained because of their fragile skeleton that allows their dispersion and deposition in the substrates (Gomes, 2002 p.92-94; Volkmer Ribeiro and Almeida, 2005 p.130).

Considering the former scenarios, to prove the intentional incorporation of sponge spicules in the obtained samples from the three excavated archaeological sites, previous research has proposed different criteria to identify whether they were used as temper. One of the main parameters is the quantitative element (Mcintosh and MacDonald, 1989 p.489-494), which suggest naturally occurring sponge spicules are scarce, and so if they are copious in the sample they must have been added. This can only be confirmed by performing petrographic analysis in clay samples obtained *in situ* and compare them with archaeological samples. Aside from their abundance, added sponge spicules are expected to appear in clusters and not evenly distributed on the paste, as a result of the mixing process. They must also follow a certain orientation from the applied force during the fashioning and finishing stages, particularly from the making of coils and the smoothing of the surface (Felicissimo et al. 2010 p.2182-2183).

As mentioned before, Sponge Family potsherds from the Cotúa project are characterized by the conspicuous presence of this siliceous-rich elongated inclusions, occupying between 40-50% of the matrix, along with few silt-sized sub-rounded quartz, and rare microcline, muscovite and biotite inclusions. In comparison with the clay samples obtained in the clay quarry visited with Aura in the margins of the Orinoco, only sample CS-006 or the 'Black Clay' sample presented a similar texture, with very few sub-rounded quartz and microcline inclusions but with rare (2%) sponge spicules in the matrix (***Fig.6-13***).

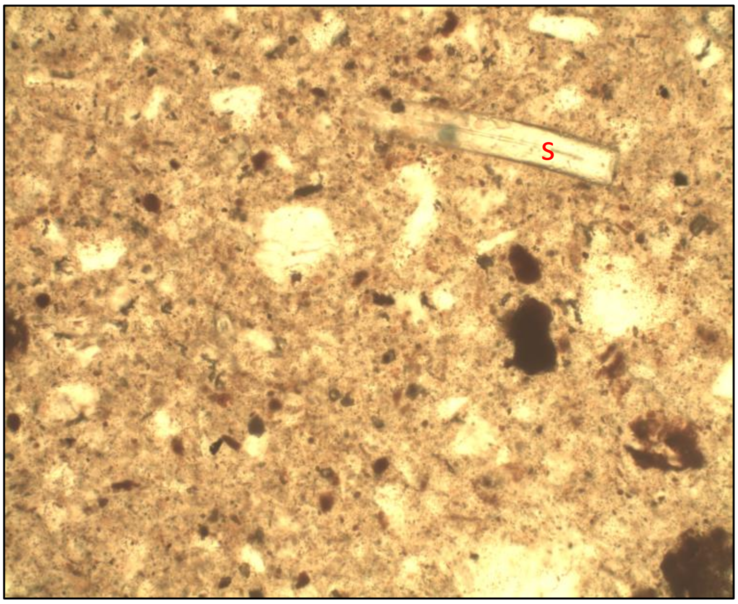


Figure 6-13. *Microphotograph in Plain Polarized Light (PPL) of the 'Black' Clay sample (CS-006). S) Sponge Spicule. Image width: 1.5mm. Source: Natalia Lozada, 2017.*

The clay sample was crushed to make a briquette, following Aura's own treatment of the clay, for which the size of the inclusions in the original sample could have been slightly larger. However, the identified rare spicules were not affected or broken during this procedure, appearing complete and with a maximum length of <0.1mm. Based on this comparison, archaeological samples do have abundant spicules in its matrix, exceeding the rare naturally occurring spicules found on the clay samples, which indicates tempering.

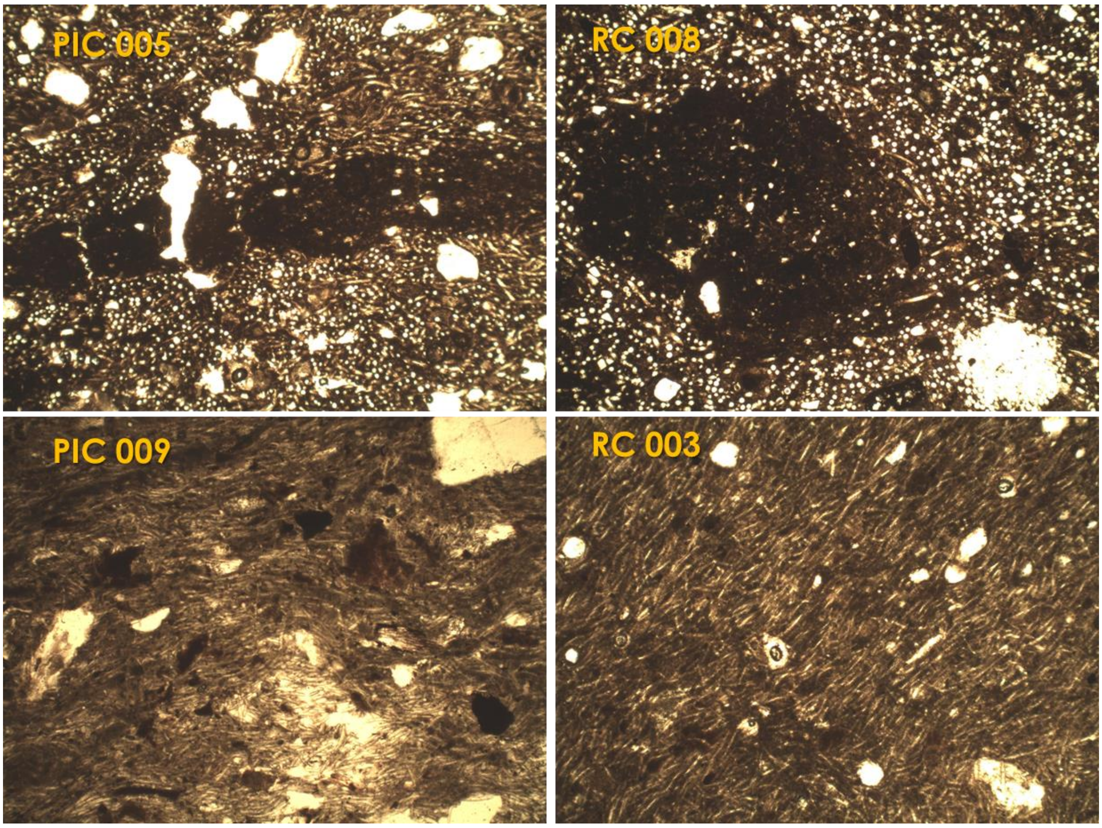


Figure 6-14. *Microphotographs of Sponge spicule tempered sherds from Picure (PIC) and Rabo de Cochino (RC) sites. Top images show evidence of incomplete mixing, while bottom images show sponge spicule alignment. Image width: 3mm. Photos on composite taken by Natalia Lozada, 2017.*

Concerning the clustering and orientation of the spicules, samples from Picure and Rabo de Cochino sites do show sponge clumps and large base clay areas without sponges. These last ones are thought to correspond to portions which did not receive sponges during the blending (Quinn, 2013 p. 175), suggesting incomplete mixing techniques (***Fig.6-14***). Likewise, spicules' orientation was visible in certain samples, in which the elongated size of the siliceous structures was parallel to the thin section's cut. Spicules alignment did follow circular shapes, associated with coil formation, although most of the times they were horizontally aligned, parallel to the sherd's walls, which can be due to the drawing (i.e. *étirement*) of the coils during the fashioning stage or the smoothing of the walls during the finishing stage.

Additional arguments to claim tempering are associated with the appearance of certain anatomical structures of the sponges and the advantages associated with their addition. Regarding the anatomical markers for tempering, the presence of the reproductive cells or gemmules and of their protective spicules or gemmoscleres has been proven to be a key feature to argue intentionality and to identify provenance. Gemmules, the reproductive chamber or shell which contains the stem cells or archaeocytes, are surrounded by a membrane with gemmoscleres (gemmule embedded spicules) (***Fig.6-15***) and protected by large elongated spicules (megascleres). This structure functions as an asexual reproductive adaptation of certain species during dry or adverse seasons. It grows fixated to a hard surface, such as a rock or tree branch, and remains attached during the dry season, waiting for a new water rise to grow and expand (Volkmer-Rivero and Pauls, 2000 p.6). Their presence is necessary to perform a taxonomic identification and to inform a possible provenance.

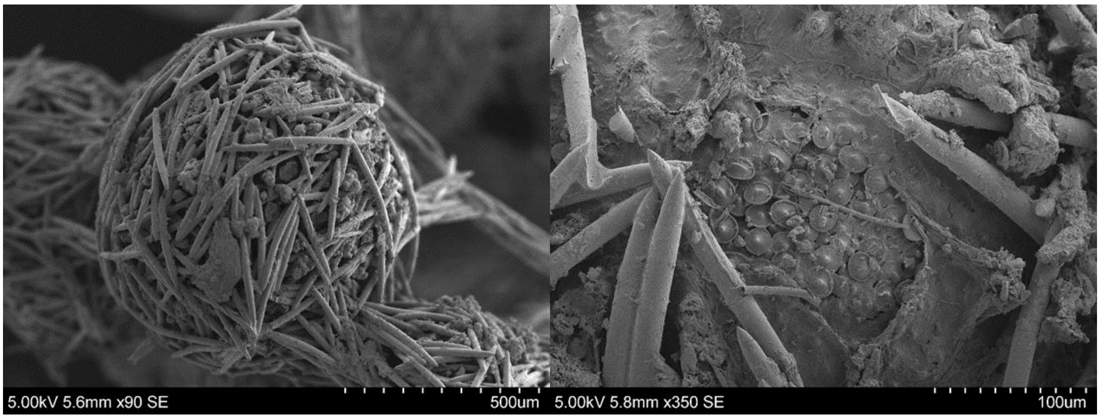


Figure 6-15. *SEM microphotographs of a gemmule form a Drulia sp. sponge collected near the Tiestero site, on the Bita river bank, opposite to Rabo de Cochino site. On the left, a gemmule covered by megascleres. On the right, a close-up of the gemmule on the inside where round button-like gemmoscleres can be seen. Photos taken by Natalia Lozada, 2017.*

Certain species of gemmules are not found on sediments, for which their occurrence in the paste of archaeological ceramic samples indicates they were added. Gemmules from the *Metaniidae* family, which have been reported inside ceramic potsherds (Gomes, 2002; Volkmer-Ribeiro and Gomes, 2002;

Volkmer-Ribeiro and Almeida, 2005) grow inside a rigid exoskeleton in the form of a thick bulbous crust (Volkmer-Riberio et al., 2012 p.191-192). This thick reticulum preserves the gemmules inside an inner camera, attached directly to the trunk and/or rocky surface, preventing their dispersion or deposition. Their appearance, along with the protective megascleres that surrounds them, is most likely the product of an intentional removal from the tree.

Although a more thorough taxonomic evaluation is needed, gemmule and gemmoscleres morphology and size suggest the use of the *Metania* or *Trochonspongilla* genus (***Fig.6-16, 6-17***) in samples collected from Picure and Rabo de Cochino. In contrast, the siliceous structures found on the 'Black Clay' sample and on the hardened clay lumps corresponded only to microscleres, external spicules which could fall from the sponge into the sediment. The former strengthens the argument in favour of tempering for archaeological potsherds.

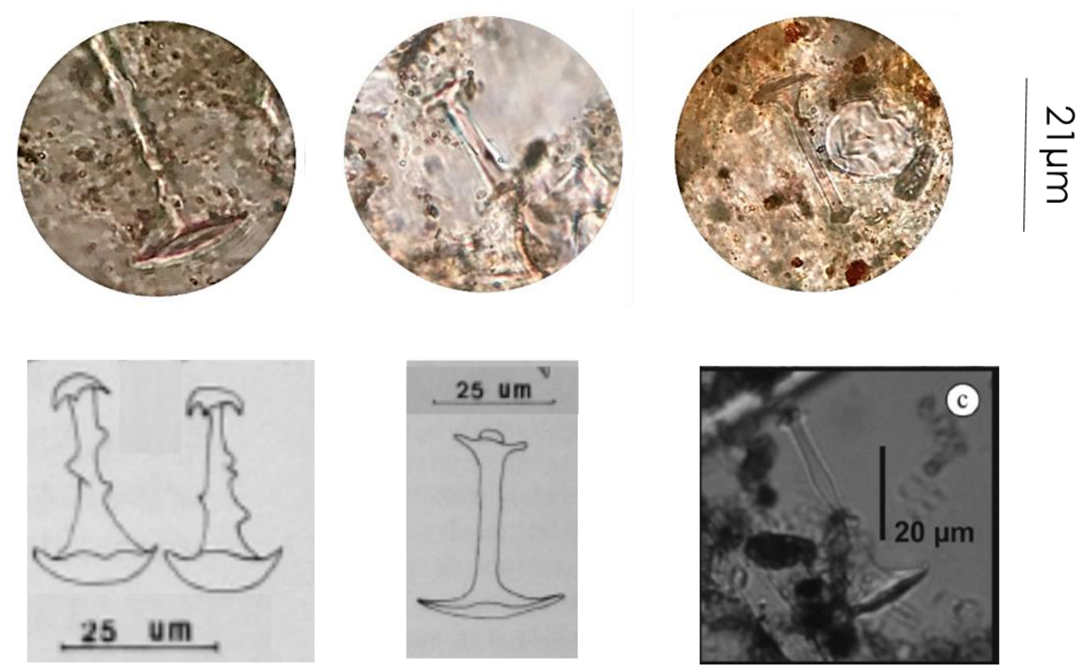


Figure 6-16. *Comparison of gemmoscleres found on archaeological samples from Rabo de Cochino and taxonomic references from Venezuela and Brazil. Top images: Microphotographs under Plane Polarizing Light (PPL) of samples from Rabo de Cochino (from left to right: RC-007, RC-038, RC-020). Bottom images: Drawings and Optical microscopy pictures from Volkmer-Ribeiro and Pauls 2000 (left and centre) and Machado, Volkmer-Ribeiro and Iannuzi 2016 (right) depicting gemmoscleres. Sponge species from left to right: Metania reticulata, Trochonspongilla paulula and Metania spinata. Top photos taken by Natalia Lozada, 2018.*

Figure 6-17. *Microphotographs in Plane Polarizing Light (PPL) of archaeological ceramic potsherds from Rabo de Cochino and Picure sites where single gemmoscleres or rings of gemmoscleres can be spotted in the matrix of Sponge Spicule Family sherds. Photos taken by Natalia Lozada, 2017.*

Considering the former discussion, the present research on the sponge spicule ceramics from Culebra, Picure and Rabo de Cochino sites aim to explore the technology behind their incorporation and to provide additional evidence to explain their presence in the samples. For that purpose, petrographic analyses and experiments were conducted using sponge spicules collected from a seasonally flooded meadow close to the Rabo de Cochino site. Both methods were used to inquire on how the sponges were added, observing the distribution of the spicules in the matrix in the archaeological samples and comparing them to the thin sections from the clay tempering experiments.

The sponges used for the experiment were collected during the dry season, in January 2017, using a large leaf to grab them without getting thorn by the sharp spicules. Although it was not easy to detach the sponges from the tree branches, the sponges were dry and so they were fragile and brittle, crumbly turning into a fine powder when pressed. This contradicts the use of fire to free the sponges from the tree (reported by Linné, 1957 p.156, Heckenberger, 1996), and suggests that sponges could have been easily collected during the dry season, along with the clay from the exposed river banks. The fine powder containing spicules could have been obtained from dried sponges without burning them, while the crushing did not require larger heavy tools, given that they could be pressed by hand using a leaf or a cloth as protection. Although fire is not mandatory for their collection and separation, it does not mean it was not performed by some groups in ancient times.

Further crushing of the sponges was done in the lab, using a mortar and pestle. The obtained powder was later mixed with a powdered stoneware clay and a wet terracotta clay, using equal proportions of sponges and clay in the mix. Clay samples from the Orinoco had already been turn into briquettes the year before, so they were not available for this experiment. Equal size briquettes were made, both subjected to a 700ºC temperature in a kiln, which has been previously suggested as an approximate temperature for archaeological sponge-tempered samples based on the preservation of the spicule’s structure (Felicissimo et al,. 2010). This temperature can change based on the species and other inclusions present in the paste, for which more experiments are needed.

As seen in ***Fig. 6-18*** in both the dry and wet briquettes, the spicules tend to remain in clumps, even though these last ones were more frequent in the dry clay sample. These clumps have various shapes, following a more elongated pattern in the dry clay mixture and a circular shape in the wet clay. The dry clay also presented larger vugh and vesicle shaped voids, while also showing megascleres still merged in the circular chamber which protects the gemmule. Both samples presented large areas without spicules, showing no conclusive evidence of which way guaranteed a more homogeneous distribution of the spicules in the matrix.

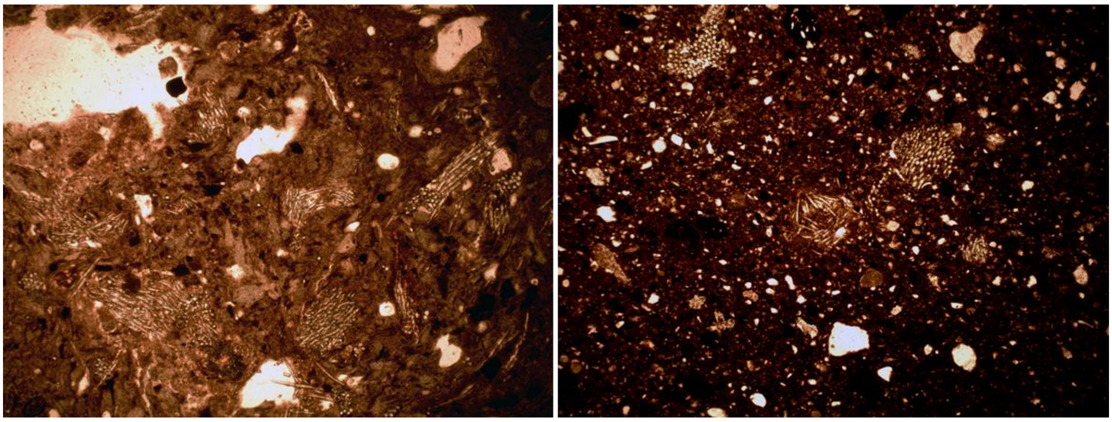


Figure 6-18. *Microphotographs under Plane Polarizing Light (PPL) of experimental briquettes for sponge spicule tempering. Crushed sponge spicules were added to a dry powdered stoneware clay (left) and wet terracotta clay (right). Sponges blended better with the dry clay, with a more homogeneous distribution in the matrix. However, more sponge clumps were recorded using the dry mixing method. Image width:3mm. Photos by Natalia Lozada, 2018.*

On the other hand, the dry samples showed medium to fine coarse-sized amorphous and circular argillaceous inclusions without sponge spicules. These clay-rich plastic inclusions can be distinguished from the empty areas without sponges because they have clear boundaries, sometimes even ring-voids, with a neutral optical density and also cracks inside. Since they were only visible in the dry clay briquette, these clay-pellets or porphyroclasts are thought to be the result of poor hydration of the paste during the mixing. Their appearance can also serve as a marker for tempering, particularly for a powdered mixture between sponges and clay. Nonetheless, more experiments are required to conclusively determine if this is the procedure ancient potters from the Orinoco were applying, given that the clay used for the experiment is not similar to the clay samples collected in the research area.

Finally, sponge spicule tempering must consider the functional advantages of their incorporation and if they are restricted to certain vessel forms (Adamson, Clark and Williams, 1987 p.125-126). Spicules have been shown to be an advantageous material for reinforcing ceramic pots. According to Natalio et al. (2015), these structures were selected because of their intrinsic properties that contribute to prevent shrinkage of the clay, hindering the propagation of cracks and increasing the stiffness of the material. They also provide a higher tensile strength and permeability (Felicissimo et al., 2010 p.2182) while also creating a thermal-stress absorbing network, making them ideal for cooking (Rye, 1981 p.34-35). Sponge spicule-tempered ceramics are also lighter, making the pots easier to carry, despite their dimensions. In this sense, sponges could have been collected and processed to add to a clay to improve its resistance and make portable pots. The association with certain forms will be discussed per site in the corresponding section to address this functional dimension of sponge spiculed ceramics.

Unfortunately, the Hiwi potter who lived in the study area does not temper with sponge spicules but used burned tree bark as their only temper. However, based on the obtained clay samples, sponges do not occur in clay naturally in the proportions seen in archaeological ceramics. Moreover, for their incorporation, as proven earlier, potters must have followed clearly defined steps for making pots, which considered the season and how to collect the sponges, crushing them and/or burned them and mixing them with clay, more likely a dry powdered clay to which they add water. The latter is based on the argillaceous inclusions and 'sponge free' areas in the matrix, associated with poor hydration and incomplete mixing. Since these last two features are seen in almost every sponge spiculed sherd, the described mixing routine is consistent and was very likely transmitted among potters, to be able to properly handle this organism and know-how to add them in the manufacturing of their vessels.

6.3.3 Fibre and Tree Bark tempering

Fibres, which correspond to parts of the xylem structure, did not have anatomical features which allowed their taxonomic identification. To argue that they were incorporated into the paste, petrographic analyses were conducted to evaluate their distribution and proportion in the matrix. The uneven spreading, bimodal size and abundance, which are normally used to argue tempering (Quinn, 2013 p.102-105), were the three factors considered when analysing archaeological ceramic fragments from the excavated sites which presented these types of inclusions. As seen in ***Fig.6-19,*** fibre inclusions are abundant in the matrix, with proportions ranging from 15-20%. Their size is variable, presenting minimal lengths between <0.2-0.5mm and maximum measures of <0.8-1.2mm. Regarding their distribution, they are fairly well distributed on the matrix, although they also do appear in clumps, indicating they could have been mixed into the paste.

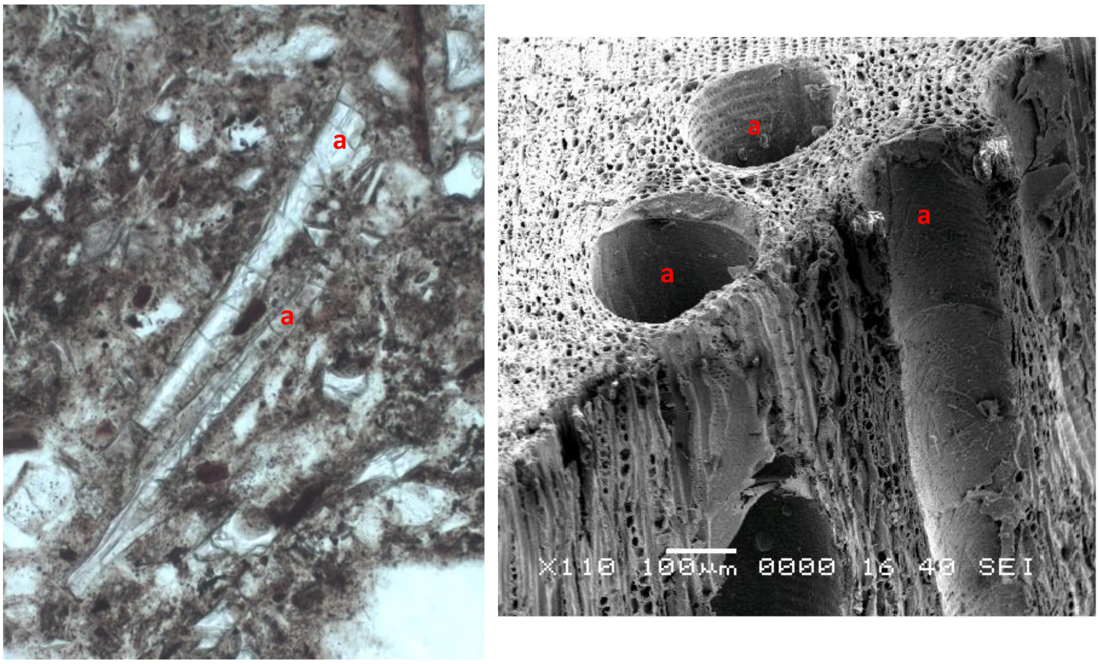


Figure 6-19*. Fibre inclusions in the Fibre Fabric corresponds to vessel elements from the xylem (a) which transport water through the plant. An SEM image (right) of a transversal cut of an oak wood fragment shows the vessel within the xylem structure, while the microphotograph with plane polarized light (PPL) (left) of sample PIC 049 shows loose vessels within the matrix. Left Image width: 0.23mm. Right SEM image width: 0.7mm. Microphotograph in PPL taken by Natalia Lozada, 2016. SEM microphotograph courtesy of Wikicommons.*

Even though the identification of the fibre inclusions in the Cotúa project's ceramics was not possible during the length of this project, it is important to emphasize there have been reports of siliceous organic inclusions other than wood or bark which have been used as temper in the Amazonian region. Reports of a kind of fibre, possibly corresponding to a palm tree fruit, added to clay in archaeological sherds in the Madeira river has been registered as *caraipé B* (Wüst, 1990; Almeida and Moraes, 2016). Likewise, reports on the use of leaves and latex from the *Couma macrocarpa* (Herrera et al, 1989) as temper also suggest ancient potters from the region use more than the branches or trunk to enrich their clays for pottery making.

The addition of wood and bark as temper in the Amazonian basin, was registered in the early 20th century (Spruce and Wallace, 1908 v.1 p.12-14, 87, 520; Métraux, 1942 p.165; Linné, 1957 p.156). It was reported along the Negro, Vaupés, Casiquiare, Orinoco, Pará and Trombetas rivers, as well as in the province of Maynas and Canelos in the eastern Andes (east of Peru and Ecuador), and among the Paressí, Cavina and Chacobo indigenous communities in eastern Bolivia. In the early descriptions of this paste recipe, the potters used the ashes of burnt bark, named *katipe* or *caraipé,* belonging to the *Chrysobalanaceae* family (*Licania sp.*) (Spruce and Wallace, 1908 v1 p.87, 520) to enrich the clay, arguing it made it stronger and more resistant to higher temperatures.

Ethnographic accounts from Guyana, Colombia, Venezuela and the Northwest Amazon described the tempering of clay with of burnt tree bark ashes by indigenous potters who used bushes and trees belonging to the *Chrysobalanaceae* family, particularly the *Licania parvifructa* (Grandtner and Chevrette, 2013. p.353)*, Licania octandra* (Archila 2005), *Couepia sp.* (Rostain 1991, 2016; Van den Bel, 2009) and *Hirtella macrophylla sp.* (Schultes and Raffauf, 1990 p.131). The only tree bark from a different family used for the same purpose is the *Melastomatacea*, specifically the *Adelobotrys macrophylla sp*. (Schultes and Raffauf, 1990 p.294). These trees are found in flooded coastal savannahs and elevated inland forests, the latter of which is present further east of the research area of this project, inside the Guyana shield, or towards the deep tropical forests in the west, in the Guaviare basin.

Nowadays, the bark used for the clay tempering process are commonly referred as '*palo mezclo*' ('mixing tree' in English) in Venezuela, *kwepi* in Guyana (among the Palikur indigenous groups) or *caraipé* in the Amazonian basin. According to Aura Chipiá, the Hiwi potter who let me see her work for a couple of days at La Reforma, the '*palo mezclo*' is found up in the mountains to the east of the Orinoco and brought back home by her husband, who goes there for hunting. She does not know how to recognize the tree but identifies the branches and the bark used as temper once it is cut. Since the hunting excursions are not frequent, the bark is burnt, and the extra ashes are stored for a next pottery batch. The ashes are first sieved through a fine mesh before adding it to a wet clay mass. This procedure mostly agrees with the one described among the Palikur potters (Rostain, 2016 p.103; Van den Bel, 2009 p.44), who burnt the bark and then sieved the ashes before mixing it, although they do a different mixture with a crushed dry clay.

Petrographic analyses conducted on samples from Culebra, Picure and Rabo de Cochino sites revealed not only burnt bark but also wood and charcoal. The latter was denominated as such because of its lack of anatomical features for taxonomic identification due to extreme fire, for which they could correspond to the so called 'ashes'. Both bark and charcoal are not useful for taxonomic identification, which is why the wood inclusions are necessary to classify the type of tree used by ancient potters. However, these types of inclusions are not so common, with only a few registered in samples from Culebra and Rabo de Cochino. Their scarcity indicates they were most likely incidental to the bark tempering.

As part of this project, a sample of the ashes prepared by Aura to mix with her clay and the few wood inclusions inside pottery sherds from the three excavated sites, were analysed aiming to identify their taxonomy and probable provenance. Few ashes and a transversal cut of a wood inclusion found on a potsherd from Culebra site (***Fig6-20***) exhibited a common structure, with a similar distribution and size of multi-seriated vessels. These last ones allowed to classify both as part of the *Licania sp.* Unfortunately, more views of the wood inclusions are needed to do a proper identification, which was not possible in the thin section petrography sample. It was also the only wood fragment with well-preserved anatomical features in the samples. While the *Licania sp.* trees are not present on the sites, we cannot rule out the use of other local tree barks in the remaining samples, given that only one charred wood inclusion was identified. A well-documented reference database build from *in-situ* collections is required for this purpose.

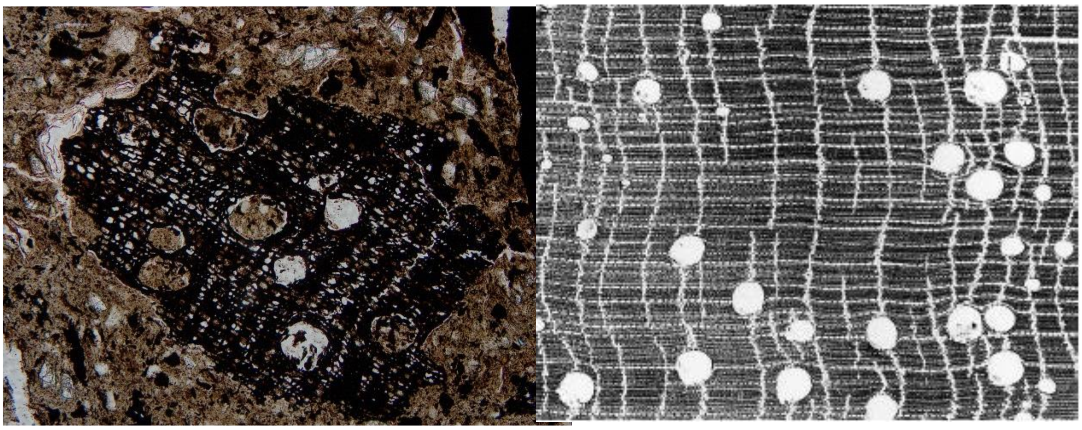


Figure 6-20. *Comparison between transversal cut wood found on CUL-010 and an equally oriented cut from a Licania alba tree. Left: Plane polarizing light (PPL) micro photographs of Culebra samples CUL 010 (left) Image width: 1mm. Source: Natalia Lozada. Right: Micro-photograph of a transversal cut of Licania alba wood. Image width: 0.7mm. Source: Inside wood web Images*.

Tree bark inclusions were present both charred and non-charred, and occurring in the samples in similar proportions. Charred inclusions were probably burned before adding them to the paste, while non-charred silicified bark is likely the result of the firing of the vessel. This claim is based on firing experiments using a tree bark tempered clay sample made by Aura at La Reforma, where non-carbonized tree bark inclusions left a silica-rich and translucent exoskeleton after been subjected to 700°C (***Fig. 6-21***). The use of both charred and un-charred bark can be the result of using stored burned bark and newly collected bark as part of the temper mix. Likewise, both charcoal and burnt bark have a similar size (0.3-0.5mm in length) while non-charred tree bark inclusions are usually larger (1mm in length). Their similar yet different sizes also suggest separate sieving processes where conducted before adding them to the paste.

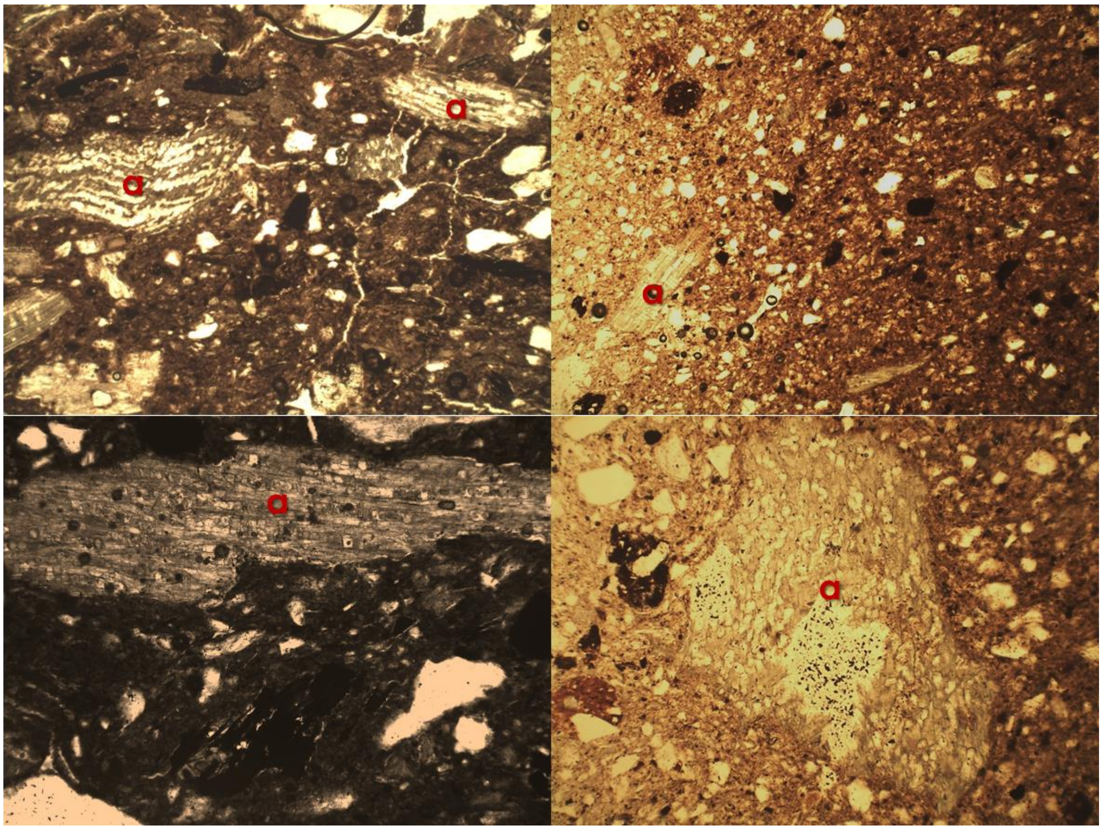


Figure 6-21. *Comparison of an archaeological potsherd from Culebra (CUL-003, left column) and a recent tree bark-tempered clay sample (CS-003, right column) made by Aura Chipiá, a Hiwi potter from La Raforma, close to Culebra site. Plane Polarizing Light (PPL) microphotographs showing non-charred tree bark (a) temper. Top images width: 3mm, Bottom images width: 1.5mm. Photos by Natalia Lozada, 2017.*

The addition of tree bark in the paste increases lightness and porosity, weighting 20% less than a sand-temper recipe while also resisting a higher thermal shock (Moraes and Da Rocha Nogueira, 2016 p.340). For the latter reason they are most likely associated with cooking vessels (Shepard, 1956 p.126; Skibo, 1992 p.37; VanPool, 2001 p.122). Even so, most of the bark and fibre tempered clays are accompanied by other types of inclusions, such as sponges, which depending on their abundance, distribution and species, can be thought as naturally occurring or intentionally added. This co-presence in some cases can suggest both bark and sponges were collected together or burnt at the same time. Nevertheless, their addition as a single temper or accompanied by fibre and/or spicules, is without a doubt the product of a well standardized preparation which includes collecting the right type of bark, its posterior burning, sieving and incorporation, proving to be a distinct paste recipe.

6.3.4 Grog tempering

Re-use of broken pots as temper was reported among the Guarayú and Pauserna, descendants of the Guaraní, in the San Miguel and Blanco river (Bolivia) (Métraux, 1942 p.103). They were said to look for old settlements along the river to gather potsherds and pulverized them before adding them to the clay paste. Same procedure was followed by the Shipibo-Conibo in the Ucayali province (Peru), where the potters used modern and archaeological ceramics as temper. They preferred the latter given that they were softer and easier to crush (DeBoer and Lathrap, 1979 p.116). In areas of the central Amazon, recent research also reports the use of grog tempering along with sponge spicules in bowls and vessels for serving food, storage and consumption (Moraes, 2013 p.166; and Da Rocha Nogeira 2016 p.336-338).

In the Middle Orinoco region, there has been reports of clay pellet tempering (Zucchi and Tarble, 1984; Zucchi, Tarble and Vaz, 1984). This differs from the grog temper described in other areas since the pellets are characterized as dry clay which was not fired. Re-use of broken vessels is not a common technique among contemporary indigenous communities and so its findings in the area are rare and thought to be the product of trade. However, petrographic analyses of the ceramic sherds obtained through excavations conducted in this project, suggests the re-use of broken vessels could be, in certain cases, a local idiosyncratic and opportunistic paste recipe. Grog tempered sherds were reported in all three sites, although with key differences that will help to distinguish whether they are home-grown or introduced recipes, a discussion which will take place in each site chapter considering their temporal and vertical distribution.

On one hand, fibre tempered grog inclusions, found in Culebra and Picure site, contained xylem and phytoliths (***Fig.6-22***) and where added into a clay matrix equally tempered with fibre. They are coarse inclusions, coming in various sizes (2mm-0.8mm), and usually larger than the average quartz and microcline minerals found on the clay fraction (0.1-0.3mm). These grog fragments are very similar in texture and composition to the fibre fabric sherds registered at the same sites. This suggests the potter most likely knew the broken vessel had fibre and added it intentionally. Fibre tempering through fibre-tempered grog represents the easiest technique, by using readily available material with a similar temper and thermal expansion. It also must have been preferred given that the potter had always added fibre and so re-cycling fibre-tempered vessels maintains the same paste preparation process they have always use.

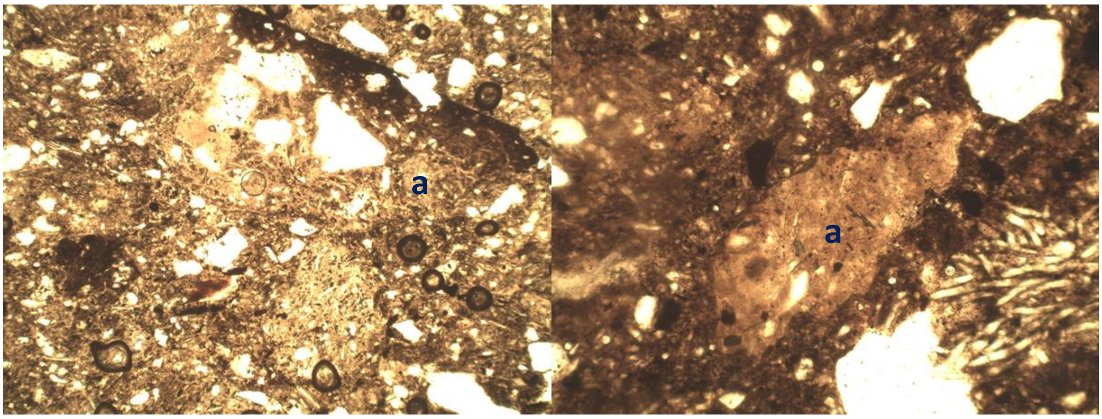


Figure 6-22. *Fibre-tempered grog (a) in Culebra (CUL 001) (left) and Picure (PIC 015) (right)archaeological ceramic potsherds. Left Image width:3mm. Right image width: 0.7mm. Microphotographs taken by Natalia Lozada, 2017.*

On the other hand, sponge spicule fabrics show a larger diversity of grog inclusions which are not tempered exclusively with sponges. Mixed Sponges Family samples from Picure site exhibited angular and sub-angular coarse and medium-grained sized broken ceramic bits, tempered with different materials like fibre, tree bark and sponge spicules, and even non-tempered ones as the granitic grog. Same family sherds in Rabo de Cochino site presented sponge tempered and granitic grogs. The base clay in both sites is primarily tempered with sponge spicules and very few fine to coarse silt-sized mineral inclusions.

Sponge spicules tempered vessels from Picure contained three types of grog inclusions: 1) grog from ceramics tempered with sponge spicules, 2) grog tempered with tree bark and fibre and 3) grog tempered with fibre. The recycling of sponge spicule tempered vessels as grog for cauixí vessels reinforces the idea of a potter who knew the siliceous rich content of the broken vessels and used similar material for tempering. However, the presence of other siliceous rich-tempered grog inclusions in the same vessels might suggest they were only using any material available, regardless of their content. Its presence seems to suggest potters could have had a range of different grog materials at their disposal and may have not discerned between them. The Clay Rich with Sponge Spicule grog, Granitic grog and Fibre grog fabric sample (PIC 003 in ***Fig.6-23***)- has three kinds of tempered grog inclusions which do not correspond to the base clay recipe. This composition might also reveal that there was not enough material for tempering from a single broken vessel and potters were using whatever they could find. Anyhow, the use of different broken vessels as tempering material for a single recipe suggest they were most likely found together or in close proximity, indicating common refuse areas that coincided with the common distribution of different macroscopic fabrics observed in the test units excavated in the island.

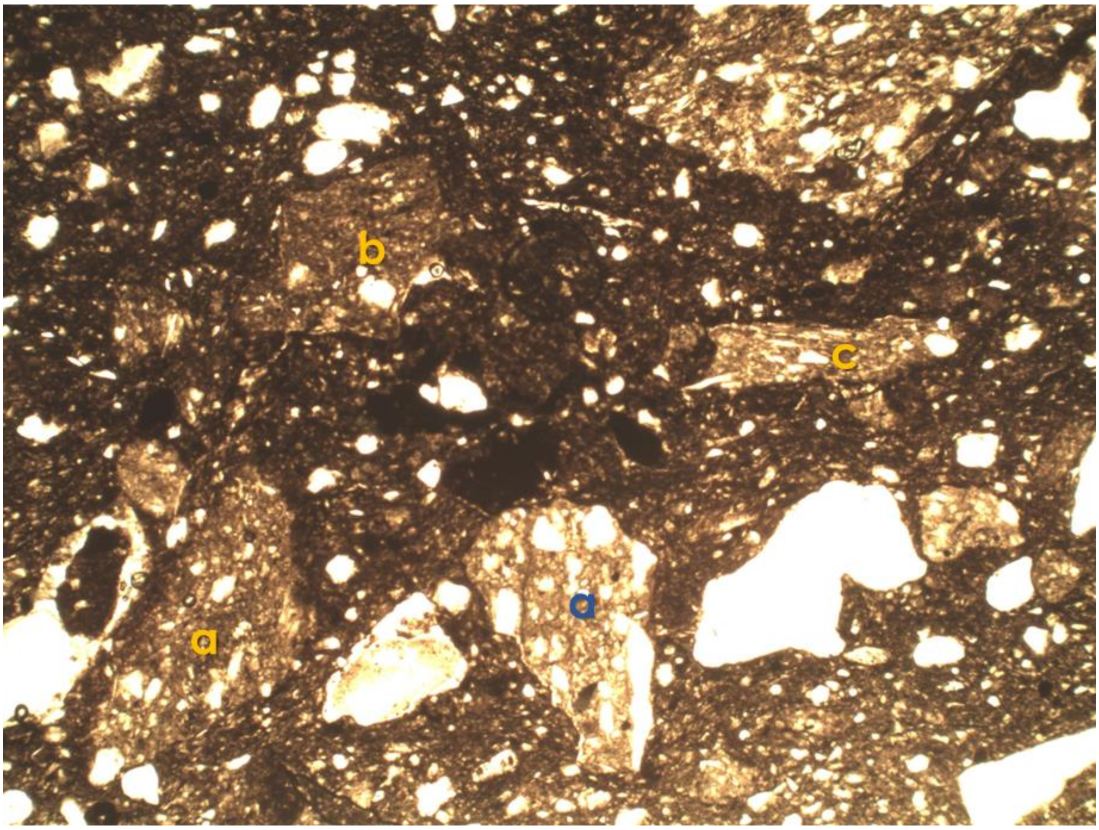


Figure 6-23. *Grog-tempered archaeological sample from Picure (PIC 003) which contains granitic grog (a), sponge spicule-tempered grog (b) and fibre-tempered grog (c). Image width: 3mm. Microphotograph taken under Plane Polarizing Light (PPL) by Natalia Lozada, 2017.*

At Rabo de Cochino site, minority fabrics from the Mixed Sponge Spicule Family present granitic grog and sponge spicule tempered grog. Regarding the sponge grog (***Fig.6-24***), there were very few identified in only one sample, for which the intentional incorporation of this inclusion is debatable. Granitic Grog, on the other hand, is easily recognizable from its medium-coarse size

(0.3-0.5mm) and sub-angular shape. Granitic-tempered grog inclusions were common (15-20%) and evenly distributed though in the observed sample. This kind of temper was most likely obtained from Granitic fabric broken sherds, with whom they share a similar composition and bright red paste colour. Only two samples shared this last paste recipe, suggesting it can be thought of as rare and possibly idiosyncratic recipe.

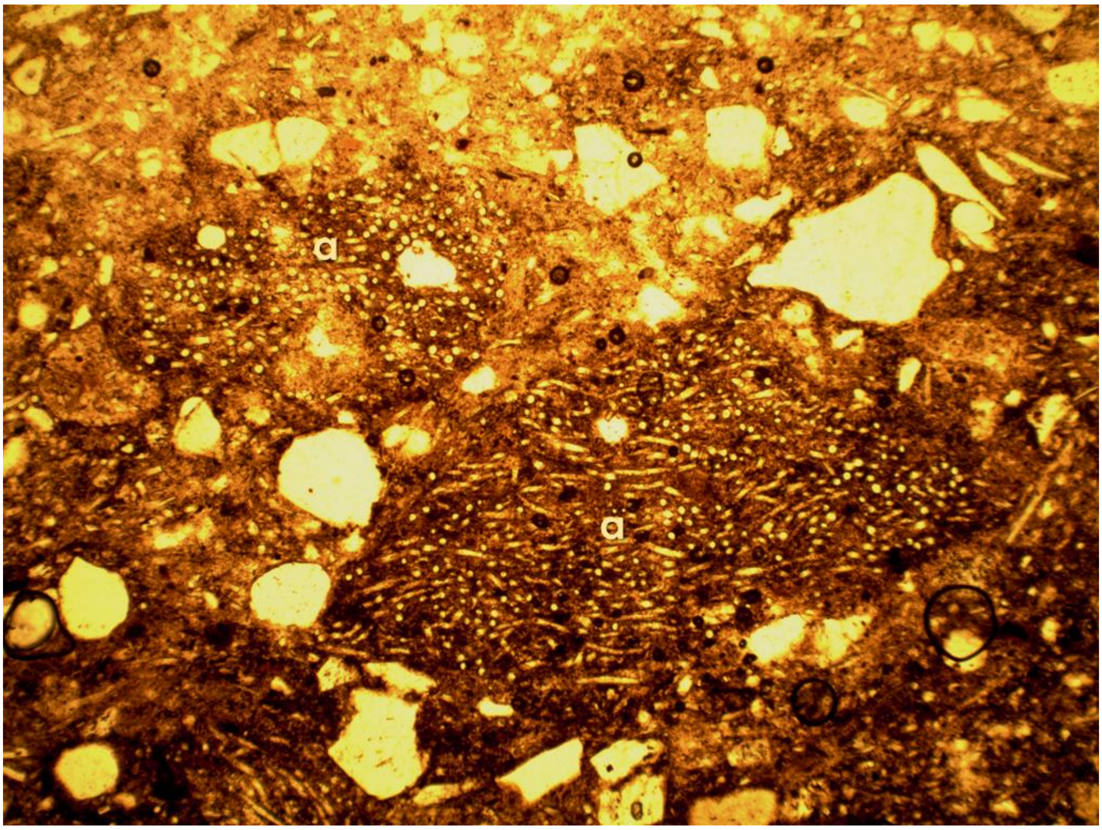


Figure 6-24. *Sponge spicule-tempered grog in an archaeological ceramic sample from Rabo de Cochino site (RC-059). Image width: 3mm. Microphotograph taken under Plane Polarizing Light (PPL) by Natalia Lozada, 2017.*

Based on the former results, the re-use of broken vessels was not common and also not limited to similarly tempered sherds. Sponge Spicule Grog reported on Sponge Spicule tempered sherds could have been precisely selected for its siliceous composition, as the fibre tempered grogs, similar to the base paste. However, Granitic and Fibre Grog inclusions in sponge spicule tempered sherds suggest it might be an opportunistic practice used when tempering material was scarce.

6.4 Distribution of macroscopic and petrographic fabrics per site

The following sections outline and examine the diversity of paste recipes identified in each site. This section will not address their relative abundance or vertical scattering, since both elements will be discussed in the respective site chapter, in order to identify continuities and ruptures and possible chronological markers.

Since all of the excavated samples were analysed according to the macroscopic fabrics' classification, their distribution is crucial to provide a global indication of the heterogeneity of the assemblages. As seen in ***Table 6-3,*** each archaeological site has seven different macroscopic fabrics, although there are certain fabrics that only occur in a particular site. This is the case for the Cream Coarse Sand (CCS) macroscopic fabric, a yellowish-coloured and coarse-grained sand fabric that was only found on Culebra site. Likewise, the Cauixí and White Clay Pellets (C+WCP) macroscopic fabric, a light brown-coloured and mixed fine-grained fabric with sponge spicules and white argillaceous inclusions, which was only present in Rabo de Cochino site.

Site / *Macro fabrics*	**Culebra (AM1)**	**Picure (AM2)**	**Rabo de Cochino (AM3)**
Coarse Sand (CS)	X	X	X
Black Coarse Sand (BCS)	X	X	
Cream Coarse Sand (CCS)	X		
Fine Sand (FS)	X	X	X
Cauixí (C)	X	X	X
Cauixí and Sand (C+S)	X	X	X
Cauixí and Fibre (C+F)	X	X	X
Cauixí and Red Clay Pellets (C+RCP)		X	X
Cauixí and White Clay Pellets (C+WCP)			X

Table 6-3. *Distribution of macroscopic fabrics per archaeological site. The ´X´ marks the presence of each fabric per site.*

Lastly, two macroscopic fabrics were found in two of the three archaeological sites. The Black Coarse Sand (BCS) fabric, a dark reddish coloured fabric with coarse-grained sand inclusions was registered in both Culebra and Picure archaeological sites. Also, the Cauixí and Red Clay Pellets (C+RCP) fabric, a light-coloured and fine-grained mixed fabric with sponge spicules and red argillaceous inclusions, was present in Picure and Rabo de Cochino sites.

While all four of the sand-based groups are present in the Culebra archaeological site, only three were found on Picure and just two in Rabo de Cochino. The opposite trend is described for mixed fabrics, with only two of them found on Culebra while three and four of them were registered in Picure and Rabo de Cochino sites, respectively. Regardless of their abundance or stratigraphy, this general pattern seems to mark a preference for sandy fabrics up river, while sponge spicule and mixed fabrics are more common downriver. Nonetheless, there is no exclusive macroscopic fabric (sand-based, sponge-based or mixed) for any of the sites.

When translated in terms of the defined petro families, there is a more restricted distribution. According to ***Table 6-4,*** most of the seven families or paste modes are not evenly present in the analysed three sites. Only the Granitic and Mixed Fibre families were found in all sites. In contrast, the Fibre Family was present in Culebra and Picure sites, while the Sponges and Mixed Sponges families where only at Picure and Rabo de Cochino sites. The Granitic Tempered Family was exclusive of Culebra site while the Mixed Granitic Family was only identified in Picure site.

Petro Family /Archaeological Site	**Culebra (AM1)**	**Picure (AM2)**	**Rabo de Cochino (AM3)**
GRANITIC	X	X	X
GRANITIC TEMPERED	X		
SPONGES		X	X
FIBRE	X	X	
MIXED FIBRE	X	X	X
MIXED SPONGES		X	X
MIXED GRANITIC		X	

Table 6-4. *Distribution of petrographic families per archaeological site. The ´X´ marks the presence of each fabric per site.*

In comparison, Culebra site has a total of four different paste modes, same number as Rabo de Cochino, while Picure has six; becoming the most diverse assemblage in terms of paste. In this last one, the only missing family is the Granitic Tempered, exclusive of Culebra. Sponge tempered families -Sponge Spicules and Mixed Sponges- are noticeably absent in this last archaeological site. Likewise, Fibre and Mixed Granitic families were missing from Rabo de Cochino site.

Considering each petro fabric (***Table 6-5***), main differences can be noticed among the Fibre, Mixed Fibre and Mixed Sponges fabrics. Among the Fibre potsherds, only some samples from Culebra reported tree bark tempering, while Picure samples only contained fibre. In contrast, Mixed Fibre samples from Rabo de Cochino site was the only one that presented tree bark tempering mixed with sponge spicules, while Culebra and Picure sites presented fibre and heavily charred bark. The former could be translated as a preference for fibre inclusions in Picure. It also proposes that bark tempering in Rabo de Cochino always occurred along with sponge spicules and never by itself. Lastly, Mixed Sponges Family fabrics in Picure and Rabo de Cochino are also very different, with the former containing at least two different kinds of grog in the same vessel while the samples from the latter only present one type of grog per vessel. This difference is relevant since it suggests a more opportunistic grog tempering in Picure site.

Petro Family	Site / Petro Fabric	Culebra (AM1)	Picure (AM2)	Rabo de Cochino (AM3)
GRANITIC	Granitic	X	X	X
	Weathered Granitic	X	X	X
GRANITIC TEMPERED	Granitic Tempered	X		
SPONGES	Sponge Spicules		X	X
	Coarse Sand Sponge Spicules		X	X
	Sponge Spicules with Arguilliceous Inclusions		X	X
FIBRE	Tree Bark	X		
	Fibre	X	X	
	Fibre with Grog with Fibre	X	X	
MIXED FIBRE	Fibre, charcoal and sponge spicules	X	X	X
	Fibre and Sponge Spicules	X	X	X
	Tree Bark and Sponge Spicules			X
MIXED SPONGES	Sponge spicules with grog with tree bark and fibre		X	
	Sponge spicules with grog with sponges and fibre		X	
	Clay rich with sponge spicule grog, granitic grog and fibre grog		X	
	Sponge Spicules and Granitic Grog			X
	Sponge Spicules and Grog with sponges			X
MIXED GRANITIC	Granitic with fibre and charcoal		X	

Table 6-5. *Detailed distribution of paste families and fabrics per archaeological site according to the petrographic analysis. The ´X´ marks the presence of each petro-fabric per site.*

6.5 CULEBRA (AM-1)

6.5.1 Geographic context

Culebra archaeological site is located on a floodplain at the confluence of the Cataniapo and Orinoco rivers (UTM: 19N 653782.00 m E - 619155.00 m N, 61-70 masl), within the complex of rapids collectively known as Átures Rapids and just south the airport serving Puerto Ayacucho, the capital city of the State of Amazonas-Venezuela. The terrain gently slopes to the north and west and is subject to annual flooding from March to December. This area can receive up to 1,620mm of rainfall, sharply contrasting with the ca.12-16mm during the dry season (IGAC, 2014 p.105-108).

***Figure 6.5-1**. Google Earth satellite image of La Culebra Site taken on March 2015, when archaeological work began. The red squares identify (from left to right) Test Units (or trenches) C, B, and A. On the left and on top, Orinoco and Cataniapo River, respectively. Courtesy of Google Earth ®.*

Parts of the Parguaza Granite Formation crops out on the surface as large granitic slabs, remnants of the ancient pre-Cambrian rock formations of the Guyana Shield. The latter comprises isolated circular and elongated rock units between 1-40km in diameter (IGAC, 1999), with a relatively homogeneous composition of alkali feldspar, quartz and plagioclase (IGAC, 2014:76-77).

The relatively flat terrain is currently covered by typical savanna grasses used for cattle grazing, gallery forests on the banks of the Cataniapo and Orinoco rivers, and scarce woody trees adjacent to granitic outcrops (mostly bromeliads and euphorbiaceous plants). Casmophitic vegetation, associated with the granitic slabs, grows within the rock fractures where organic matter has been accumulating over time. Likewise, the rock cracks protect the vegetation from stationery flooding, which covers the low portions of the rocks themselves. Trees between 4-6m height and small bushes are common, among which the best known are *Mandevilla caurensis, Anthurium fendleri, Bauhinia ungulate, Melocactus mazelianus, Vochysia venezuelana, Vellozia tubiflora, Copaifera pubiflora* and *Connarus venezuelanus* (IGAC, 2014 p.123-283).

Based on both trench excavations and shovel test pits, the sediments throughout the site are characterized by a fine sandy silt that, in various locations, included relatively well-sorted rounded to sub-angular medium coarse pebbles inclusions. On the surface as well as subsurface of the site, there is a relative abundance of milky quartz that has eroded and fractured from quarzitic veins imbedded in the local granitic slab rocks and the inselbergs of the region (***Fig 6.5-2***).

Figure 6.5-2. *Quartz vein on a granitic slab adjacent to the Cataniapo River (background). Courtesy of José R. Oliver, 2015.*

6.5.2 Site description and analysed data

Culebra archaeological site was previously excavated by William P. Barse (1989:383-399), who proposed an occupation sequence for this site of ca. 9000 years (7000 BC- AD1500). During the 2015 fieldwork season, systematic surface collection, auger tests and three excavation units were conducted. The surface collection was organized in a grid of square units of 10x10m (4.1km^2) and auger tests of 40x40cm were excavated at their intersections (***Fig. 6.5-3***). This permitted the delineation of the extent and depth of the site's archaeological deposit and informed the location of the excavation units.

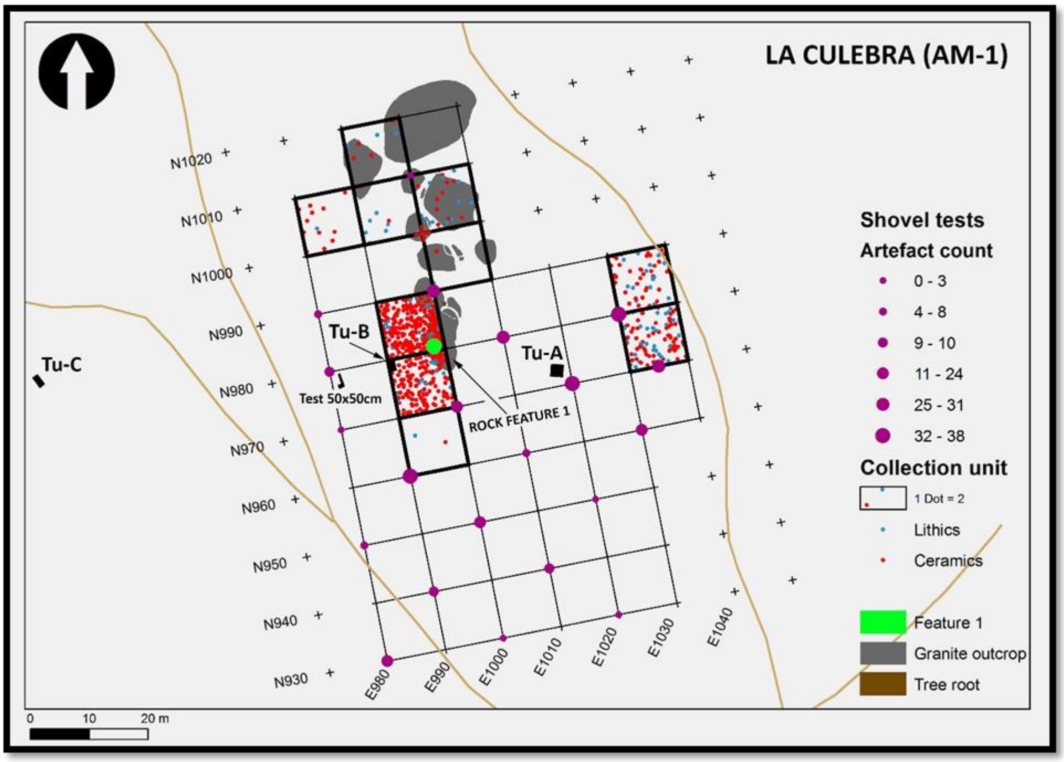


Figure 6.5-3*. Map showing the surface collection grid for Culebra, the location of the Trench units and the Rock Feature-1. It also shows the relative frequency of artefacts recovered. The coordinates of the grid are arbitrary, with transit datum point (N1000-E1000) located in UTM: 19N E653784 - N619164, 65 ± 5m ASL. Courtesy of Phil Riris.*

From the surface collection (***Table 6.5-1***), 65.6% (n=850) of the materials - both lithics and ceramics- were recovered from two shovel tests associated with a granitic slab. This slab, hereafter referred as Rock Feature-1 (RF-1), was located at the arbitrary grid block designated N990-70 E990-1000 (which corresponds to the UTM 19N E653784- N619164, 65 ± 5masl). It presented five different circular grinders on its surface, accompanied with a very high concentration of materials in an 8-10cm thick layer, with the best preserved and largest ceramic sherds of the entire site. This dense ceramic deposit on the surface of the rock was not mentioned in Barse's work (1989). Perhaps it became exposed due to erosion during the following decades or Barse did not consider relevant to mention it in his research. In any case, its presence is highly ubiquitous although its origin and extension into the adjacent terrain remains unclear. An opportunistic sample of different diagnostic sherds for shape and decoration (n=45) from this feature was selected for further analysis. The selected ceramics were used to identify their modal attributes and to conduct petrographic and macro-trace analyses to reconstruct the production sequence that, in turn, can be compared to smaller and less well-preserved fragments recovered from the excavation units.

Bag Code	N	E	Body	Rims	Handles	Decoration	Bases	Lithics	Feature	Total
930/990	930	990	2	0	0	0	0	2	0	**4**
940/990	940	990	0	0	0	0	0	0	0	**0**
950/990	950	990	0	0	0	0	0	0	0	**0**
960/990	960	990	2	0	0	0	0	2	0	**4**
970/990	970	990	284	21	1	3	3	5	1	**318**
970/1030	970	1030	94	21	0	0	0	68	1	**184**
980/990**	980	990	375	85	18	12	13	28	1	**532**
980/1000	980	1000	17	5	1	0	1	2	0	**26**
980/1010	980	1010	0	0	0	0	0	0	0	**0**
980/1030	980	1030	67	6	1	0	1	29	0	**104**
990/990	990	990	0	0	0	0	0	0	0	**0**
990/1000	990	1000	1	0	0	0	0	2	0	**3**
1000/990	1000	990	5	0	0	0	0	14	0	**19**
1000/1000	1000	1000	21	1	0	0	0	23	0	**45**
1010/990	1010	990	8	0	0	0	0	6	0	**14**
		TOTAL	**876**	**139**	**21**	**15**	**18**	**181**	**3**	**1253**

Table 6.5-1. *AM-1 Surface collection by square unit of 10x10 m***.**

The high density of ceramics (***Fig.6.5-3:*** red dots) in the two quadrangles units just west of Rock Feature-1 are not directly associated to this deposit. Most of the materials seem to have come from Barse's 1987 excavation unit. The high frequency of sherds recovered here is most likely the spoil spread around the area because of screening activity.

The excavation units were placed in areas with high surface artefact density (Trenches A and B). Trench C was located adjacent to Barse's 1987 excavation unit in order to obtain charcoal for dating and augment the sample of the site's purported 'pre-ceramic' component (***Fig.3***) (Riris, Oliver and Lozada, 2017). Trench A (2x2m), was located between three high-count artefact shovel tests (see ***Table 6.5-1***). A total of 1,644 ceramic sherds were recovered between surface and 60cm below surface (cmBS hereafter), spanning three different stratigraphic contexts. Trench B, a 2x1m excavation unit near N970/E990 in the arbitrary grid, was located a few meters west of a set of large granitic slabs, and on line with the slab that contained the high surface concentration of artefacts, primarily ceramics (Rock Feature-1). A total of 449 sherds were recovered from Trench B between 0-35 cmBS, in two stratigraphic contexts. Finally, Trench C, a 2x1m unit, was located west of the prospected grid area, close to Barse's excavation unit where he reported a pre-ceramic occupation. A total of 32 potsherds were recovered from this trench, between 30-40cmBS.

6.5.3 Culebra Site Excavations

This section discusses the stratigraphy, chronology and artefact distribution for each of the excavated trenches at Culebra. The main focus is on Trenches A and B, which will be described individually and then compared at the end of each section, in order to highlight important similarities and differences. Trench C will not be addressed in terms of its chronology since we did not obtain ^{14}C dates for this unit, due to absence of charcoal. It will also not be consider for the stratigraphic argument given its distinctive soil characteristics, due to its location on site, almost 40m from Trench B and 70m from Trench A. Likewise, very few ceramic sherds were recovered in this trench (n=32). Thus, Trench C will be treated separately. Finally, after describing the deposition patterns of ceramic materials with their associated strata and dates, a detailed analysis of the distribution of artefacts in both Trench A and B, and the Rock Feature-1, as well as the reconstruction of the *chaîne opératoire* will be addressed.

6.5.3.1 Stratigraphy and chronology at Culebra Site

Six radiocarbon dates (AMS) were obtained from Culebra site (***Table 6.5-2, Appendix 9***), from Trenches A and B, reported here with a 2σ calibration. The dates reflect human occupation through ca.720 years, by locating the site occupation period between cal. AD 437-1155. However, this temporal span does not translate itself into a continuous occupation. It also does not include the earliest dates (sample OxA-34259, 34372) recovered from Trench A. Although the dates in each trench are in the correct order by level, there are significant disparities between dates from both trenches that need to be addressed. To explain these, it is necessary to refer to the stratigraphic contexts and associated features so as to understand the deposition regime at Culebra site, and the reasons that led to the exclusion of the earliest dated samples from Trench A.

OxA#	Unit	Cx.	Lev	cmBS	Date	Error	δ13C	2σ (IntCal13)
34371	A1	101	4	16	1158	26	-26.7	AD 775-967
34372	A2	103	7	35	2767	29	-27.4	996-836 BC
34259	A3	103	8	40	4250	38	-27.7	2925-2696 BC
34373	B1	201	2	20	951	28	-28.5	AD 1024-1155
34374	B2	201	7	36	1488	30	-26.0	AD 437-645
34375	B3	203	8	50	1491	29	-27.9	AD 437-643

Table 6.5-2. *Radiocarbon dates for Culebra site*

- ***6.5.3.1.1 TRENCH A***

Trench A yielded ceramic artefacts from four different stratigraphic contexts, which follow each other as the depth increases, to a maximum depth of 60cm below surface (hereafter cmBS). To measure depths, an elevation datum was established 10 cm above surface in the southwest corner of the unit (N971.28 – E1017.24 of the site's arbitrary grid). An arbitrary elevation datum above surface was established (10cm above surface) and excavation proceeded in arbitrary levels of 5cm, using shovel and trowels as appropriate. The soil was screened dry though a 1/8” (3.175 mm) wire mesh. Changes in the soil colour and/or texture were given a different Context-Number. Context 100 (Cx.100), closest to the surface (0-5cmBS), can be described as a uniform dark grey brown compacted fine silty sand soil. It has a fair amount of small sub-angular to sub-rounded coarse pebbles (<20mm) within a dense grassroots mat. This is followed by Context 101 (Cx.101), which extends from 5-25cmBS. Although sediment matrix and colour remained the same, there is an increase in the rounded medium coarse pebble in relation to the previous context, and the root mat is somewhat less dense. An associated charcoal from 16cmBS yielded a date of cal. AD 775-967 2σ (1158 ± 26 BP, OxA-34371) for this context. The smooth, sub-rounded, round medium-coarse pebbles bore a patina that suggests water (chemical) and transport (mechanical) erosion as they were displaced toward lower elevations of the floodplain. Likewise, the number of <1cm² ceramic sherds, are unusually high in the first 5cm of this context, adding to the argument of an event or repeated similar episodes in a period of time, which caused high erosion and fragmentation of pottery, such as flooding or trampling.

Figure 6.5-4. *View of the NE Quad of TU-A, Level 3, Contexts 101 and 102. Note the strong brown mottles. Source: Phil Riris, 2015*

Towards 10cmBS, Context 102 (Cx.102) emerges. It’s characterized by isolated strong brown mottles (7.5 YR 5/6), with a hardened medium to coarse silty sand texture (***Fig.6.5-4***). This context only appears briefly within Cx.101

in a depth of 20cmBS and did not exhibit any associated artefacts and or/ mineral inclusions.

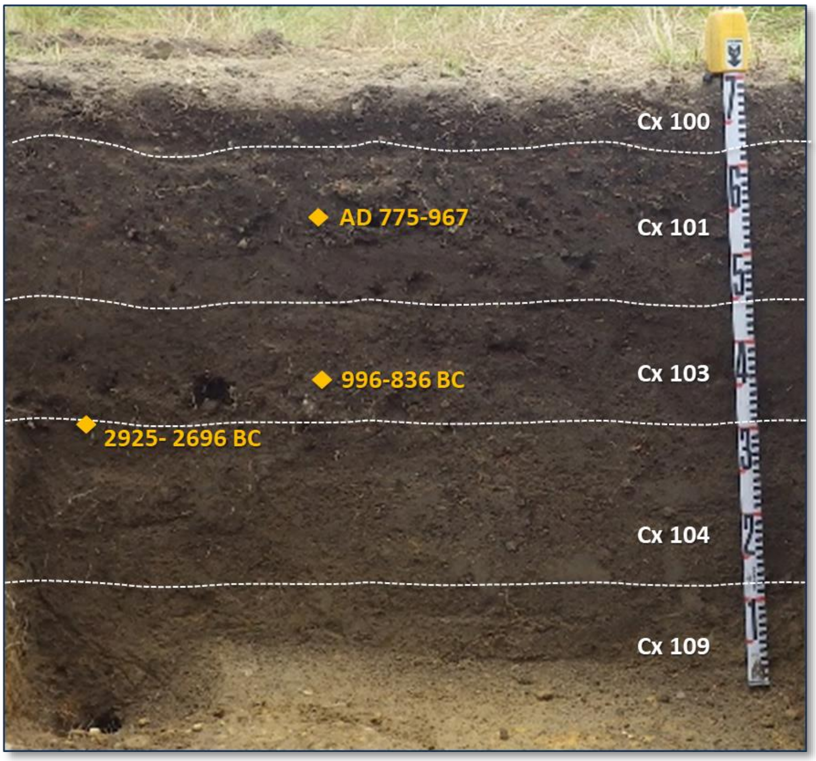


Figure 6.5-5. *Excavation TU-A, View of South wall profile in the South-West corner. Rough depths by Context and cmBS (see scale). Animal burrowing (bottom left corner of profile) as well as root disturbances in Cx.103 are visible in the profile. Date locations here are correct in terms of depth only. Source: J. R. Oliver, 2015*

Finally, Context 103 (25-40cmBS) (Cx.103) is characterized by a compacted silty sand soil matrix with a greyish-brown colour and few amounts of round medium-coarse pebbles. Within this context two charcoals were recovered and yielded significantly different dates. At 35cmBS a date of cal. 996-836 BC 2σ (2767 ± 29 BP, OxA-34372) was obtained from a charcoal collected in the middle of the trench, associated with very few ceramic sherds. Between 35-40cmBS very rare shattered ceramics (<1cm² per sherd) were spotted but not recovered given their size and poor state, which is why this level appears as sterile and the date obtained cannot be confidently associated to these artefacts.

Considering the low amount of materials reported in the base of Cx.103, the excavation progressed through a window of 50x60cm placed on the SW corner to ascertain the thickness of this context and the depth where cultural sterility is encountered. At 40cmBS, the earliest charcoal for Trench A with a date of cal. 2925-2696 BC 2σ (4250 ± 38 BP, OxA-34259) was obtained. This charcoal was recovered from the transition between Cx.103 and Context 104 (Cx.104) (40-60cmBS). As it became apparent in deeper levels, the scarce ceramic sherds noted between 40-50cmBS were possibly displaced by bioturbation. The latter was confirmed at 50cmBS where evidence of an animal burrow was found, along with a series of deep roots which run into the south-west corner (***Fig 6.5-5***). Because the 40cmBS sample was also collected in the south-west corner, it can be argued that this significantly older charcoal had likely been mechanically displaced upward. At present the dates from Cx.103 are held in doubt, given its close proximity to the animal burrow and, as well roots.

- ***6.5.3.1.2 TRENCH B***

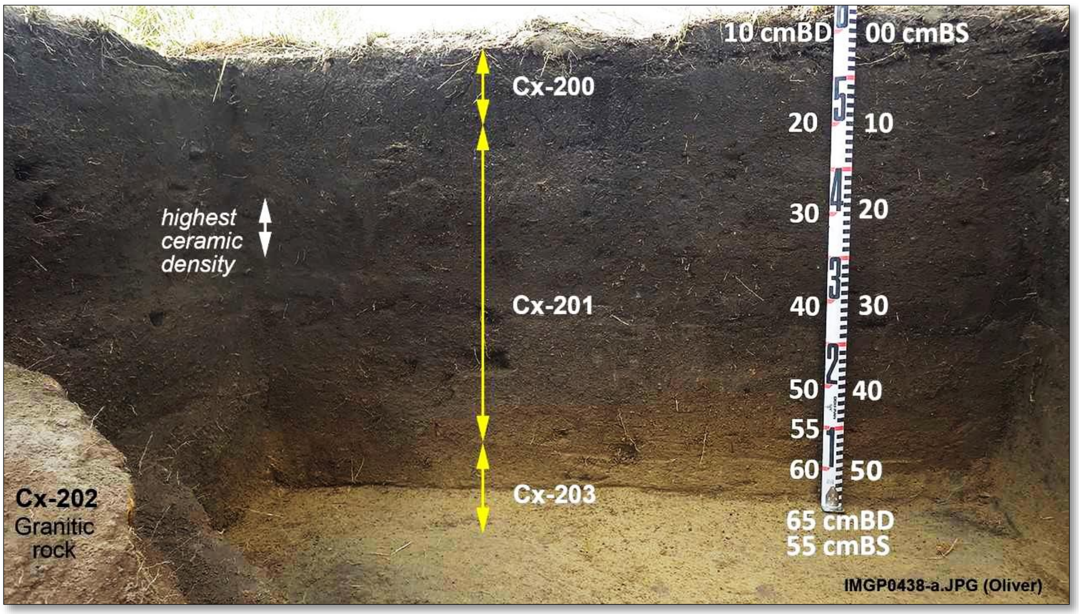


Figure 6.5-6. *TU-B, North Wall (NE corner) showing the approximate borders between Contexts 200, 201 and 203. Cx-202 is a large granitic rock encounter in situ (as seen in bottom left corner). Source: J. R. Oliver, 2015.*

Test unit B was excavated to a depth of 55 cmBS. The arbitrary elevation datum was located 10cm above surface in the SW corner (N978-E990). Excavation proceeded in arbitrary levels of either 5 or 10cm, with shovels and trowels; the soil was dry-sifted through a 3mm wire mesh screen. The ceramic materials were recovered from three different stratigraphic contexts, overlying in sequential order, bottom to top.

Context 200 (Cx.200), between 0-5cmBS, corresponded to a relatively dense root mat topsoil, with a fine silty sand texture and a greyish-brown colour, and few ceramic sherds. From 5-35cmBS, the following stratigraphic Context 201 (Cx.201) is described as having a less compacted silty sand soil with less roots and darker colour (very dark brown to dark brown). Even though no gravel inclusions were recorded in this unit, a high fragmentation rate of ceramic sherds was observed between 15-20cmBS, encompassing more than 90% of the sample from the entire trench. The soil's colour lightened gradually as the unit deepened, reaching a yellowish-brown colour at 35 cm BS (***Fig.6***). Below 35cmBS, 4 lithic artefacts were recovered with no associated charcoal to be dated. In the middle of context 201, from 15-55cmBS, a granitic rock slab emerged on the south-west wall. This slab was named as Context 202 (Cx.202). The lower levels (35-50cmBS) corresponded to Context 203 (Cx.203), a fine silty sand yellowish-brown soil with a few roots, and no evidence of associated ceramic artefacts.

Trench B had a significant peak of ceramic and lithic deposition (n=417 ceramics and 73 lithic artefacts) at a depth of 15-20cmBS, overlying an artefact-free zone between 20-30cmBS, both of which occur within Cx.201. This peak concentration dates to no earlier than cal. AD 1024-1155 2σ (951 ± 28 BP, OxA-34373). The hiatus (between 20-30cmBS) overlays a layer of 5cm in thickness that contains few artefacts associated with a date of cal. AD 437-645 2σ (1488 ± 30 BP, OxA-34374). Given the hiatus in artefact deposition, this basal assemblage, albeit consisting of just 23 ceramic artefacts, clearly represents a much earlier occupation (400 to 600 years earlier). At the depth of 50cmBS a charcoal was recovered dating to cal. AD 437-643 2σ (1488 ± 29 BP, OxA-34375). This date is statistically the same as the one obtained in Level 7 (OxA-34374), and is part of the same stratigraphic context, although it is not associated to any ceramic artefacts. Fortunately, Trench B did not exhibit any evidence of bioturbation or disturbances.

6.5.3.2 Contrasting deposition regimes

Despite some similarities in terms of texture and colour between Cx.101 in Trench A and Cx.201 in Trench B, the main disparity lays in the pebbles, that are absent in the latter trench. Based on their standard medium-coarse size, roundness and patina, these pebbles have clearly been rolled and tumbled following the gentle slopes of the savanna toward the Orinoco-Cataniapo rivers. Their uniformity in size and their patina suggest a repeated process of erosion due to transport rolling action in tandem with the rise and fall of the flood tides. It seems that a low energy water flow shaped the pebbles into their rounded form and accounts for its wide distribution throughout broad areas of the site. The same grains were observed in most, albeit not all, the shovel test pits at about the same depth range of Cx.201.

It is possible that the points or zones of refuse accumulation have been progressively deflated and displaced due to the flooding cycles. Because of the latter and the absence of organic remains (e.g. bones), it is hard to characterize Trench A deposit as a midden, as Barse did in his work (i.e., units close to TU-A such as his Test Unit 8 [Barse, 1989 p.100]). Nor is it evident in terms of the soil characteristics that there is a buried soil horizon, unless one focuses only on ceramic frequency peaks. Assuming that there is a buried horizon because there is a peak in frequency of artefacts, it is still an inference that remains conjectural until geoarchaeological analyses can confirm it.

Based on soil texture, grains and cultural inclusions, including eroded and ‘minced’ (<1cm) ceramic artefacts, it is here inferred that Cx.101 and Cx.201 can be regarded as sharing fairly similar depositional regimes, but which contain evidence for differing flooding episodes, thus resulting in the variable accumulation of ‘patches’ of artefacts and natural inclusions. This has implications on the dates obtained from both trenches since charcoals, ceramic ‘shatter’ and the round medium-coarse pebbles, would have been displaced. This would explain, in part, the date differences between trenches. Nonetheless, dates recovered are in sequence and are not associated to any evidence of bioturbation.

One of the most likely explanations is to consider Trenches A and B as a product of distinct occupation episodes. The areas where Trench A and B were located could have been occupied at different times, as the hiatus in Trench B supports the argument of a period with no associated cultural material. In this scenario, Culebra may have been first occupied as early as cal. AD 437-644 (OxA-34374, 34375), but with a clear intense period of occupation between cal. AD 775-967 2σ (1158 ± 26 BP, OxA-34371), and a later even more intense occupation, based on the amount of associated material refuse, around ca. AD 1024-1150 (OxA-34371, 34373). The character of the ceramic materials discarded during each of these occupations will be discussed in terms of the associated techno-stylistic traditions in the following sections, taking into consideration macro- and microscopic traits to define petro fabric groups, their formal and decorative elements, and their distribution in each trench.

6.5.4 Artefacts Distribution Patterns

<u>6.5.4.1 Trench A</u>

Figure 6.5-7. *View of Trench A towards the North at 40-50cmBS, encompassing Contexts 104. Window is at 55cmBS. Source: Phil Riris*

Trench A excavation unit yielded 2,364 artefacts, with 1,644 ceramic fragments and 720 lithics. Materials were recorded according to arbitrary levels of 5cm. Distribution of material refusal shows a continuous and stable increase between 5-30cmBS (bottom to top). Between 25-35cmBS, there is a 34% decrease in materials total counts, followed by an increase of more than half (59%) in the next level (20-25cmBS) (***Fig.6.5-8A***). Materials refuse augmented erratically between 5-20cmBS, going from 40% between 15-20cmBS to 19% between 10-15cmBS, and finally to 60% between 5-10cmBS. A significant drop of 97% in the number of shreds between 0-5cmBS marks the culmination of the exponential trend. The only previous reduction in terms of sample numbers, reported between 25-30cmBS, can be attributed to lithic material, which rapidly declines in a span of 5cm, going from 88 lithics between 30-35cmBS to only 22 between 25-30cmBS (***Fig.6.5-8A***).

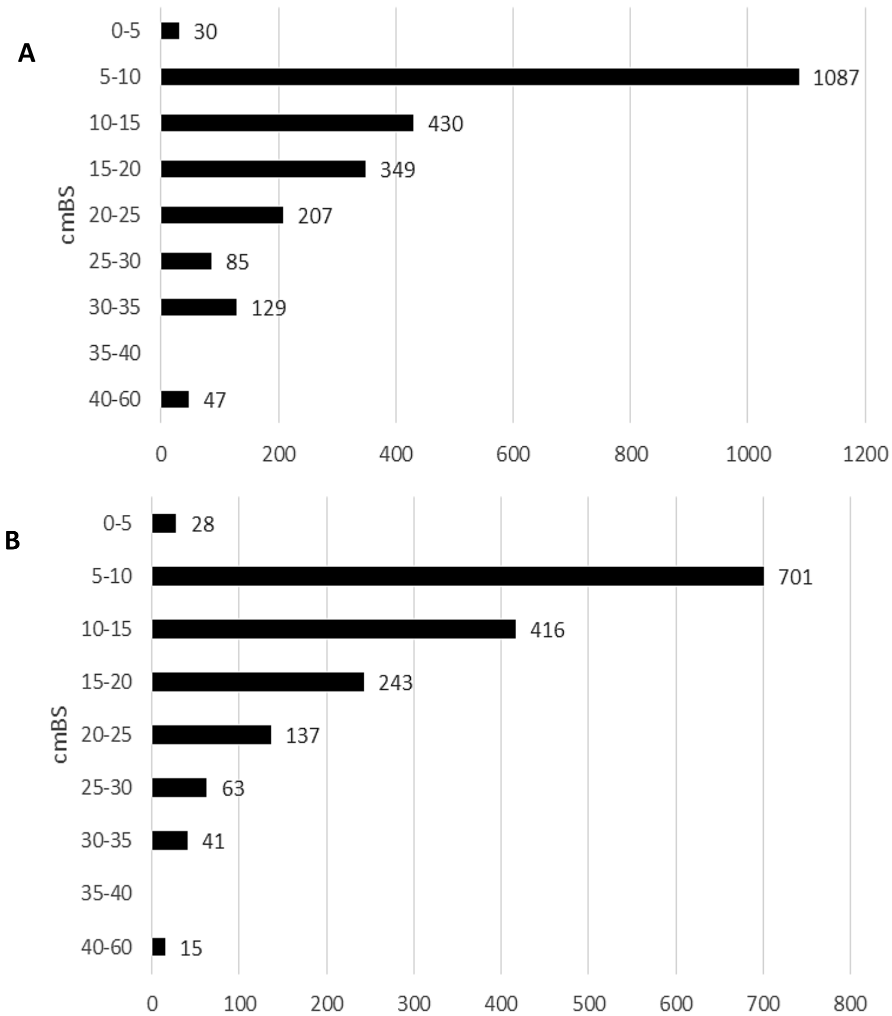


Figure 6.5-8*. Materials recovered at Culebra, Trench A, registered per arbitrary level (cm below surface -BS-). A) Total artefacts recovered per level, B) Total ceramic sherds recovered per level.*

The 47 artefacts (32 lithics and 15 ceramics) from the deepest part of the trench correspond to an excavation window of 50x60cm² in the southeast corner, which extended from 40-60cmBS. The recovered materials and the associated charcoal date are regarded to be intrusive as discussed in the previous section.

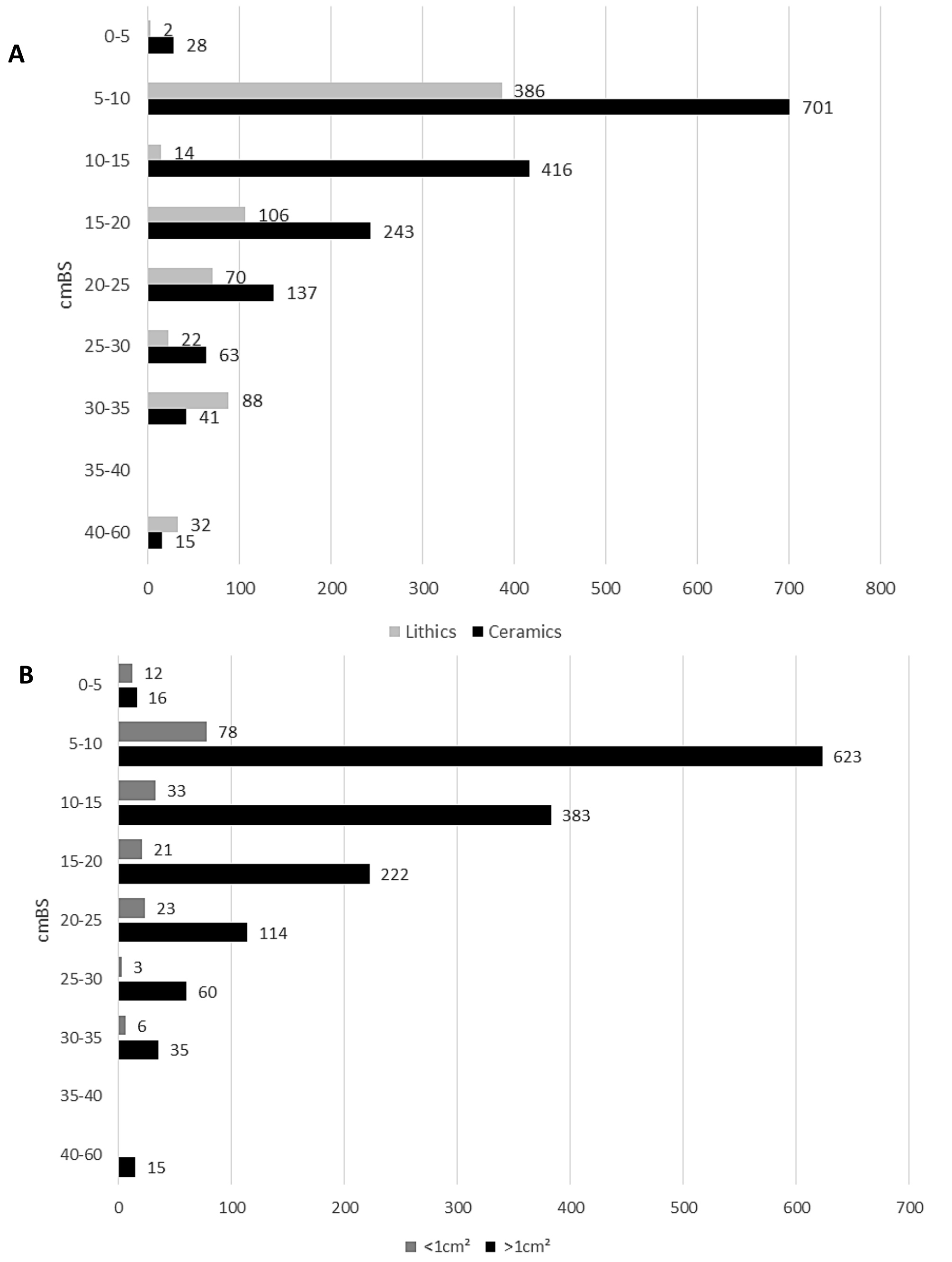


Figure 6.5-9. *Materials recovered at Culebra, Trench A, per arbitrary level (cm below surface). A) Artefacts discriminated by type of material (ceramics and lithics), B) Total ceramic sherds per level discriminated by size.*

Focusing only on the ceramics recovered at Trench A (***Fig.8B***), there is a steady increase of ceramic sherds per arbitrary level. Unlike the general artefact distribution trend, ceramics augment in a pattern of steady rate of increase from the deepest levels. Between 25-30cmBS, materials recovered increased by 35%, while on the above 5cm (20-25cmBS), it reached a 54% increase. From 5-20cmBS there is a constant increase of 42% ceramic sherds every 5cm, and finally, between 0-5cmBS, there is a significant decrease of 96%. It is worth noticing that a very different trend is registered among the smallest ceramic sherds (<1cm²). A significant increase of small ceramic sherds occurs from 5-20cmBS (***Fig.6.5-9B***). The increasing percentage of <1cm² sherds per arbitrary level is irregular; however, it is worth noticing that the amount of smaller sherds is doubled between 5-10cmBS, marking an intense activity span on the site. Similar to previous trends observed in total artefact and ceramic counts, the top 5cm (0-5cmBS) present an 84% decrease in terms of the amount of small ceramic sherds.

The interpretation of the above trends must consider the stratigraphic contexts in which all the materials were recovered. The top soil context, which corresponds to the first 5cm —characterized as a grassroot mat— is labelled Cx.100. This context yielded only 30 ceramic and lithic artefacts. Just below, Cx.101 is a dark grey brown fine silty sand soil with rounded medium-coarse pebbles and a less dense root mat. It extends from 5-25cmBS and constitutes the most intense refuse accumulation with 2,073 artefacts (576 lithics and 1,497 ceramics), which represent 88% of the total materials recovered in Trench A. The amount of materials recovered increases steadily towards the top, as shown by the distribution of both ceramic sherds and lithics in the top two levels (***Fig.6.5-9A***).

Context 103, a greyish-brown compacted silty sandy soil with very few sub-rounded pebbles, extending from 25-40cmBS, yielded 214 artefacts, from which 48% (n=104) correspond to ceramic sherds. The latter are mostly concentrated in the top 5cm of the context, while lithic materials comprise most of the artefacts recovered from the bottom 5cm, which suggest a significant change in terms of the activities performed at the site.

Finally, regarding the smallest ceramic sherds (<1cm^2), their distribution is significant as it suggests a greater degree of activity and their size probably is the result of intensified trampling and/or post-depositional mechanical erosion in this area. Thus, while in Cx.103 the <1cm^2 ceramic sherds are almost non-existent, in Cx.101 there is an overall constant fragmentation rate, which is accentuated, indeed doubled, in the top 5cm of the context, signalling either stronger or more repetitive erosion episodes or a more intense human presence in the area.

The number of artefacts in Cx.101 is greater when compared to other contexts. The difference in volume is significant given that Cx.101 has 0.8m^3, four times that of Cx.100 (0.2m^3) and 1.3 times larger than Cx.103 (0.6m^3). Given that the obtained sample was different due to disparate volumes for each context, a 1m^3 volume unit was chosen as a common measure to be able to compare them. Artefact projections on a 1m^3 volume are not real counts but predictions, based on the actual count artefacts found per context.

Using this common volume ratio, Cx.101 still exhibits the largest quantity of ceramic materials (n=1871/m^3), 90% more sherds/m^3 than Cx.103 (n=173/m^3) and 92% more than Cx.100 (n=140/m^3). Ceramic materials in level 9 (40-50cmBS) (n=15), the first level excavated in the SW window, are considerable, given that they were found on a smaller volume of soil (0.03 m^3). When compared to other contexts, in 1m^3 it projected 30% more sherds (n=250/m^3) than Cx.103 and 86% less than Cx.101. Nonetheless, this level corresponds to a mixed context (103+104) and so these results are not considered as for the overall distribution trend of Trench A.

From the frequency distribution patterns and the stratigraphic descriptions, it can be confidently argued that there is a clear link between an increasing amount of ceramic materials and the formation of context 101 (5-25cmBS). As suggested above, it is possible that human activity intensified in the area, as seen in the greater number of ceramic sherds —both in total and in the smaller than 1cm^2— recovered in Trench A, and particularly towards the upper part (5-20cmBS) of the trench. It is also likely it could be the result of marked and continuous flooding episodes. With an associated date of cal. AD 775-967 2σ

(1158 ± 26 BP, OxA-34371), this marks the late occupation at Culebra. An early occupation registered in Cx.103 (25-40cmBS), with unreliable associated radiocarbon dates, is also distinguished by the lesser number of artefacts, the lack of an increasing trend in number of sherds between arbitrary levels, significant abundance of lithic materials and very few small ceramic sherds of <1cm^2, which suggest less trampling or a different flooding regime in the area. Additional arguments focused on ceramic wares, production sequences and vessel morphology to be discussed in the next sections, will help to define the early and late as two distinct ceramic complexes that reflect two periods of occupation.

- ***6.5.4.1.1 Macro fabric distribution***

The distribution of the macro-fabrics for Trench A (***Fig.6.5-10***) was recorded per stratigraphic context (***Table 6.5-3***) and by arbitrary levels of 5cm (***Table 6.5-4***). Heavily fragmented sherds, under 1cm^2 in size, were registered as 'Other' (i.e. undetermined), given that their limited size did not allow their classification.

The deepest stratigraphic context, Cx.104 (40-50cmBS), was excavated in a 50x60cm window placed at the south-west corner of the unit. This context has a date of cal. 2925-2696 BC (OxA- 34259) and yielded only 15 sherds. Two macro-fabrics are present in this context and both correspond to the Granitic Family: Coarse Sand (66%) and Black Coarse Sand (33%). Their association with these strata is questionable. Based on excavation field notes from 2015, the south-west corner presented evidence of bioturbation associated with an animal burrow and the intrusion of heavy roots and, at some points, showed a mixture of Cx.103+104. These observations support the inference that these ceramic materials are intrusive and redeposited.

Cx	cmBS	Total	FS	C	CS	C+S	C+F	BCS	CCS	Other
100	0-5	28	0	3	13	0	0	0	0	12
101	5-25	1497	26	17	1058	44	14	120	63	155
103	25-35	104	12	1	32	0	0	31	19	9
103+104	40-60	15	0	0	10	0	0	5	0	0

Cx	cmBS	Total	FS	C	CS	C+S	C+F	BCS	CCS	Other
100	0-5	100	0	10.7	46.4	0	0	0	0	42.9
101	5-25	100	1.7	1.1	70.7	2.9	0.9	8.0	4.2	10.4
103	25-35	100	11.5	1	30.8	0	0	29.8	18.3	8.7
103+104	40-60	100	0	0	66.7	0	0	33.3	0	0

Table 6.5-3. *Trench A. Macro-fabrics distribution per stratigraphic context, by number of sherds and percentages.*

Given that we found empirical evidence of disturbance and admixtures of sediments in the bottom contexts, then the deepest stratigraphic unit without any clear signs of disturbance is Cx.103 (25-40cmBS), within which 104 ceramic fragments were recovered (***Table 6.5-3)***. When analysed, five macro-fabrics were defined. Three coarse groups —Coarse Sand (CS), Black Coarse Sand (BCS) and Cream Coarse Sand (CCS)—, characterized by their quartz and sand inclusions, dominate the sample with almost 79% of the sherds. These groups correspond to the Granitic and Granitic Tempered families. The Fine Sand (FS) group —with quartz inclusions under 2mm in size— correspond to 11% of the sample, while *Cauixí* macro fabric (C), which corresponds to the Fibre and Sponge Spicule fabric, only represents 1% of the total. Finally, the fragments that could not be classified because of their size (i.e. Other) constitute almost 9% of the sample. The *Cauixí* group in this case is constituted by one small fragment and might be the result of post-depositional disturbance that displaced this sherd from an upper context. This is reinforced by the fact the other *cauixí* macro-fabrics (sponge spicules with sand or with fibre inclusions) are absent in this context. Also, the earliest dates of *cauixí*-tempered ceramics in the Middle Orinoco start around ca. AD 700 (as reported for Corozal site; Roosevelt, 1978 p.178). The date of cal. 996-836 BC 2σ (2767 ± 29 BP, OxA-34372) of Cx.103 might then be too early.

In the upper context, Cx.101 (5-25cmBS), 1,497 ceramic sherds were recovered. In this context all seven macro-fabrics were present. The dominant fabrics are the coarse sand ones (82%), followed by *Cauixí* fabrics (5%) and the Fine Sand (FS) group (2%). Unidentified small ceramic sherds - 'Others'- constitute almost 11% of the sample, which makes them second after the quartz-based groups. Although *Cauixí* groups are reported, their presence is rare and can help sustain the argument of a 'trade' ware, foreign to the Culebra site. Unlike the previous context, Cx.101 has a date of cal. AD 775-967 2σ (1158 ± 26 BP, OxA-34371), contemporaneous with the earliest dates of Arauquinoid materials in the Middle Orinoco (Tarble, 1985; Roosevelt, 1997).

While the analysis per context is fundamental to understand the distribution of the macroscopic fabric groups through time, the arbitrary levels were useful to identify significant changes within the strata since, in theory, they represent shorter time intervals. By observing the percentages of each macro-fabric per arbitrary level (***Fig.6.5-10; Table 6.5-4***), an important change in the distribution is observed in level 5, between 30-35cmBD (20-25cmBS), between Cx.103 and Cx.101. Here, the increasing trend within the Weathered Granitic and Granitic Tempered fabrics —Black Coarse Sand and Cream Coarse Sand— reaches a peak that is rapidly reversed in the upper levels.

Cx	cmBS	Total	FS	C	CS	C+S	C+F	BCS	CCS	Other
100	0-5	28	0	3	13	0	0	0	0	12
101	5-10	701	8	5	578	29	0	3	0	78
	10-15	416	0	8	314	0	14	26	21	33
	15-20	243	10	0	166	15	0	28	3	21
	20-25	137	8	4	0	0	0	63	39	23
103	25-30	63	8	1	24	0	0	13	14	3
	30-35	41	4	0	8	0	0	18	5	6
	35-40	0	0	0	0	0	0	0	0	0
103+104	40-60	15	0	0	10	0	0	5	0	0

Table 6.5-4. *Macro-fabrics frequencies per level in Trench A. Legend: FS=Fine Sand, C=Cauixí, CS=Coarse Sand, C+S= Cauixí and Sand, C+F=Cauixí and Fibre, BCS= Black Coarse Sand, CCS= Cream Coarse Sand*

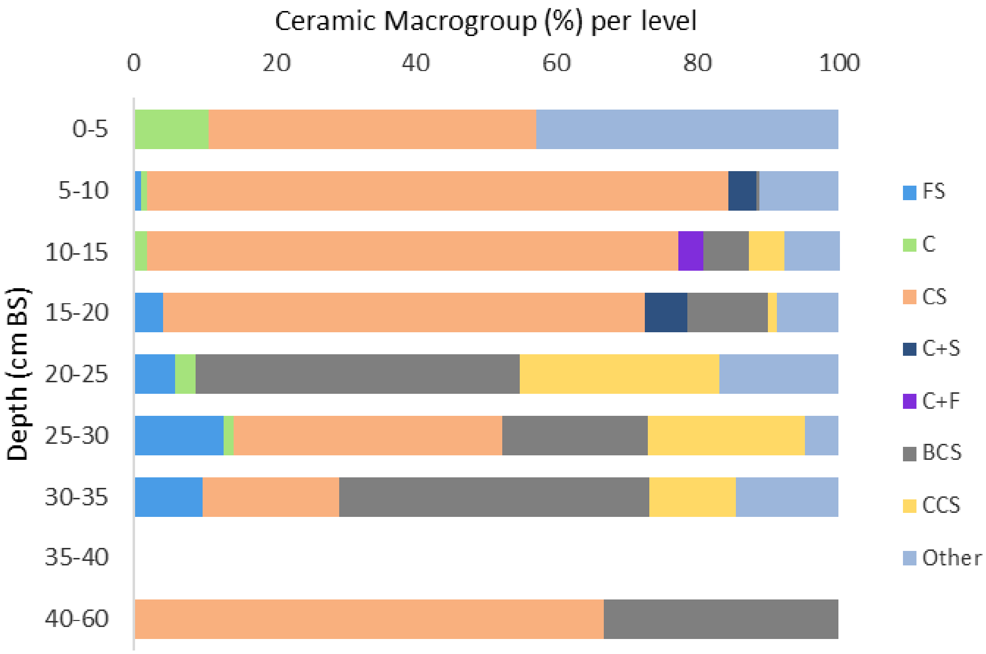


Figure 6.5-10. *Macro-fabrics percentages per arbitrary level in Trench A. Legend: FS=Fine Sand, C=Cauixí, CS=Coarse Sand, C+S= Cauixí and Sand, C+F=Cauixí and Fibre, BCS= Black Coarse Sand, CCS= Cream Coarse Sand*

In comparison, the Coarse Sand group, equivalent to the Granitic Family, is heavily concentrated in the upper levels of Cx.101 (15-30cmBD) (5-20cm BS), as well as the *cauixí* groups. These latter are more abundant between levels 2 and 3 (15-25cmBD) (5-15cmBS), which noticeably coincides with an average increase of 53% of the Coarse Sand macro fabric within the same levels. Although granitic or granitic tempered fabrics are common throughout the sequence, sponge spicule fabrics are restricted to the upper levels; for which their appearance might therefore be used as a chronological marker.

Despite the fact the Fine Sand fabric, part of the Granitic Family, is always a minority within the materials for each level and context, it is more common in the lower levels, particularly from level 4 (25-30cmBD) (15-20cmBS) and throughout Cx.103. This would mean that there is a constant presence of Fine Sand macro fabric throughout contexts, although they have a greater representation in the lower levels.

6.5.4.2 Trench B

Figure 6.5-11. *Trench B, Culebra. View to E-NE. Note the large natural boulder inside the unit.*

In Trench B, 567 artefacts were recovered, with 449 ceramic fragments and 118 lithics in total. Materials were recorded according to arbitrary levels of 5cm and 10cm. Only three non-consecutive arbitrary levels were positive for material culture (***Fig.6.5-12A***). The deepest level in the trench with ceramic artefacts is Lv.6 (30-35cmBS), with a small concentration of pottery sherds (n=23). After ten centimetres with no associated archaeological materials, Lv.3 (15-20cmBS) presented a significant number of ceramic fragments and a few lithics. With an increase of 95% in relation to the previous positive level, a total of 490 artefacts were reported. Finally, very few artefacts (n=13) were reported in the upper 10cm, which were obtained during the sieving process. This latter accumulation represents a decrease of 97% of materials towards the upper end of the trench. Most of the evidence is composed of ceramic sherds as seen in ***Fig. 6.5-12B***. The contribution of lithics is not relevant for the general distribution trend and only occurs in levels 3 and 6.

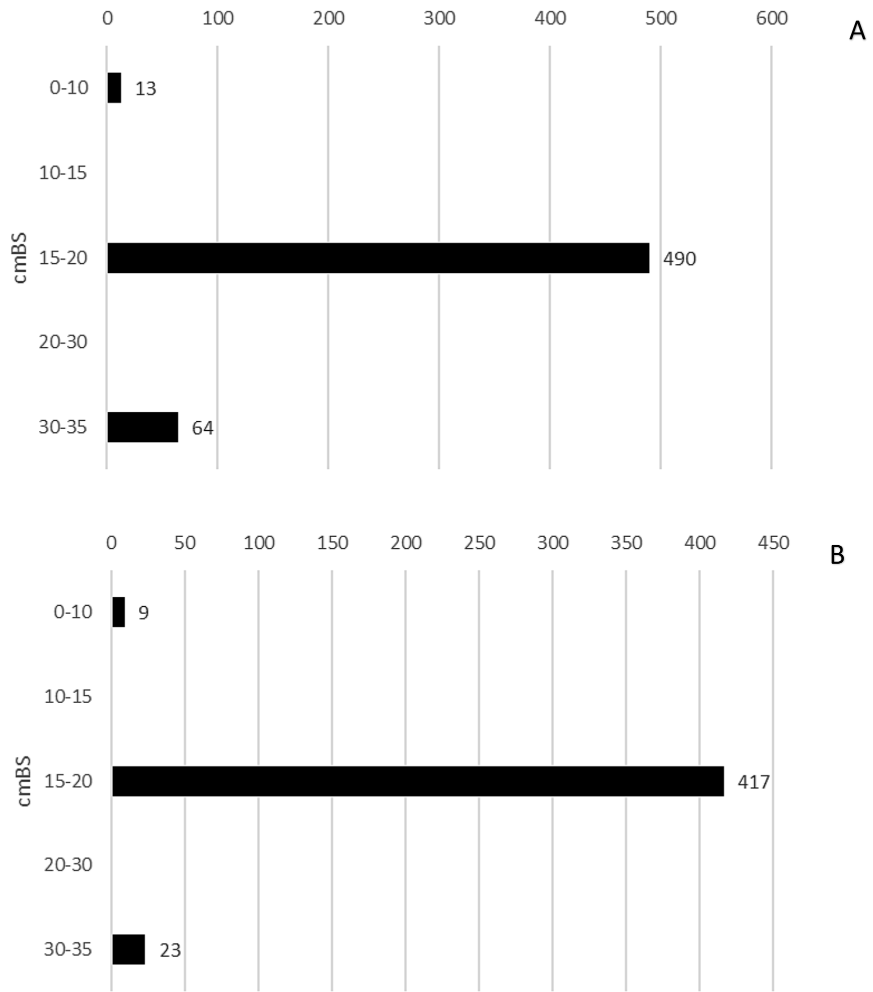


Figure 6.5-12. *Materials recovered at Culebra, Trench B, registered per arbitrary level (cm below surface-BS-). A) Total artefacts recovered per level, B) Total ceramic sherds recovered per level.*

Ceramic sherds with a small size (<1cm²), denominated as “Others” due to the fact they were not positively classifiable, follow a similar trend than the one reported for all ceramic materials in general (***Fig.6.5-13***). Materials recovered in level 6 were mostly larger sherds, with only 17% (n=4) considered as Others. The proportion of small and larger sherds in level 3 is very different, with 42% (n=178) of ceramic sherds considered as Others. This significant number of smaller sherds may be the result of with more intensive trampling and/or a stronger flooding regime during this period, which might had caused a higher ceramic fragmentation rate. Finally, in the upper 5cm, the number of smaller sherds doubled (n=6) the larger ones (n=3) but, given the quantity (n=9), its significance is inconclusive.

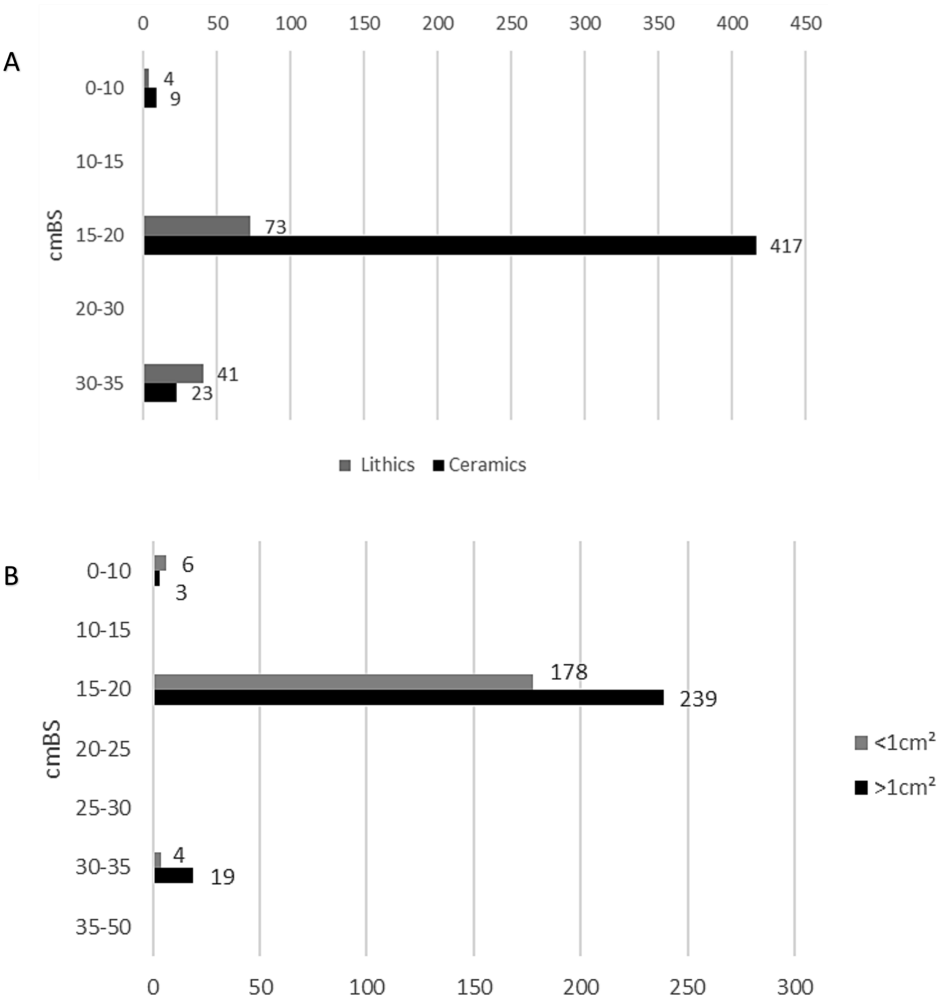


Figure 6.5-13. *Materials recovered at Culebra, Trench B, registered per arbitrary level (cm below surface -BS-). A) Total materials recovered from Trench B separated by type of artefact; B) Total ceramic sherds per level discriminated by size*

The distribution of archaeological materials is not directly associated with the stratigraphy of Trench B. Top soil Cx.200, a dense grassroot mat with fine silty sand texture and a greyish brown colour, extends only in the first 5cmBS. However, the 11 artefacts from the first 10cm were only noticeable when screening the soil; thus, the ceramic and lithic materials from Cx.200 and the first 5cm of Cx.201 are registered as part of a 10cm first level and attributed in the catalogue as part of Cx.200. The latter decision was made since the next 5cmBS, which were part of Cx.201, consisted of a sterile layer.

Given Trench B’s proximity to the dense, surficial deposit of sherds on the Rock Feature-1, it was expected that the upper levels would yield a high density of artefacts, had the artefacts from Rock Feature-1 continued westwards underground. This is clearly not the case as seen by the few artefacts recovered in the first 10cmBS. Furthermore, a shovel test pit placed between the trench and the Rock Feature-1 proved that the latter deposit was restricted to the surface of the granite slab.

Context 201 was a fine silty sand soil with lighter roots and a very dark brown colour, which extended from 5-35cmBS. Within Cx.201, two accumulations of ceramics occur separated by a 10cm sterile layer. In this scenario is important to consider the granitic rock found inside the trench. Denominated as Cx.202, the rock extended along the west wall of the unit. As excavation proceeded, the rock's surface expanded considerably in size so that at the bottom depth of the trench (50cmBS) it covered about 40% of the unit's area. This rock was a constant presence throughout Cx.201, and even though its shape might have augmented in conformity with the depth, it cannot account directly for the distribution pattern difference within the same context. Finally, Cx.203 (35-50cmBS), a fine silty yellowish-brown sandy soil with no associated artefacts.

To be able to compare contexts, a $1m^3$ measure was chosen to standardize the differences in volume. First, each context's volume was calculated by subtracting the granitic rock's volume. With an initial size of 110cm length x 50cm width, in Cx.201 the rock represented 12% ($0.06m^3$) of the total volume, while in Cx.203 it accounted for almost 40% ($0.12m^3$). Once the volume adjustments where considered, Cx.200 (0-10cmBS) has $0.2m^3$, while Cx.201 (10-35cmBS) doubles that volume ($0.4m^3$), and Cx.203 (35-50cmBS) is just 10% smaller ($0.18m^3$). When using the standardized ratio (number of artefacts/$1m^3$), Cx.201 has the largest amount of ceramic materials (n=1094/m^3), 94% more sherds/m^3 than Cx.200 (n=55/m^3). As part of Cx.201, level 3 (15-20cmBS) is mostly responsible for this difference, given that it has 92% more sherds (n=4793/m^3) than level 6 (30-35cmBS) (n=383/m^3).

The latter suggest both artefact depositions from Lv.3 and Lv.6, although part of Cx.201, represents different accumulation episodes. This is reinforced by the fact that they are separated by a 10cm sterile layer and each is associated with different radiocarbon dates. While the later assemblage in Lv.3 has a date of cal. AD 1024-1155 2σ (951 ± 28 BP, OxA-34373), the earlier one in Lv.6

dates no later than cal. AD 437-645 2σ (1488 ± 30 BP, OxA-34374). Further arguments on the associated wares and formal modes will help to confirm this distinction.

- ***6.5.4.2.1 Macro fabric distribution***

The distribution of the macro-fabrics for Trench B was recorded per stratigraphic context and depth, with sherds under 1cm² registered as 'Others'. Cx.201 (10-35cmBS), has six of the seven macro-fabrics (***Table 6.5-5***). The most abundant fabrics are the coarser ones —Coarse Sand (CS) and Cream Coarse Sand (CCS), from the Granitic and Granitic Tempered families— comprising 53.4% of the sample, followed by 'Others', with 41.4% of the sample. The latter indicates a high rate of fragmentation. Ceramics classified as part of the Cauixí fabric, associated with the Fibre and Sponge Spicules fabric, only include a small proportion of sherds (4.1%), while the Fine Sand (FS) fabric, from the Granitic Family, is the least popular (1.1%). The upper context, Cx.200 (0-10cmBS), yielded nine ceramic sherds, a third of which belong to the coarse sand fabrics, while the rest were classified as 'Others'. The very low count of sherds in the upper context of the trench, along with their reduced size and eroded character, support the argument that these artefacts are unrelated to the ceramics found in the Rock Feature-1, where sherds are quite large and much better preserved (despite being on the rock's surface). In none of the two contexts, the Black Coarse Sand (BCS) fabric, belonging to the Weathered Granitic fabric, was encountered.

Cx	cmBS	Total	FS	C	CS	C+S	C+F	BCS	CCS	Other
200	0-10	9	0	0	2	0	0	0	1	6
201	10-35	440	5	7	194	8	3	0	41	182

Cx	cmBS	Total	FS	C	CS	C+S	C+F	BCS	CCS	Other
200	0-10	100	0	0	22.2	0	0	0	11.1	66.7
201	10-35	100	1.1	1.6	44.1	1.8	0.7	0	9.3	41.4

Table 6.5-5. *Trench B. Macro-fabrics distribution per stratigraphic context, by number of sherds and percentages. Legend: FS=Fine Sand, C=Cauixí, CS=Coarse Sand, C+S= Cauixí and Sand, C+F=Cauixí and Fibre, BCS= Black Coarse Sand, CCS= Cream Coarse Sand.*

The analysis discriminating the macro-fabric per arbitrary level is very significant. ***Fig.6.5-14*** and ***Table 6.5-6*** show that the two levels positive for archaeological materials in Cx.201 behave very differently. Between 15-20cmBS, where 417 sherds were found (92.8% of the total for Cx.201), the singularity of this concentration is evident by the presence of minority fabrics tempered with sponge spicule, restricted only to this 5cm arbitrary level. In contrast, between 30-35cmBS, 23 sherds (5% of the total for Cx.201), are divided between coarse sand groups (82.6%) and Others (17.4%).

Cx	cmBS	Total	FS	C	CS	C+S	C+F	BCS	CCS	Other
200	0-10	9	0	0	2	0	0	0	1	6
201	10-15	0	0	0	0	0	0	0	0	0
	15-20	417	5	7	182	8	3	0	34	178
	20-30	0	0	0	0	0	0	0	0	0
	30-35	23	0	0	12	0	0	0	7	4

Table 6.5-6. *Macro-fabrics frequencies per level in Trench A. Legend: FS=Fine Sand, C=Cauixí, CS=Coarse Sand, C+S= Cauixí and Sand, C+F=Cauixí and Fibre, BCS= Black Coarse Sand, CCS= Cream Coarse Sand.*

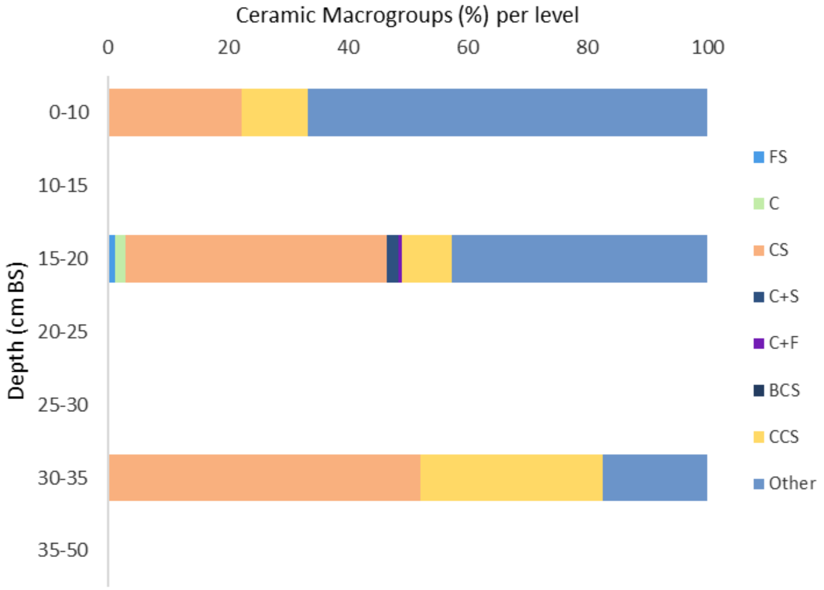


Figure 6.5-14. *Macro-fabrics percentage distribution per level in Trench B. Legend: FS=Fine Sand, C=Cauixí, CS=Coarse Sand, C+S= Cauixí and Sand, C+F=Cauixí and Fibre, BCS= Black Coarse Sand, CCS= Cream Coarse Sand.*

The presence of ceramics classified within different macroscopic fabrics in each arbitrary level within Cx.201 support previous arguments of different deposition patterns and associated radiocarbon dates, which suggest at least two different occupation episodes in this context. The presence of *cauixí* groups in this trench has an associated date of cal. AD 1024-1155 2σ (951 ± 28 BP, OxA-34373), which is supported by other radiocarbon dates from associated sites in the Middle Orinoco with Arauquinoid materials (Roosevelt, 1978; Zucchi, Tarble and Vaz, 1984; Barse, 1989). While the numbers in which sponge spicule tempered sherds appeared in the sample are too low on their own to be associated to an ephemeral occupation, their occurrence does indicate they are intrusive wares in this site during this late period.

6.5.4.3 Rock Feature-1

Rock Feature-1 represents a series of accumulative events restricted to the surface of a large granitic slab (inselberg). The stratigraphy shown by a 40x40cm auger test between the rock and Trench B demonstrated that the ceramic deposit on the surface of the rock did not extend into the terrain's subsurface (***Fig.6.5-15***).

Figure 6.5-15. *View of the Rock Feature-1 deposit, Trench B and auger test, Culebra site. Courtesy of José R. Oliver, 2015.*

Although this feature's origin is uncertain, possibly a 'cluster' resulting from flood episodes or as an intentional, chosen disposal spot, the ceramic materials found on top of the rock constitute some of the best-preserved sherds of the entire site, which is why some of them were selected for further analysis. Less fragmented than the ones found on the trenches, the study of these materials was quite productive since it allowed to better reconstruct vessel forms and identify decorative motifs and forming techniques to compare with the excavated ceramics. To determine a relative date for the Rock Feature-1 feature ceramic assemblage, an assessment of some paste recipes and formal modes present on the rock was made. In this section, the presence of certain wares will be discussed as part of a relative chronology for this feature.

- ***6.5.4.3.1 Macro fabric distribution***

From a total of about 1,545 ceramics obtained from Rock Feature-1, a small sample of 25 rim sherds (1.6%) was selected for further analysis. Although not a random sample, it still is 'representative' in the sense that it contains the different macro-fabrics present in the feature and also the most common rim forms of the assemblage. The proportions of macro-fabrics present in the sample are shown in ***Table 6.5-7***.

CS	CCS	C+S	TOTAL
20	4	1	25

CS %	CCS %	C+S %
80	16	4

Table 6.5-7. *Macro-fabrics distribution for the Rock Feature-1. Legend: CS=Coarse Sand, CCS= Cream Coarse Sand, C+S= Cauixí and Sand*

Sherds belonging to the coarse sand macroscopic fabrics, from the Granitic and Granitic Tempered families, are predominant (96% of the sample), while fibre and sponge spicule tempered sherds are a minority (4%). This distribution corresponds to the general pattern described for the late occupation period in Culebra, with rare *cauixí* sherds and predominantly sand paste fabrics. In Trenches A and B, the associated dates with *cauixí* ceramics range between ca. AD775-1155 (OxA-34371, 34373).

6.5.5 Identifying Ancient Pottery Production Practices at Culebra Site

This section is organized in terms of the sequential stages of the *chaîne opératoire* in the production of ceramics, starting with the chemical and petrographic characterization of the paste and ending with its final products: a set of ceramic vessels (i.e., traversing from ceramic technology to morphology). Each stage in the sequence present dimensions (*sensu* Spaulding, 1960; Lathrap, 1962) along which trait variability, be it continuous or discontinuous, are qualitatively and/or quantitatively measured and, ultimately, from which modes are determined. The objective here is to identify, through inference, the different pottery production practices present across space (i.e., different excavation units) and through time (i.e., levels, contexts). Marked differences (disparity as well as variability) in how pottery is produced, and ultimately characterizing its resultant vessel form set and associated decorations/surface treatments, forms the basis for proposing and establishing a given ceramic 'Complex'. The results at the end of this this chapter will argue for the presence two distinct complexes, an Early Culebra Complex, followed in time by a Late Culebra Complex, respectively representing an early and late occupation and period.

6.5.5.1 Geochemical characterization of ceramic samples

Portable X-ray fluorescence spectroscopy (pXRF) analysis was used to characterize 40 pottery sherds from Culebra site, considering both inclusions and clay fraction. All of the samples were recovered from Cx.100 and 101 from TU-A and the Rock Feature, except for 5 sherds (CUL 017-021), which were recovered from TU-A, Cx.103 (25-30cmBS). Net counts obtained with this method were converted into concentrations via an in-house calibration method. From the fifteen recorded elements, and after comparing the results with a bespoke reference sample, nine elements with an error of ≦25% (K, Fe, Ti, Nb, Rb, Sr, Zr, Co, Ga) were chosen for further analysis.

To explore the chemical variability among the samples recovered from this site, a Compositional Variation Matrix (CVM) was calculated using the above mentioned 9 elements (***Table 6.5-8***). The total variance of the assemblage (vt) was equivalent to 0.7821, which suggests a relatively low variability. This kind of variation has been previously associated with non-polygenic populations (Buxeda, Cau and Gracia, 1999; Buxeda i Garrigós and Kilikoglou, 2003; Belfiore et al., 2007; Fantuzzi and Cau, 2018 p.764).

	Co	**Fe**	**Ga**	**K**	**Nb**	**Rb**	**Sr**	**Ti**	**Zr**
Co	0	0.0075	0.1849	0.1697	0.2459	0.1362	0.2425	0.2072	0.2922
Fe	0.0075	0	0.1617	0.1391	0.2200	0.1155	0.2177	0.1820	0.2673
Ga	0.1849	0.1617	0	0.2724	0.0438	0.1637	0.1555	0.0411	0.1153
K	0.1697	0.1391	0.2724	0	0.3468	0.0590	0.2291	0.2944	0.4313
Nb	0.2459	0.2200	0.0438	0.3468	0	0.2145	0.2784	0.0843	0.0831
Rb	0.1362	0.1155	0.1637	0.0590	0.2145	0	0.1733	0.2065	0.3177
Sr	0.2425	0.2177	0.1555	0.2291	0.2784	0.1733	0	0.1522	0.4274
Ti	0.2072	0.1820	0.0411	0.2944	0.0843	0.2065	0.1522	0	0.1600
Zr	0.2922	0.2673	0.1153	0.4313	0.0831	0.3177	0.4274	0.1600	0
$T_{i.}$	1.4860	1.3109	1.1384	1.9417	1.5168	1.3863	1.8762	1.3277	2.0944
vt/τ_i	0.5263	0.5966	0.6870	0.4028	0.5156	0.5642	0.4169	0.5891	0.3734
r v,T	0.5370	0.4113	0.3404	0.4930	0.3829	0.2443	0.8053	0.4529	0.7565
vt	***0.7821***								

Table 6.5-8. *The compositional variation matrix (CVM) calculated for Culebra sample on the following elements: Co, Fe, Ga, K, Nb, Rb, Sr, Ti, Zr.*

From the CVM it was possible to identify the element with the least variation (*Ti*) within the assemblage, which corresponded to Ga (*Ti*=1.1384). The elements with the highest variation within the assemblage were Zr (*Ti*=2.0944), K (*Ti*=1.9417) and Sr (*Ti*=1.8762). While Zr presence is associated to weathering and high-energy environments —e.g., fluviatile sedimentation—, both K and Sr amounts are mainly associated to feldspars. K-feldspars (microcline, orthoclase) and K-mica (muscovite) are often responsible for K values, although it can also be found absorbed by clays such as illite. Sr quantities are associated to K and Na feldspars, as well as to carbonates, for which this element is a substitute. Finally, Sr is also common in weathered products and its amounts are relative to the degree of weathering (Degryse and Braekmans, 2014 p.194).

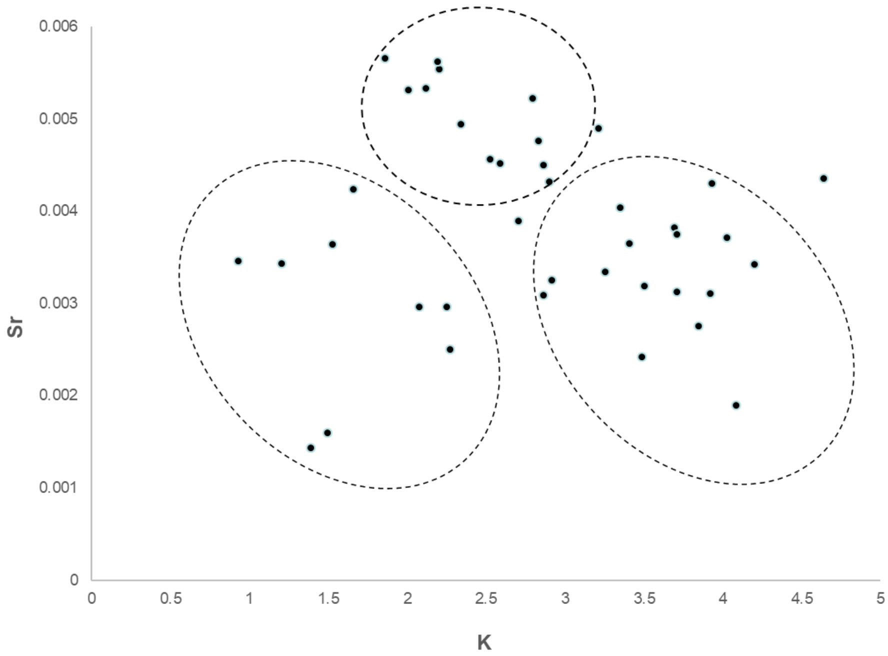


Figure 6.5-16. *Bivariate scattered plot using Sr and K with highlighted tendency groups. Ellipses are for illustration purposes only and do not represent confidence intervals of group membership. Axes have concentrations values.*

A bivariate scattered plot using potassium (K) vs strontium (Sr) (***Fig. 6.5-16***) revealed three broad tendencies within the Culebra samples. Two of these share similar concentrations of Sr (0.001-0.0004) but differ in terms of their K values, one with a low concentration (1-2.5), and the other with a higher one (2.5-4.5). In itself, this does not translate into two different clay sources since K values can respond to the presence of naturally occurring or intentionally added K-feldspars and K-micas in the paste. On the other hand, the third tendency shows particularly high Sr concentrations (>0.004) that, as already mentioned, are often associated to high levels of Ca and a higher degree of weathering. Unfortunately, the elements measured by UCL Ceramics Cal 1 do not include Ca and cannot confirm this association in terms of chemical composition. However, its presence suggests the samples with these values are likely to come from a different clay source.

To confirm the previous observations, a more complete analysis using all nine elements was conducted. According to the CVM, Ga was used as the divisor for the log-ratio transformation, being the element with the highest ratio (*vt/Ti*) and, therefore, the one least affecting the total variation. Following the formula proposed by Aitchison (1986) and Buxeda i Garrigós (1999), the results were used for Principal Component Analysis (PCA) and Hierarchical Cluster

Analysis (HCA). HCA was calculated using a centroid agglomerative method and the square Euclidean distance.

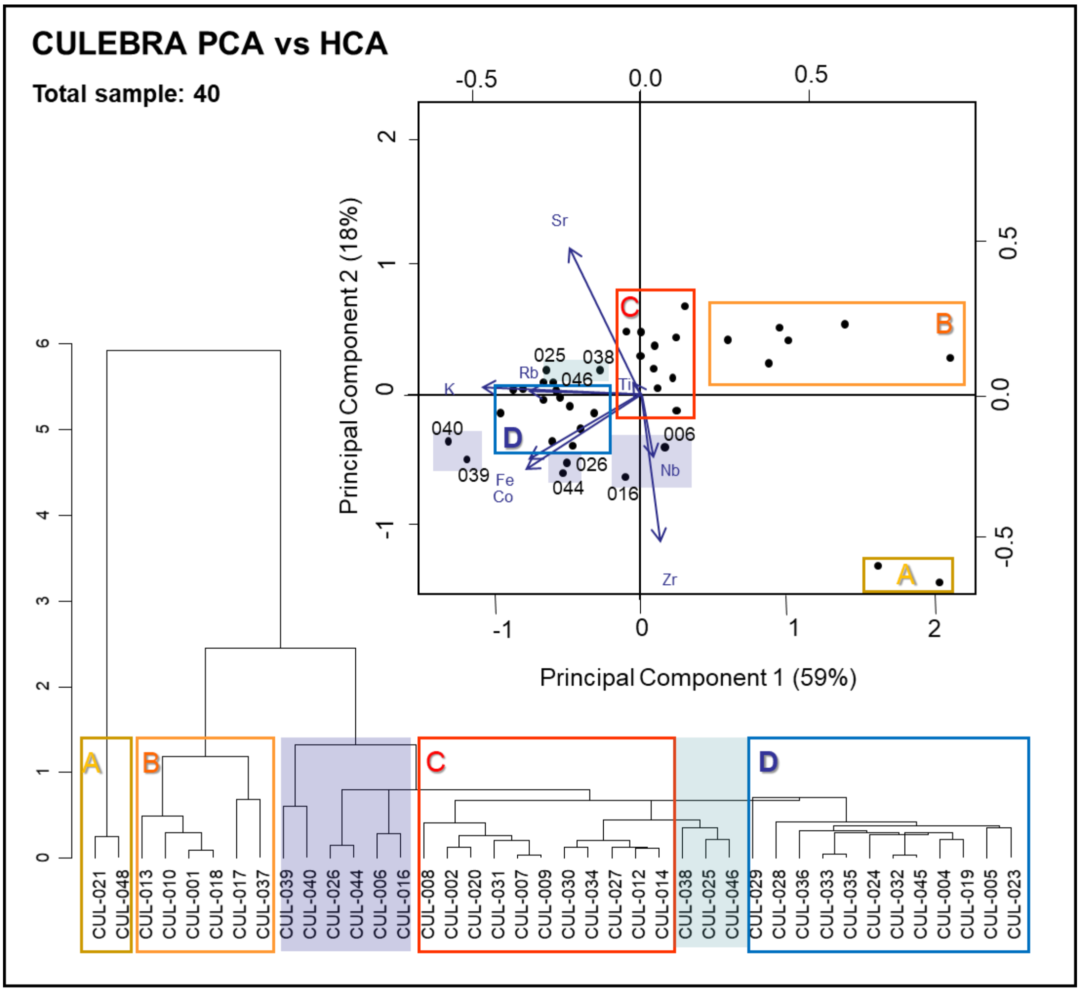


Figure 6.5-17. *Bottom: Cluster tree of Culebra site ceramics using the centroid agglomerative method and square Euclidian distance performed on log-ratio transformed concentrations, with Ga as divisor. Right top corner: scatter plot of a PCA analysis performed on the same transformed results, which encompasses 77% of the composition between the first two principal components.*

Both PCA and HCA revealed important patterning, which might suggest pottery found at Culebra site was made using different paste recipes (see ***Appendix 10***). As seen in ***Fig.6.5-17***, four main groups are revealed with both methods. Group A, with only two samples, is located on the bottom right-quarter of the PCA graph, and both are distinguished form the rest of the assemblage by its high concentrations of Zr (>0.17) and very low amounts of Sr (<0.0015). These two samples, as seen in the HCA graph, are completely separated, but were not considered as outliers since they both presented very similar values, despite coming from two different locations on the site. Their values were measured on different dates, therefore, ruling out any possible contamination or malfunction of the machine.

On the top-right quarter of the PCA scatter plot, the more dispersed group B comprises six samples. This group splits form the rest of the assemblage, as seen in the HCA dendrogram, based on its very low concentrations of Fe (<3.34) and K (<2.26). Fe values are often linked directly to the clay fraction, which absorbs ferric oxides formed by weathering (Degryse and Braekmans, 2014 p.194). In this sense, this group might constitute a different clay characterized by poor iron concentrations. Nonetheless, is important to point out that internal differences respond to variations in Sr and Zr concentrations. While higher Sr values (e.g. samples CUL 018, CUL 001) are related to carbonates and a more weathered clay fraction, high values of Zr (e.g. CUL 017, CUL 037) are associated with zircons (Mackenzie and Guilford, 1980) and high-energy environments (Degryse and Braekmans, 2014 p.194). The latter might indicate differences in terms of weathering stages.

Group C is noticeably different from the surrounding clusters because its 11 samples present very high Sr concentrations (>0.004). These values strongly suggest a different, more weathered clay source, perhaps richer in Ca. Internal differences within this group are associated to Rb values, which are related to higher K concentrations (Degryse and Braekmans, 2014 p.194). The latter are most likely due to more K-feldspars and micas in some samples (e.g. CUL 014, CUL 012, CUL 030, CUL 034). The remaining Group D, with 12 samples, can be differentiated by its very low concentrations of Ga (<0.0026) and Sr (<0.004) and by having the highest Fe concentrations (>3.6). These last two seem to be key to argue for a different clay source; based on its low Sr and Ti values, they are less weathered.

The other samples not directly grouped in any of the previous clusters are outliers of Group D. Samples CUL 025, 038 and 045 presented low Fe (<3.5) and Co (<0.0014) concentrations. Despite low iron levels —which might indicate a different source—, concentrations of K, Sr and Ti are very similar to those present in group D and thus in agreement with a less weathered clay source with a coarser fraction. On the other hand, samples CUL 039, 040, 044, 026, 016 y 006 have very high concentrations of K (>3.2), Ti (>0.5) and Zr (>0.07), most likely associated to a higher and coarser number of K-feldspars and zircons.

The chemical characterization of the Culebra samples suggests at least three different clay sources used for pottery making. Group D correspond to a less weathered clay with low levels of Sr, while Groups B and C are more weathered, possibly sedimentary clays, with low Fe concentrations. Although there can be natural compositional variation within the same clay source —commonly found in residual clays and lacustrine deposits formed by seasonal depositional cycles (Quinn, 2013 p.42)—, differences in K, Rb and Ti values suggest these are different sources. The latter is supported by strong dissimilarities in terms of size and type of mineral inclusions (specifically feldspars and/or micas), which will be discussed in greater detail shortly.

Group A, which comprises two hardened clay samples found in the Trench A and in the Rock Feature-1, although clearly distinct from the rest of the pottery sherds sampled from Culebra, cannot be said to have been used in pottery-making since they did not match any of the analysed ceramic fragments; they are best described as clay lumps. These clay lumps are usually associated to hearths, firing pits, or *topias,* that is cylindrical or hourglass-shaped supports for unstable vessels. However, these features were not detected in our excavations.

6.5.5.2 Petrographic analysis vs Geochemical data

Petrographic analysis of 46 sherds from Culebra confirmed some observations derived from the chemical characterization and their association with their texture and mineralogy (see ***Appendix 2*** for an extensive discussion on each petro-fabric). As seen in ***Fig.6.5-18***, different petro-families are present in each one of the possible clay sources previously described. However, there are unifying characteristics in terms of type of inclusions and grain size that accounted for their clustering and the use of a common base-clay in each group.

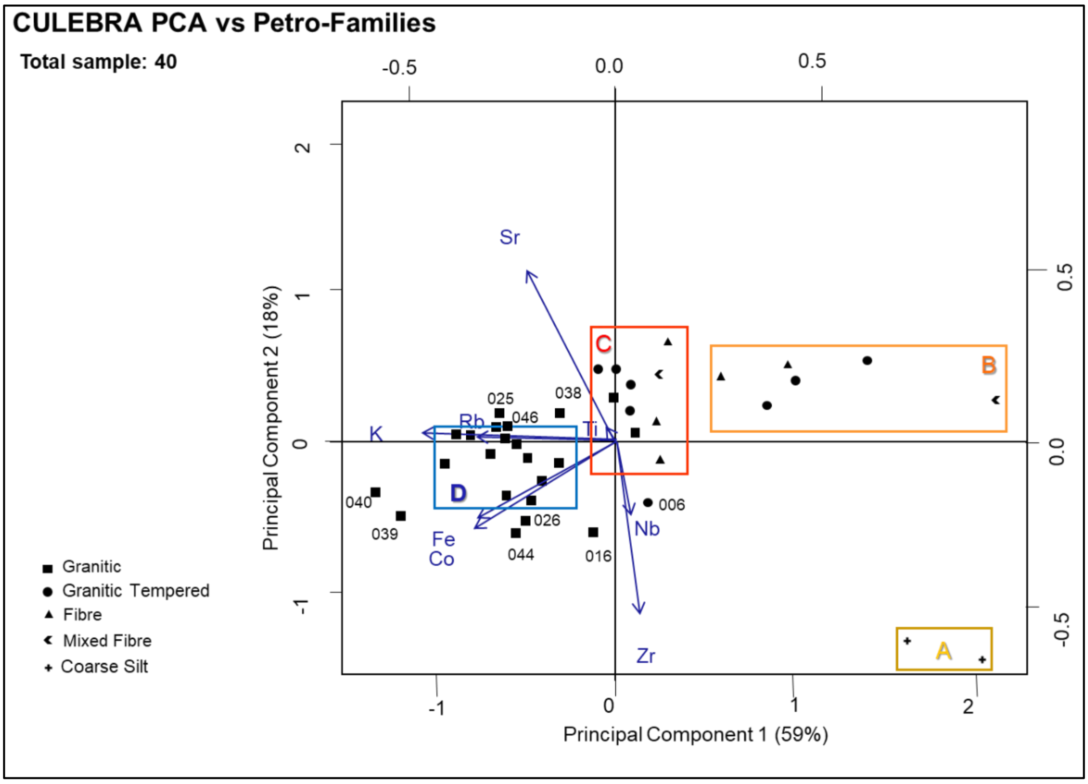


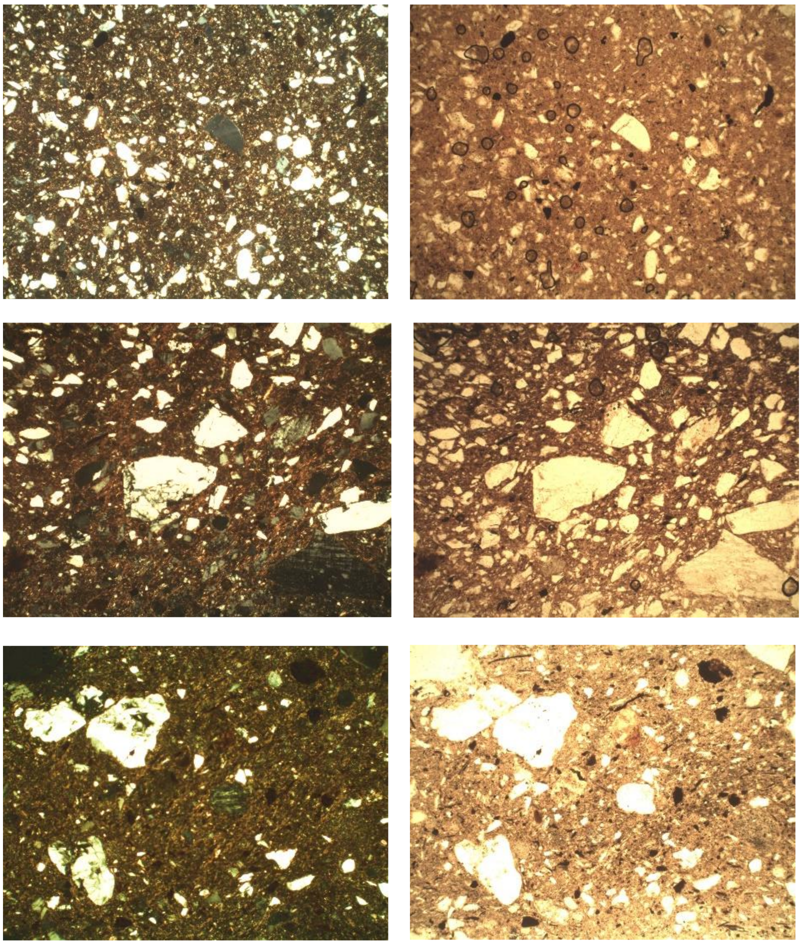
Figure 6.5-18. *Scatter plot of PCA analysis performed on log-transformed results. Petrographic families are depicted vs different geochemical groups, highlighted with different colours.*

The most cohesive groups in terms of petro-families are Group A and D. Group A samples correspond to a Coarse Silt Fabric, possibly deriving from an alluvial clay source. Its main mineral inclusions were mostly quartz (30%), with very few microcline and biotite particles (<1%), indicating it might have derived from a heavily weathered, acid igneous rock, possibly a micro-granodiorite. Both quartz and feldspar inclusions are very rounded, probably shaped by a high energy environment and heavy erosion. Surprisingly, no zircons where spotted. Based on these characteristics, local alluvial deposits on the banks of the Orinoco and Cataniapo rivers might have been used to obtain this clay. These areas, derived from the weathering of the pegmatite and mineralized veins in the granitic geological formation (US Geological Survey and Corporación Venezolana de Guyana, 1993 p.89), are continuously exposed to strong water currents and seasonal flooding.

The samples that belong to chemical group D were classified as belonging to the Granitic Family. Granitic Fabric and Weathered Granitic Fabric are both characterized by a coarse-medium-grained with poorly sorted angular mineral and rock inclusions. The main mineral inclusions comprise angular quartz, microcline, microcline perthite, plagioclase and biotite. These inclusions and their frequencies correspond to fragments of the original parent rock, possibly a weathered, medium grained, igneous rock of acidic composition, most likely a granite. The latter is dominant in the area, part of the Parguaza Granite Formation (***Fig.3-1***). It can also be confirmed by rock inclusions in which its main components, biotite, quartz, and microcline, are still merged.

Angular and poorly sorted quartz and feldspars minerals, and rock inclusions in both fabrics, are indicative of a residual clay source formed in situ, perhaps in deposits further inland within the Parguaza Granite Formation. Although the presence of altered feldspars can indicate a different parent rock for the Weathered Granitic fabric samples, it might also suggest different breakdown and alteration stages within the same clay quarry pit. Despite the altered microcline feldspars, the angularity and poorly sorted character in both fabrics is congruent with the less weathered character expected for Group D. Also, a strong red colour in the base clay in well-fired samples within this group indicates high Fe concentrations, as attested by the X-ray fluorescence results.

In contrast, Group B samples pertain to different petro-fabrics, which, despite having distinct tempering techniques, they share similar textures, granularity and type of mineral inclusions. Half of the samples belong to the Granitic Tempered Fabric, while the other half corresponds to Tree Bark, Fibre and Sponge Spicule tempered fabrics. Nonetheless, all of them also present few (10-15%) medium to fine-grained sub-angular and rounded quartz inclusions. The angularity of the quartz and of some microcline inclusions suggest transport form the source of origin, while the scarcity of K-feldspars and biotite micas support the argument of a higher degree of weathering. These characteristics are indicative of a sedimentary clay source, probably deriving from a weathered medium-grained igneous rock of acidic composition, perhaps microgranite. Finally, scarce feldspars explain the low K values, while well-fired sherds with a yellowish colour agree with the low Fe concentrations encountered.



A

D

B

Figure 6.5-19. *Micro photographs of Culebra samples from groups A, D and B, in cross-polar (XP) (left) and plane polarizing light (PPL) (right). Image width: 3mm.*

Even though Group C samples belong to the same petro-fabrics present on Group B, they differ in terms of their mineralogy and weathering degree, which might suggest a different source. Microcline feldspars with perthite intergrowth are more abundant in the Granitic Tempered Fabric samples in this group (CUL 012, 014, 017 and 030), which can explain the slightly higher K and Rb values that separate them from Group B. Round and fine-grained quartz and microcline feldspars, with very few biotite minerals, are congruent with a sedimentary clay source derived from a highly weathered acid igneous parent rock. This is also congruent with the higher Sr values reported above. Granitic (CUL 031) and Weathered Granitic (CUL 007, CUL 034) fabric samples in Group C are clustered within this group because of their high Ti and Sr concentrations, possibly associated to a higher degree of weathering, but not necessarily because they originated from a different clay source.

Sedimentary clay deposits are available along the banks of the Orinoco and Cataniapo rivers. Based on the angularity of its quartz grains, and the remaining rock and few biotite inclusions, the clay deposit used was quite juvenile, meaning that it had not been transported too far from source and thus the grains were not that eroded; indicating its probable source might be further inland, where clay is not so heavily exposed to the erosion caused by the stream. Sedimentary clays used for Group B and C, although slightly different, could potentially come from nearby quarry pits, with similar compositions but distinct weathering stages.

Based on the geochemical and petrographic analysis, Culebra ceramics were made using potentially local clay sources. Residual and sedimentary clays derived from granitic parent rocks at different weathering stages, are available within a radius of 5km from site. Regarding their vertical distribution on TU-A, all of the above identified clay groups were represented in both Cx.101 and 103, from the Late and Early Occupation, respectively. However, three of the samples from Cx.103 corresponded to sedimentary clay sources from closely related Group B (CUL-017 and 018) and C (CUL-020). One of the remaining samples belongs to the heavily weathered alluvial clay from Group A (CUL-021) and the last one to the residual clay Group D (CUL-019). Providing these results correspond to a sample bias given by sherd size and conservation, there is a preference for sedimentary clays over residual ones in the early period.

6.5.5.3 Paste preparation

From macroscopic observations during fieldwork, seven macro-fabrics were defined based on their paste colour and type and size of inclusions. A small subsample with representatives of each the macro-fabrics was selected for further petrographic analyses. These analyses allowed to confirm paste composition and determine in which cases the inclusions were naturally occurring or intentionally added to the clay fraction. Nine different petro-fabric groups were defined from the subsample, which correspond to four different paste families (i.e. modes).

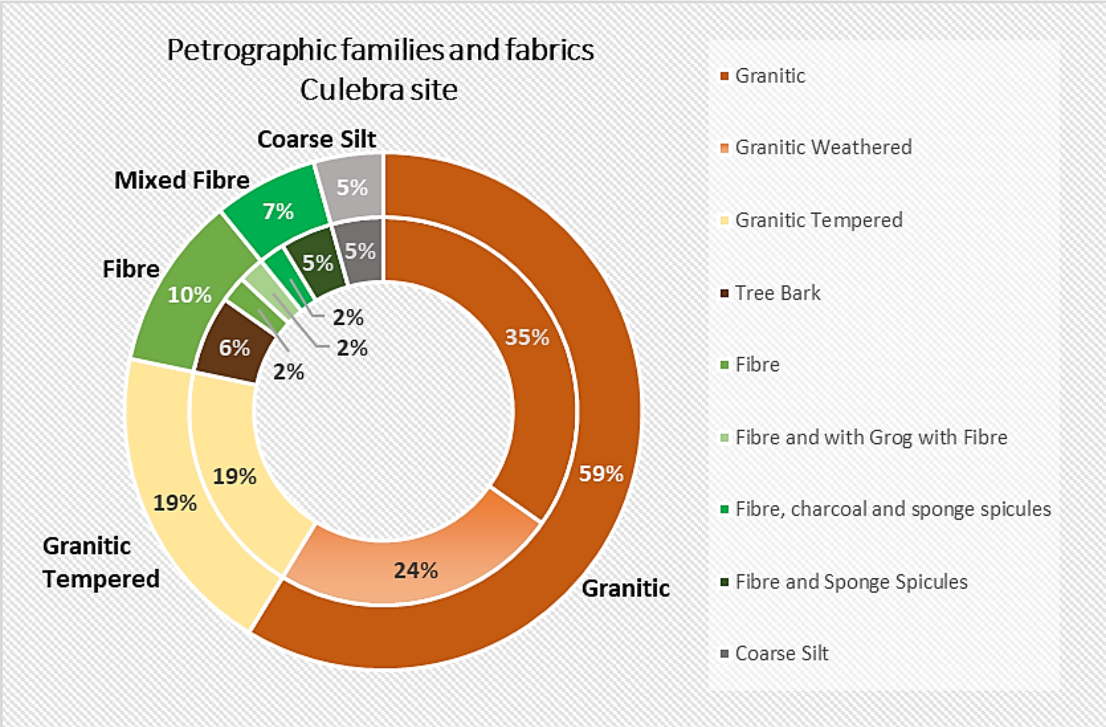


Figure 6.5-20. *Petro-fabric families and fabrics at the site of Culebra. (n=46).*

A total of 46 ceramic sherds recovered at Culebra were analysed using optical microscopy. The sample was composed by 25 sherds from the Rock Feature1 and 21 form Trench A (15 from Cx.101 and 6 from Cx.103). All the pottery from the Rock Feature-1 were rim sherds, while from Trench A one was a rim and the rest body sherds. Detailed descriptions of each one of the petro fabrics were identified in Culebra can be found on ***Appendix 2***.

The dominant family was the Granitic, with 59% (n=27) of the samples, comprising the Granitic and Weathered Granitic fabrics (***Fig. 6.5-20***). This family was followed by the Granitic Tempered Family with 19% (n=9) and the Fibre Family with an 10% (n=5). This last one had three different fabrics: the Fibre, the Fibre with Grog with Fibre and the Tree Bark Fabric. Remaining family is the Mixed Fibre with 7% (n=3), with two different fabrics and the Coarse Silt Family (5%, n=2), with a homonymous fabric.

Most of the sherds in the sample (59%) presented abundant and poorly sorted mineral and rock inclusions which are thought to be natural occurrences. The composition of the Granitic and Weathered Granitic fabrics, which are part of this large group, are indicative of a micro-granitic parent rock. This is consistent with the geomorphological characterization of the area as part of the Parguaza Granitic Formation (Hackley, et. al., 2005). Also, since samples within the Granitic Weathered group present heavily weathered quartz and microcline with quartz blebs in intergrowths and ghost myrmekite, it is possible to suggest these two groups comprise rock minerals and inclusions from different stages of breakdown of a granodiorite parent rock.

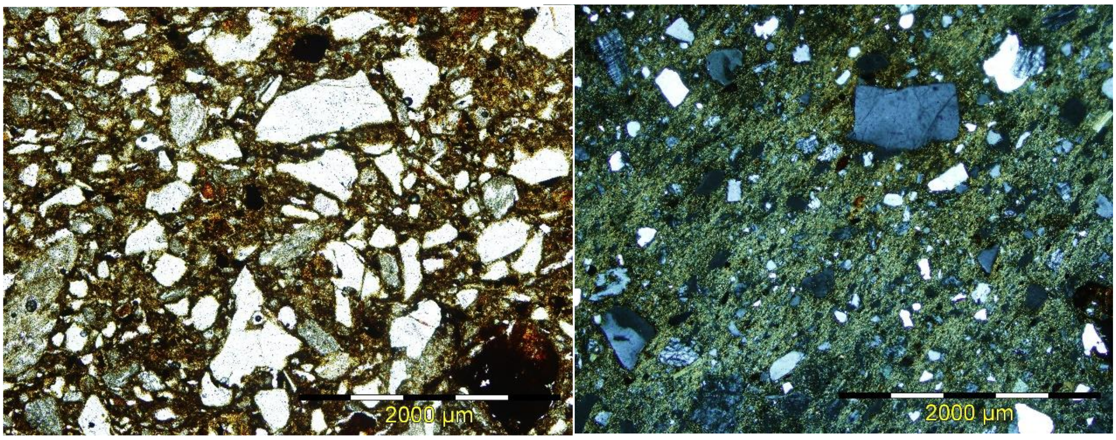


Figure 6.5-21. *Cross-polar (XP) Micro photographs of Culebra samples CUL 023 (left) and CUL 013 (right), which belong to the Granitic Fabric and the Granitic Tempered Fabric group, respectively. Image with: 4mm. Microphotographs taken by Natalia Lozada, 2017.*

Despite most of the samples with granitic-derived inclusions appear to be naturally occurring, a significant percentage (19%) do shows evidence of tempering. The Granitic Tempered fabric group, constitute the second largest fabric in the Culebra sample, characterized as a medium-fine grained fabric with sorted sub-angular quartz and microcline mineral and rock inclusions (***Fig.6.5-21***). The roundness and proportion of the minerals indicates a transported source, while the mineral composition indicates it derives from a granitic parent rock. The bimodal grain size distribution of the quartz inclusions and uneven distribution within the clay paste are both arguments to claim tempering processes.

The rest of the sherds (17%), from the Coarse Silt, Fibre and Mixed Fibre families, are possibly associated with a sedimentary source, found in the banks of the Cataniapo and Orinoco rivers (Hackley, et. al. 2005). Some of these samples (15%) contain siliceous-rich inclusions that may have been added as temper. Among the latter, sponge spicule, fibre and tree bark were identified as part of these less frequent paste recipes.

Carbonized and non-carbonized tree bark structures occurred together, in a ≤20-25% proportions, while the fibre inclusions constitute ≤15-20% of the matrix. Mixed Fibre Family sherds additionally presented siliceous-rich sponge spicule inclusions in rare numbers (<3%), leading to suggest they are naturally occurring. Rare proportions of spicules are not conclusive to argue that they were intentionally added. Fresh water sponges, as mentioned previously, are organisms that grow and reproduce mostly in lentic waters in flooded areas, although they can adhere to wood and float along calm currents. The Cataniapo-Orinoco confluence generally has a very strong, turbulent current; however, during the dry season, the low water level could favour the reproduction of this organism (Volkmer-Riveiro and Pauls, 2000). Although they can be potentially a local resource, the proportions in which they are found on the ceramic materials recovered at this site suggest that they were not part of local paste recipes and might have been either naturally occurring or part of non-local recipes, introduced in the area.

On the other hand, *Licania sp*. bark, use as temper in contemporary paste recipes by Hiwi potters located close to the Cataniapo-Orinoco river confluence, comes from a tree usually found in elevated forest areas further inland, not available near Culebra site. The nearest elevated, forested areas are 3km away from site. Analysis of some of the archaeological ceramic thin sections from Culebra (CUL-010) suggest the use of carbonized wood of '*palo mezclo*' from this genus as temper (***Fig.6.5-22***). Carbonized and non-carbonized bark temper have a strongly unimodal size distribution that can result from sieving (Quinn, 2013 p.156). Unfortunately, this was the only wood fragment with well-preserved anatomical features found on the ceramic samples.

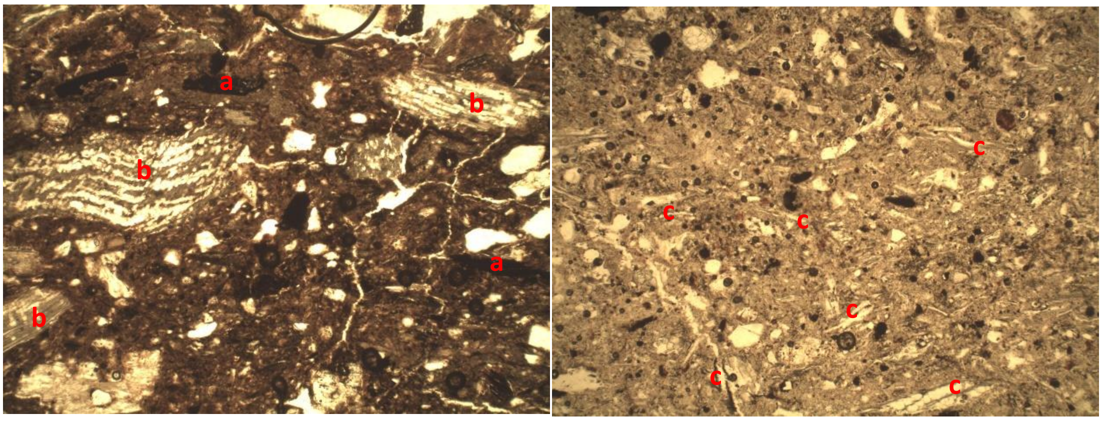


Figure 6.5-22. *Plane polarizing light (PPL) micro photographs of Culebra samples CUL 003 (left) and CUL 009 (right), which belong to the Tree Bark Fabric and the Fibre Fabric group, respectively. Inclusions identified by letters: a) Charcoal, b) Non-carbonized bark and c) fibre. Image width: 3mm. Microphotographs taken by Natalia Lozada, 2016.*

Finally, grog with fibre was used in a Fibre tempered fabric sample (***Fig.6.5-23***). These grog fragments are very similar in texture and composition to the Fibre fabric sherds present on this site, suggesting re-cycling of local fibre-tempered vessels. However, given the low frequencies of fibre tempered sherds during Late Culebra period, it seems unlikely that it was a local traditional recipe.

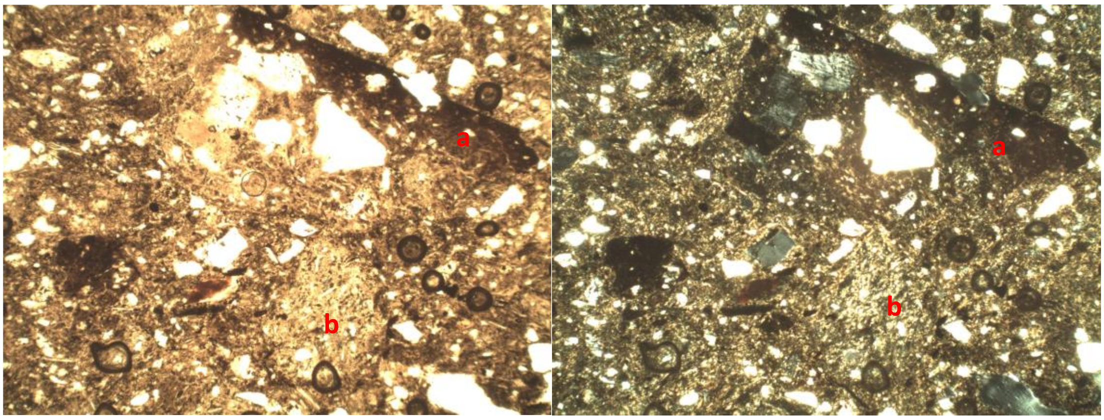


Figure 6.5-23. *Micro photographs of Culebra sample CUL 001 in plane polarizing light (PPL) (left) and cross-polar (XP) (right). A grog fragment with a slip (a) and one angular crushed body (b) can be seen in both pictures. Image width: 3mm. Microphotographs taken by Natalia Lozada, 2016.*

Vertical distribution of certain paste modes in the sequence is key to reconstruct the occupation of Culebra site. As mentioned before, most of the samples in the lower and upper levels correspond to the Granitic and Granitic

Tempered families, both of which are potentially thought to be made with local resources. However, Fibre and Mixed Family families, only present in the upper levels of TU-A and TU-B and in the Rock Feature-1, are considered as probably exogenous given their scarcity and the absence of some of their tempering materials (sponges and bark) at Culebra.

6.5.5.4 Fashioning

- ***6.5.5.4.1 Roughing-out***

A total of 22 ceramic rims obtained from the Rock Feature-1 and Trench A were examined using macro-trace and petrographic analysis in order to reconstruct the first stages of the *chaîne opératoire.* From these 22 sherds, 1 (4.5%) belong to the Black Coarse Sand fabric, 7 (32%) to the Cream Coarse Sand fabric and 14 (63%) to the Coarse Sand fabric, belonging to the Granitic and Granitic Tempered families. Unfortunately, sizeable potsherds from other macroscopic fabrics were absent or too eroded to be analysed using macroscopic analysis to reconstruct the production sequence. Also, for Trench A, the sizeable sherds came from Cx.101 and 103, from the late and early occupation periods, respectively. The observations regarding the profile, fracture, topography of both surfaces and radial section, were registered for each sherd in a data base (see ***Appendix 11****).*

All 22 sherds were elaborated using the coiling technique and assembled by using a drawing (*i.e. étirement*) technique. The type of junction was a bevelled form and the modality of placement was in alternation, which leaves a diagnostic "S" shape in the radial section of the sherd. Cracks were found in association with coil junctions, while the orientation of the inclusions was chaotic on a radial section, as expected in coiling technique (***Fig.6.5-25).***

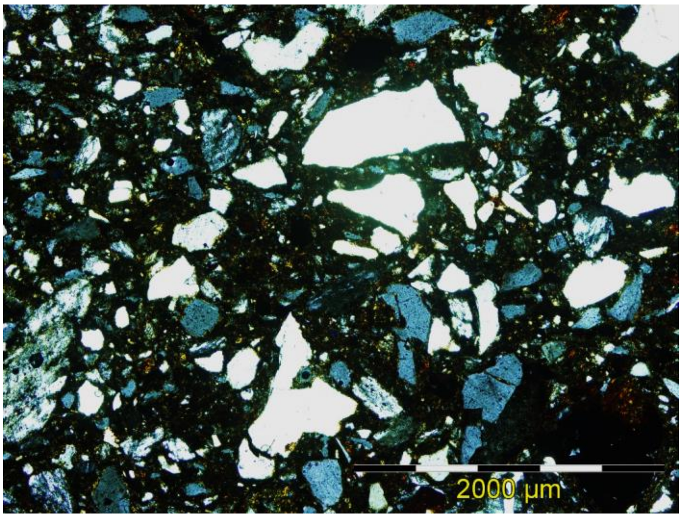


***Figure 6.5-24**. Cross polar (XP) micro photograph of CUL 023. Concentric orientation of the inclusions associated with coiling technique. Image width: 0.4mm. Microphotographs taken by Natalia Lozada, 2016.*

In thin section, forming technique reconstruction was only possible to observe in oriented cuts, using a rim or base as a reference point. This analysis could only be performed in rims sherds from Rock Feature-1. All 21 rim sherds were manufactured using coils, according to the orientation of the grains. As seen in ***Fig.6.5-24***, the analysis confirmed they used coiling technique by the concentric orientation of its inclusions. This is significant given that these sherds belonged to the Granitic, Weathered Granitic and Granitic Tempered groups, which means that despite differences in paste preparation, all coarse sand fabrics used the coiling technique. Coiling is not an exclusive feature of any macro fabric and does not change between stratigraphic contexts, for which it does not have a chronologically sensible vertical distribution.

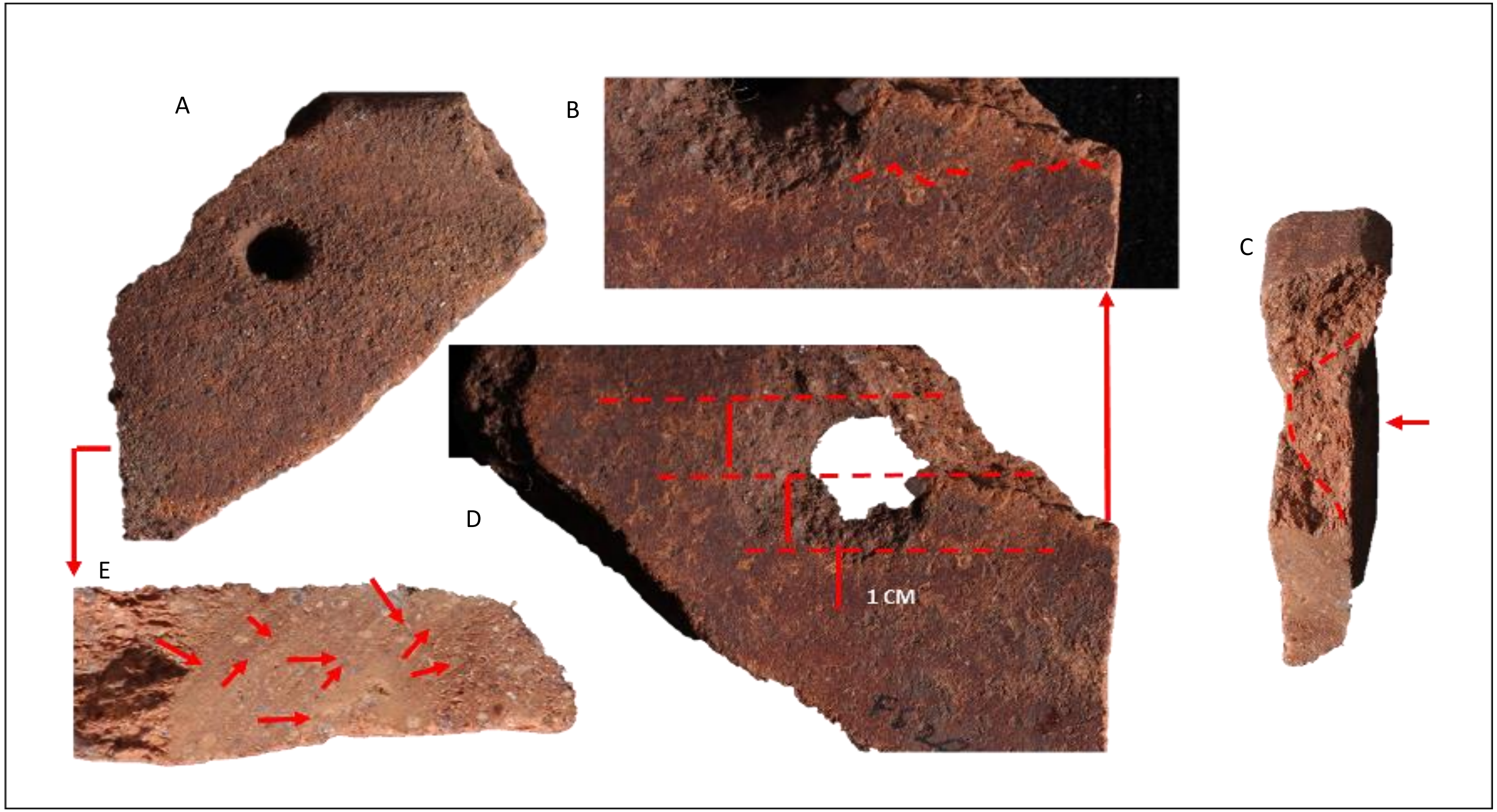


Figure 6.5-25. *Culebra ceramic sherd (CUL-041). Attributes associated with coiling technique. A: Ext. Surface Scale 1:1. B. Int Surface detail. Cracking associated with a preferential fracture of a coil junction, next to a perforation hole for repairing. C: Profile. Coil in alternation D: Int. surface. Cracks at equidistant intervals of 1cm. E: Chaotic orientation of the inclusions in the radial section.*

- ***6.5.5.4.2 Pre-forming***

More challenging was the identification of the preforming techniques. Because of the erosion of the surfaces, it was only identified in three sherds from TU-A (CUL-013, Cx.101 Lv.5 [20-25cmBS]) and the Rock Feature-1 (CUL-042, CUL-043) from the late period. The forming of the vessel took place when the clay was wet by scraping in different directions, observable by the presence of deep striations, exposed grains and a smoothing of the surface (***Fig.6.5-26)*** (see ***Appendix 11***).

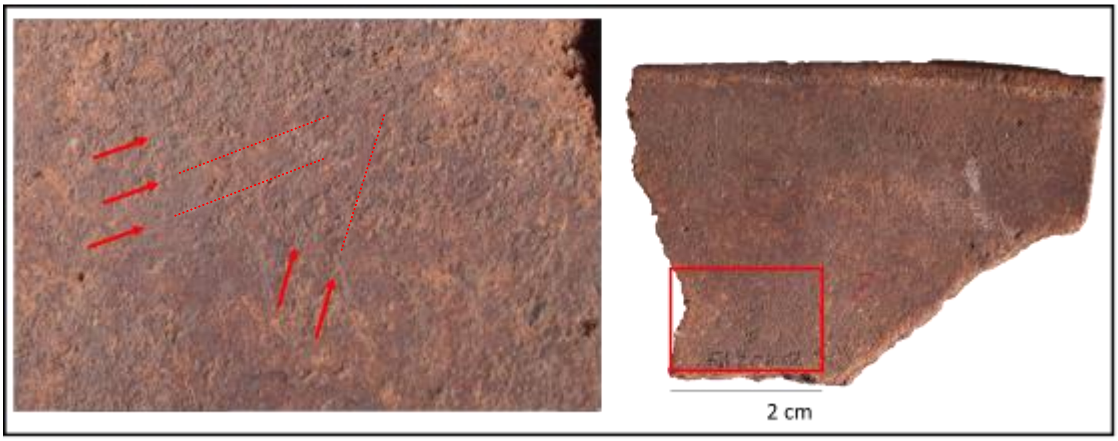


Figure 6.5-26. *Culebra ceramic sherd (CUL-042). Picture shows traces of scrapping technique use for the pre-forming stage. Photo taken by Natalia Lozada, 2016.*

One of these sherds, CUL-013, belonged to the Granitic Tempered macro fabric, while CUL-042 and CUL-043 were part of the Granitic macro fabric. Despite this difference, all sherds showed the same use of scraping technique. Nonetheless, the similarity in terms of forming and fashioning between these two groups is limited because of the small sample analysed due to poor preservation.

6.5.5.5 Finishing

The severe erosion of ceramic sherds did not allow good surface preservation, which hindered the reconstruction of this part of the production sequence. However, there are some decorative techniques that we were able to reconstruct from the surface collection of Rock Feature-1 and a few sherds recovered in the excavations.

- ***6.5.5.5.1 Decorative techniques***

Trench A

Only 20 ceramic sherds from Trench A exhibit decoration. This represents 1.2% of the total ceramics recovered in this unit. Clearly decoration is rare for the entire assemblage from Trench A. Although it constitutes a very low percentage, it resembles the 1% reported by Barse (1989, p.162) for Culebra site. Three different techniques were used: incision, punctation and applique nubbins. Rims and body sherds were both decorated with linear incisions ***(Fig.6.5-27)*** performed with a shallow and broad tool (<3mm), applied when the clay was leather hard. Applique nubbins were also used to decorate rims, bodies and handles, whereas punctation was only found on body sherds, sometimes in pairs and sometimes with a single circular shallow punctation, also applied during leather hard state.

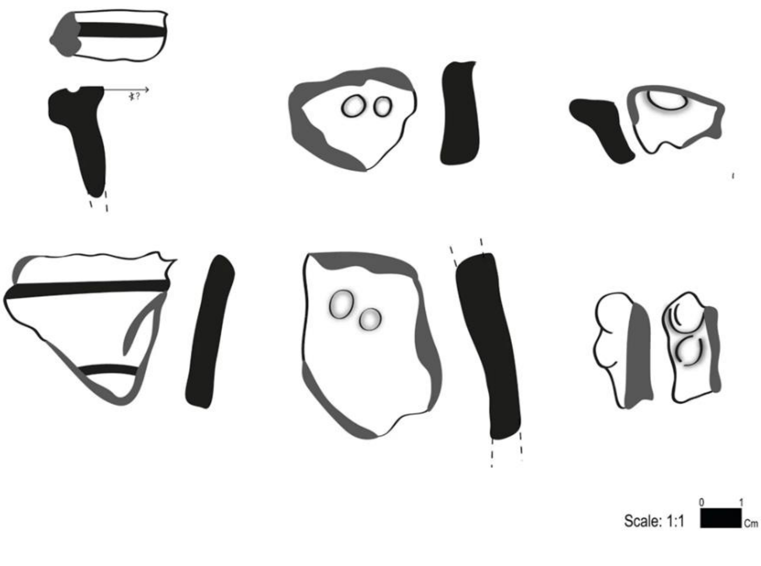


Figure 6.5-27*. Decorated rim and body sherds. Lv. 2 (5-10cmBS), Trench A, Culebra site. Left to right: incised, punctated and applique decorative techniques.*

Linear incisions running on the lip and parallel to the orifice of the vessel, correspond to rims with flat or flat-thickened lips. Given that this incision only occurs within these two kinds of lip treatments, it could be argued that such flattened space —the decorative field— was occasionally selected for incised decoration or, more frequently, left without decoration. In other words, certainly not every flat rim had an incision, but all the incised rims in Trench A are flat.

All decorated ceramic sherds are found in Cx.101 (5-25cmBS), nonetheless 80% of them are located within the top 10cm of this context (***Table 6.5-9***). Incised rims constitute the most popular decorative technique, distributed throughout Cx.101 in similar proportions, while incised body sherds are the least popular and occur scattered thought the context. However, punctation and applique decorative techniques are only reported for the top 10cm, and closely follow incised rims in frequency. Punctated body sherds are mostly concentrated on level 2 (5-10cmBS), while applique nubbins on body sherds and handles were identified in levels 2 and 3 (5-15cmBS).

TU	Cx	Lv. (cm BS)	P	A	IR	IB
A	100	0-5	0	0	0	0
A	101	5-10	4	3	3	2
A	101	10-15	1	2	1	0
A	101	15-20	0	0	2	1
A	101	20-25	0	0	1	0
A	103	25-30	0	0	0	0
A	103	30-35	0	0	0	0

Table 6.5-9*. Decorated sherds per context and level (cm below surface -BS-). Conventions: P=Punctation, A=Applique, IR=Incised Rim and IB=Incised Body.*

Figure 6.5-28*. Punctated body sherds from level 2 (5-10cmBS), Trench A- Culebra site. Photo by Natalia Lozada, 2017.*

As Barse reported for Culebra Red ware (Barse 1989:162-168), incising was the most common decorative technique on the samples, closely associated with flat thickened lips and less so with body sherds from bowls and a platter.

He also reported only six sherds with a single shallow circular punctation, and 16 sherds with applique ribbons of clay and nubbins, two of which correspond to handles with tripartite nubbin designs on the top. In Trench A, as seen in ***Fig.6.5-28*** punctated body sherds sometimes present multiple punctations, although there is no clear associated vessel form in which they occur. Applique nubbins present on the sample were reported in two elongated body sherds and one handle.

Trench B

Five ceramic sherds (1.1%) from Trench B bear incised or applique decoration. Although they all occur within Cx.201 (5-35cmBS), they are only found in level 3 (10-15cmBS). The incised lines in both rims are shallow and broad (<3mm), and they coincided in depth and thickness with the ones found on an incised body in the same level, probably made by the same tool during leather hard state of the clay. The applique nubbin on a rim in the same level was the only sherd with this kind of decoration found on this trench (***Fig.6.5-29***). Punctation was absent in this trench.

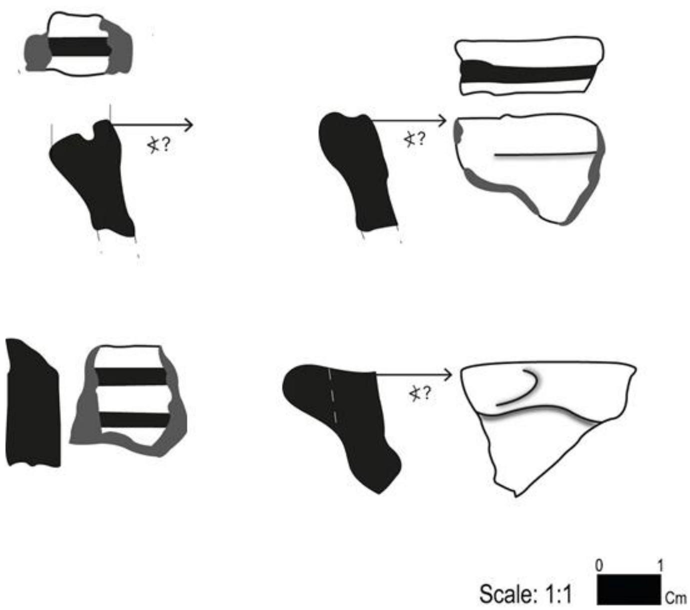


Figure 6.5-29*. Decorated rim and body sherds from level 2 (10-15cmBS), Trench B- Culebra site. We observed incised rims and bodies and applique nubbins on rims.*

Rock Feature-1

Of 31 rims sampled from Rock Feature-1 (including 6 sherds photographed in the 2015 season which were not taken for further analysis), 21 (68%) presented decoration. Only three of those had punctation as a decorative technique, present in flanged rims, accompanied by linear incisions (***Fig. 6.5-30***). Punctation seems to be part of a decorative design, located at the centre of the rim and surrounded with the linear incisions.

Figure 6.5-30. *Decorated flanged rims from Rock Feature-1, Culebra site. On the top of the flange, punctation and linear incisions can be observed.*

As seen in ***Fig.6.5-31,*** rims found on the Rock Feature-1 showed not only single linear incisions, as the ones reported on the excavation trenches, but also double-line incised rims. Twelve rims exhibit single incisions on their flat top, while five had two incisions and only one presented consecutive linear short-incisions on the outer face of the thickened lip.

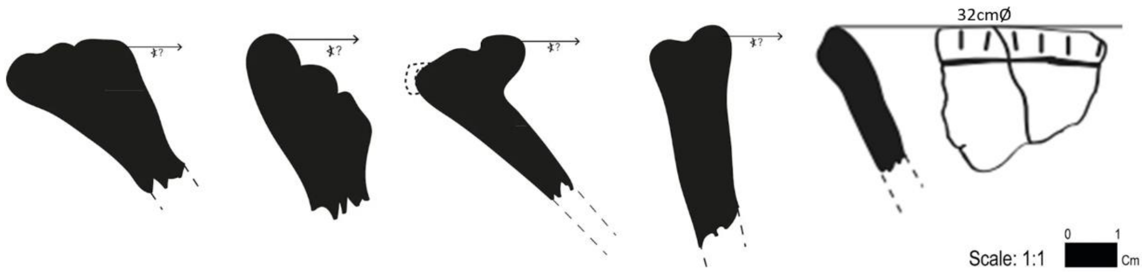


Figure 6.5-31*. Different incised rims from Rock Feature-1, Culebra site. Single and double incisions are present in exteriorly and interiorly thickened rims. Linear incised decorations on the outer rim are also present.*

Incisions on the top of the rims varied in thickness and depth, depending on whether they were single- or double-line incised rims. Single line incised rims have shallow and broad (<3mm) linear incisions, while double-incised ones present shallow and thin (1mm) ones. Although they were performed with a different tool, differences in thickness might be associated to the design and use of space available in the flat top of the rim, rather than a distinct decorative technique.

A sample of decorated sherds from the Rock Feature-1 was photographed during the first season in Culebra back in September 2015. These sherds were not taken for further analysis, using field notes and photographs form the first season to account for their decorative techniques. All of these ceramic fragments belong to the Coarse Sand macro-fabrics. Most of the recovered sherds form that first opportunistic sampling consisted of body sherds (n=10), rim sherds (n=4) and handles (n=2).

As seen in ***Fig.6.5-33,*** six body sherds are incised, two of which also show punctation***.*** One of the incised body sherds has a concentric incised design (-L-). While five of the incised sherds have a thin (1mm) and shallow incised line (b, c, f, h, i), the concentric design has a deeper incision. Based on its granularity, both types of incisions were made when the clay paste was leather hard, which means the deepest incision is not due to hygrometry but is rather intentional. This kind of deep incision, combined with punctation, is found on one flanged rim (-n-), similar to the ones previously described***.***

Figure 6.5-32. *Decorated ceramic sherds recovered from the Rock Feature-1 at Culebra site in September 2015.Photo courtesy of José R. Oliver, 2015.*

In contrast, sherd ‘a’, is the only one to exhibit a short and deep horizontal incision. All incisions are about 1cm in length and have a similar thickness (<1.2mm). They are all performed with the same tool, and based on the granulometry of the incised trace, the clay was leather hard when the incisions were made. This is the only sherd with this kind of decorative technique in all Culebra site. Finally, sherds ‘j’ and ‘k’ are handles with applique nubbins.

6.5.5.6 Firing

Petrographic analysis of the ceramic sherds was used to reconstruct aspects of the firing conditions. They were calculated based on clay matrix optical activity, transformations of micaceous minerals and presence/absence of dark cores. The Black Coarse Sand sherds, from the Granitic Family, usually showed a darker core, which might be due to an incomplete firing or a reducing atmosphere (Rice, 1987). Coarse Sand sherds, from the same family, show a strong red colour and did not have darker cores, for which it could be argued they were fired in an oxidizing atmosphere and the fire was complete. The clay matrix in all samples exhibited birefringence, which indicates a firing temperature of <800-850°C (Quinn, 2013. p.191). Cream Coarse Sand sherds, from the Granitic Tempered Family, showed less optical activity, which is related to higher temperatures. Nonetheless, biotite inclusions present in this fabric samples exhibit a normal birefringence and cleavages, which indicates a temperature below 900°C (Quinn, 2013. p.191).

6.5.6 Vessel form

At Culebra archaeological site, from a total of 3,638 ceramic sherds recovered in all three trenches, only 79 sherds were diagnostic for form, which represents less than 2% of the sample. However restricted, the information obtained from these fragments is significant since it shows important discontinuities that can be associated to stratigraphic and chronological changes, and eventually to different occupation periods.

Given that Culebra sample was significantly eroded and fragmented, no complete vessels were found on site. Form analysis had to be performed mostly on small fragmented rims, and very few bases, handles and decorated body sherds. Under these circumstances, we examined mostly rim and lip attributes, as an expression of particular pottery-making practices, where its implementation and consistency can also serve as an index to track changes through time.

Both rims and lips are located within the upper vessel segment, which, as explained in the methodology, can be classified between two main structural forms based on the projections of their contours: restricted and unrestricted vessels. These classes are associated to certain functions and they will be used, in conjunction with the modes defined for each dimension –i.e. rim, lip, handle, base, decorative techniques- to characterize a ceramic complex (*sensu* Lathrap, 1962 p.42), made by a certain group of people during a short period of time, following a particular set of rules.

By analysing each dimension individually for each trench, context and level, some important patterns are elucidated. For Trench B, the comparison was not made in terms of contexts since all diagnostic archaeological materials for form were recovered in Cx.201. In this case, Cx.201-I corresponds to arbitrary level 3 (15-20cmBS) while Cx.201-II matches level 6 (30-35cmBS), separated by a sterile layer, above and below, which correspond to at least two different occupations. For the ceramics of Rock Feature-1, the analysis was made separately since it constitutes a surface sample situated in a different locality of the site.

6.5.7 Vessel form Modal Analysis Summary in Culebra

Modal analysis for each dimension analysed in the Culebra ceramic samples was conducted in order to identify significant patterns through time and space. An extended analysis on rim and lip modes can be found on ***Appendix 12***. The main modes, their distribution and combinations are found in the following section.

6.5.7.1 Rim and lip dimensions:

Three rim angles were described for Culebra site, two corresponding to unrestricted vessel upper segments (i.e. Direct and Out-sloping) and one to restricted vessels (i.e. In-sloping). As for lip treatments, nine different lip modes were identified in all the sample.

TU-A had all three different rim angles. Unrestricted Direct rim angles were present in all contexts, while Out-sloping and In-sloping rims were only reported in Cx.101 (5-25cmBS) and Cx.103 (25-40cmBS). Even though in Cx.101 the Out-sloping rims represented the majority, in the upper context there were only Direct rims and in the bottom context there were no clear preferences, with all angles present in similar proportions. Restricted vessels are always rare, with very few sherds in Cx.101 and Cx.103.

As for the lips, in Cx.100 (0-5cmBS) and Cx.103 (25-40cmBS) only flat and rounded lip treatments are observed, showing nearly the same frequencies. The latter suggest there is a more flexible criteria which tolerates variation between flatness and roundness. Also, it was difficult to sort the sherds from these contexts consistently by lip treatment, given that the applied pressure seemed uneven. The latter could be interpreted as a one 'Flat to Round Lip' mode for both contexts.

A different behaviour occurs in Cx.101, where the two treatments could be easily differentiated into Flat Lip and Round Lip (i.e., two modes). In here, there is a clear predilection for the Round lip, with twice as many sherds as the Flat one. Aside from these two lip modes, other rare lips such as the Externally Round, Externally Flat, Bilaterally Flat and Tapered lips are also reported, making this context the most diverse of all in this trench.

Lowering the scale, rim and lips distribution per arbitrary level reveals a much more shorter time period for each mode. Although the Out-sloping Rim mode often predominates in each level, its popularity decreases with increasing depth. The difference in frequency between Direct and Out-sloping rims is more accentuated in levels 2 (5-10cmBS) to 4 (15-20cmBS) where Out-sloping Rims are the most frequent. The latter mode reached its peak in the upper levels of the trench, dated to cal. AD 775-967. Direct rims are most popular in the transition levels 2 (5-10cmBS) and 5 (20-25cmBS), while In-sloping rims are represented by rare sherds only in levels 2 (5-10cmBS), 4 (15-20cmBS) and 6 (25-30cmBS).

Round Lip treatment predominates in most levels in TU-A; however, its frequency peak is restricted to levels 4 and 5 (15-25cmBS), at the start of Cx.101. Although Round lip remains popular throughout Cx.101, in the top two levels 2 and 3 (5-15cmBS) it is closely followed by the Flat lip treatment. The diversity of lip treatments is also just visible in this top-end part of Cx.101, for which this later period seems to have a differentiating criterion. This late diverse part is definitely latter than the Lv.4 (15-20cmBS) radiocarbon date which yielded cal.AD 775-967.

TU-B has only unrestricted upper vessel segments, with both Direct and Out-sloping rims and a clear preference towards the latter in Cx.201-I (Lv.3 [15-20cmBS]). Only one Out-sloping Rim was also reported in Cx.201-ll (Lv.6 [30-35cmBS]). Lips are also less diverse than in TU-A, with only five different modes, all of which are present in Cx.201-I (15-20cmBS) —including popular modes as the Round lip, less common modes such as the Externally Flat, Externally Round and Bilaterally Flat lips and the rare Direct lip—. This level is associated to a radiocarbon date of cal.AD 1024-1155. The bottom level only has one Flat lip reported.

Finally, the Rock Feature-1 has Direct and Out-sloping Rims in equal proportions, which show a striking diversity of lip modes, more varied than the ones reported in TU-A. In here, eight different lips were identified, among which the Flat is the most common, followed by the Round and Externally Flat. Rare lips such as the Internally Flat and Internally Round lip modes were also present and are exclusively found in this feature. Additional rare lip modes were the Bilaterally Flat and Tapered lip modes.

6.5.7.2 Body dimension:

All body sherds lacked any sharp inflections or marked corner points, suggesting simple contours, mostly globular or semi-globular body shapes.

6.5.7.3 Handles dimension:

Handle fragments and handle attachment scars on body sherds were reported in TU-A and the Rock Feature. In TU-A, three handles were recovered from Cx.101, with an associated date of cal. AD 775-967. Two modes were distinguished in terms of form: two of these handles had a C-shaped hemispherical profile silhouette while the last one presented a bigger and vertically extended D-shaped (***Fig.6.5-33***). This last one had a round applique decoration on the top.

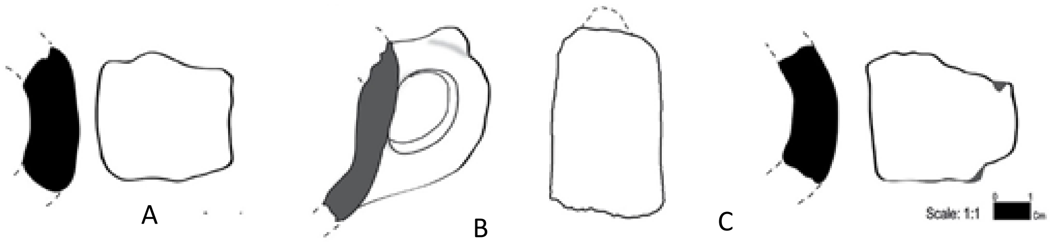


Figure 6.5-33*. Handles from Trench A, Culebra site. Hemispherical handles or C-shaped (A and C) and applique decorated strap handles or D-shaped (B). Level 2 (5-10cmBS) on the left, Level 3 (10-15cmBS) on the right.*

Three fragments with handle attachment scars were also discovered at TU-A, Cx.101. These fragments corresponded to a rim and two body sherds (***Fig.6.5-34).***

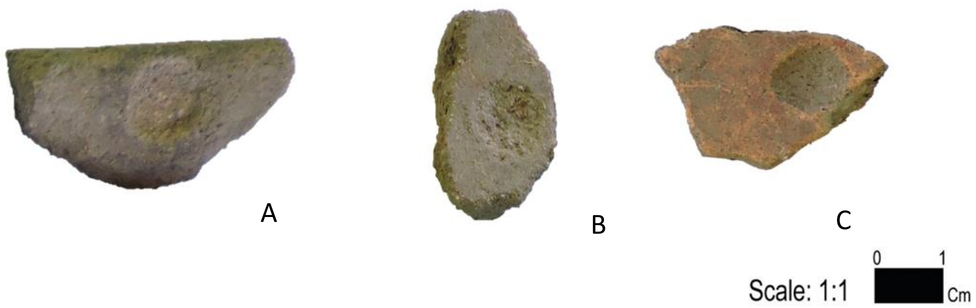


Figure 6.5-34. *One rim (A) and two body sherds (B and C) with strap handle scars found in Trench A, Cx.101.*

In the Rock Feature-1, two D-shape handles with circular applique nubbins on the top (***Fig.6.5-35***) were also recovered.

Figure 6.5-33. *Handles from the Rock Feature-1, Culebra site. Photo by Natalia Lozada, 2016..*

6.5.7.4 Base dimension:

Two base modes were defined for TU-A. Only one Annular base was found in Cx.101 (Lv.2 [5-10cmBS]). Since recognizable base fragments are very rare in the sample, it is fair to assume that the second mode would be the Direct flat base. This last mode is also assumed for TU-B, where no base sherds were identified, most likely due to a high fragmentation rate which did not allow to differentiate body from base sherds. For the Rock-Feature-1, two flat bases and one annular base were identified (***Fig.6.5-36***).

Figure 6.5-34. *Vessel with flat base (left) and an annular base (right) from the Rock Feature-1, Culebra site. Photo by Natalia Lozada, 2017..*

6.5.7.5 Mode combinations:

To see if there is any co-occurrence of rim angle, lip treatment, paste recipe modes and decorative techniques, a set of mode combinations were examined to evaluate whether their occurrence is independent or dependent of each other (see Lathrap 1962:231). By determining the mode combinations that consistently co-occur, it is possible to establish distinct types (Spaulding in Lathrap 1962:232) that allow to define vessel forms. In this case, we can only reconstruct the form of the upper segment of a vessel, given that body sherds lacked any inflections and rim fragments were often too small to project the vessel's wall with confidence.

-Rim/lip: In TU-A, most of the rim sherds (80%) were recovered in Cx.101 (5-25cmBS), where they present the largest rim and lip combinations compared to the overlying and underlying contexts. While in Cx.103 (25-40cmBS) and Cx.100 (0-5cmBS) both unrestricted and restricted vessels appear associated only with 'Flat to Round' lip modes, in Cx.101, unrestricted vessels (Direct and Out-sloping Rims) have between three and five different lip modes and restricted (In-sloping Rim) vessel have two. Out-sloping Rims predominate in the sample, and appear mostly with Round, Flat and Tapered Lips, and more rarely with Externally Flat and Bilaterally Flat lips. Direct rims are mostly associated with Round and Flat lips (***Fig.6.5-37***), and less often with Externally Round lips, while In-sloping Rims only have Round and Flat lips in equal proportions.

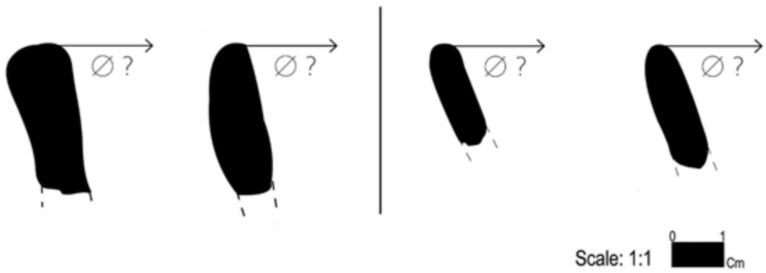


Figure 6.5-35*. A2 'Direct rim with Rounded Lip' (left) and B2 'Out-sloping rim with Rounded Lip' from Cx.101, Trench A, Culebra site.*

A significant change occurred in Cx.101, where the Flat and Round lip criteria became more standardized and easier to distinguish, and where three more lip modes were introduced in the sequence. These last lip modes are rare and only present in levels 2 and 3 (5-15cmBS) within unrestricted vessel rims (***Fig.6.5-38***). Direct Rims have an exclusive association with the Externally Round lip while the Out-sloping rims are the only ones with Externally Flat and Bilaterally Flat lips. Although the latter appears in rare quantities, and are seems to be a short-lived choice, it appears to be chronologically sensitive. This proliferation of rim/lip combinations occurring above level 4 (15-20cmBS) dates later than cal. AD 775-967 (2σ) (OxA-34371.

This behaviour can be characterized as discontinuous variation resulting from the addition of new modes and mode combinations. Round and Flat lips in both kinds of unrestricted vessels remained the predominant ‘choice’ throughout the entire sequence and, in some cases, keeping the same frequencies, which reflects continuous variation for these mode combinations. These latter mode combinations of form may not appear to be ‘culturally’ distinctive or significant since the resulting upper vessel forms are also produced by most groups from different periods around the study area. However, the discontinuous variation above noted can be interpreted as new norms being applied in vessel construction (Lathrap, 1962 p.226), a shift that introduced changes in material culture signalling a chronological border between the upper and lower parts of the deposit.

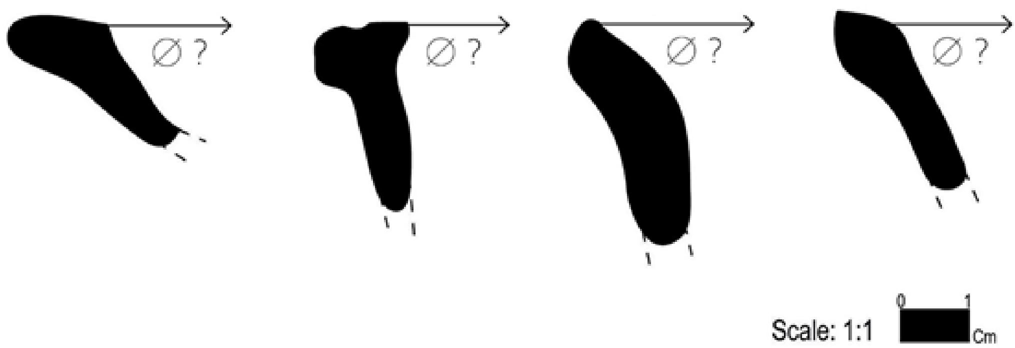


Figure 6.5-36. *B4 ‘Out-slopping rim with Externally-thickened flat lip’ (left), B5 ‘Out-slopping rim with bilaterally-thickened flat lip or T shaped)’ and B6 ‘Out-slopping rim with tapered Lip’ (last two to the right). Trench A, CulebraA2 ‘Direct Rounded Lip’ (left) and B2 ‘Out-sloping Rounded Lip’ (right) rim and lip combination for Trench A, Culebra site.*

In TU-B, all but one of the rims were recovered from Cx.201-I, with an associated date of cal. AD 1024-1155. All rims corresponded to unrestricted vessels. A single Out-sloping rim with a Flat lip was recovered from Cx.201-II, while all the other rims corresponded to unrestricted vessels recovered from Cx.201-I. In this context, Out-sloping rims were associated mostly to Round lips, followed by the Externally Round, Externally Flat and Bilaterally Flat lips. Flat lips were reported in both Direct and Out-sloping rims but are scarce.

Lastly, for Rock Feature-1, all rims correspond to unrestricted vessels. In this assemblage, Direct rims have five different lip treatments. Flat lip predominates, followed by less common Round, Bilaterally Flat and Externally Round lips and a rare Tapered lip. Out-sloping rims have seven different lip modes, making them the most diverse rim angle. In contrast to other units, the most common lips associated to this rim are the Flat, Externally Round and Internally Round, followed by rare Round, Tapered and Internally Flat lips. Exclusive lip modes form this assemblage such as the Internally Flat and Internally Round are only present among the Out-sloping rim vessels. Also, Bilaterally Flat lips usually found among the latter were only reported within the Direct rims in this feature.

-Rim/lip and paste: In TU-A, the Granitic Family, which comprises Coarse Sand and Black Coarse Sand macroscopic fabrics, presented the largest rim/lip combinations. Coarse Sand macro-fabric had up to 12 different combinations, nine of which occur within Cx.101 (5-25cmBS), and mostly between levels 2 to 3 (5-15cmBS). Granitic Family rim sherds correspond to both unrestricted and restricted vessels, all of which appear with Flat and Round lips as the more common combinations. Black Coarse sand macro-fabric, from the Granitic Family, is associated to both restricted and unrestricted vessels. It has different rim orientation for every arbitrary level within Cx.101; however, despite the rim mode, it always appears associated to the Flat lip mode. The Fine Sand macro-fabric, a finer-grained fabric of the Granitic Family, only presents Out-sloping rims, mostly with Round lips. However, between the top-end levels of Cx.101, five new rim modes appear within the unrestricted vessels of the Coarse Sand macro-fabric sherds. Direct and Out-sloping rims with Externally Round, Externally Flat, Bilaterally Flat and Tapered lips are exclusive of this family and only occur in these levels, reflecting the introduction of new modes in the sequence for a relatively short time.

Granitic Tempered Family, to which the Cream Coarse Sand macro fabric belongs to, is only associated with a Direct Rim mode throughout the entire sequence, mostly combined with Rounded Lips (***Fig.6.5-39***). Likewise, the Cauixí and Sand macro fabric, part of the Mixed Fibre Family, is associated just with an Out-sloping and an In-sloping Rim, both combined with Round Lip modes. These last family appears only in the top-end levels of Cx.101 (5-15cmBS), however, it does not show any of the thickened and tapered lips seen in the Granitic Family sherds in this same period.

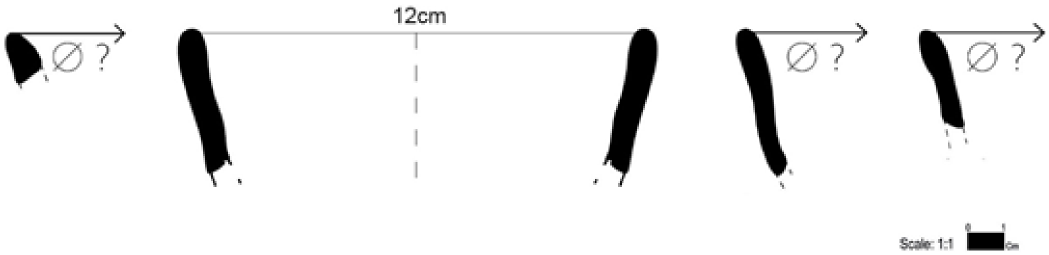


Figure 6.5-37. *Cream Coarse Sand 'Out-sloping rims with round lip" (B2) through the sequence. Trench A, Culebra site.*

In TU-B, Granitic Family sherds were the most diverse in the sample, with five different rim/lip combinations, all within the Cx.201-I (15-20cmBS). Unrestricted vessels constitute the majority of the samples, with Out-sloping rims with Bilaterally Flat lips as the most frequent, followed by the Direct rim with Flat lip. Granitic Tempered Family sherds had unrestricted vessels with Round lips but the majority where the Out-sloping rims with Externally Round lips. Mixed Fibre Family only rim-sherd had an Out-sloping rim with an Externally Flat lip.

For the Rock Feature-1, Granitic Family sherds constituted most of the samples, where only one Granitic Tempered family sherd was also analysed. While this last one showed a Direct rim with a Flat lip, the Granitic Family presented 12 combinations within the unrestricted vessels, with two exclusive lip modes as the Internally Round and Internally Flat among the Out-sloping rims. Double-incised Externally Round lips on Direct rim angled vessels were also registered exclusively in this feature (***Fig.6.5-40***).

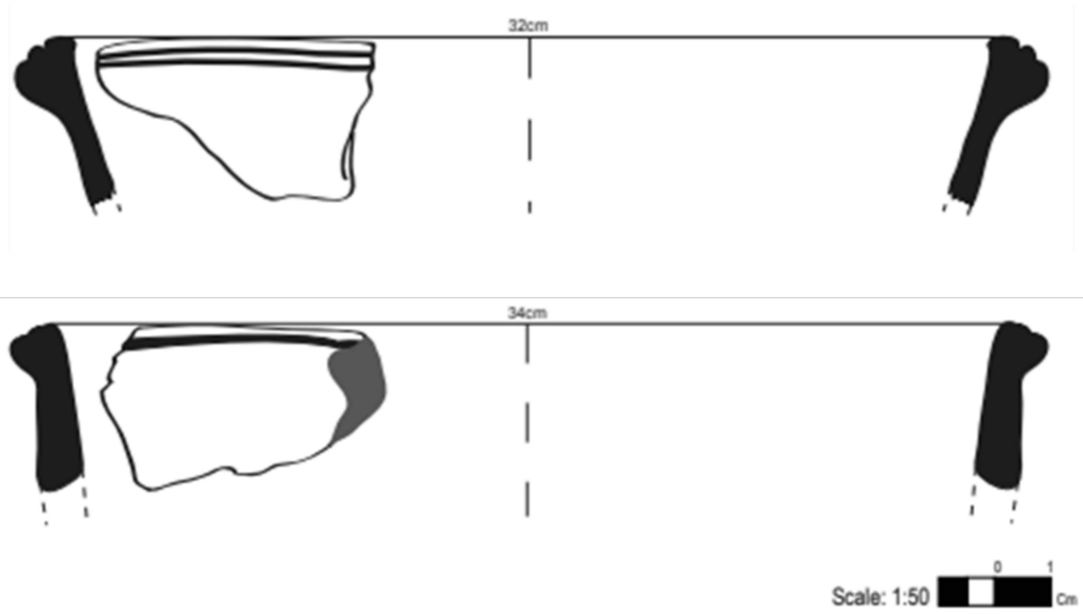


***Figure 6.5-38**. Unrestricted out-slopping externally rounded lip 'B3' from Granitic Family rim-sherds. Rock Feature-1, Culebra Site.*

-**Body and paste:** All petrographic families presented simple contour body sherds without carination or inflexions.

-Handle and paste: Both C and D-shaped handles appeared only in Granitic family sherds form the Coarse Sand macro fabric found in TU-A and Rock Feature-1. Rim and body sherds with handle attachment scars comprise both Granitic and Granitic Tempered families in TU-A.

-Bases and paste: Annular bases found on TU-A and the Rock Feature-1 corresponded to the Granitic Family. Flat bases were found in the same family and are hypothesized for the other families present in the sample.

-Paste and decoration: In TU-A, all decorated sherds belonged to the Granitic Family, and one of its variants, the Black Coarse Sand group. Sherds which exhibited decoration were reported in Cx.101, most of them in levels 2 and 3 (5-15cmBS), dated somewhere after cal. AD 775-1155. In here, incised rims and punctated and applique-decorated body sherds are first identified in the sequence. The Black Coarse Sand macro fabric presented only one incised rim in level 4 (15-20cmBS).

In TU-B, four out of five decorated sherds belong to the Granitic Fabric, and the remaining one is an Out-sloping Rim with a Flat incised lip pertaining to the Granitic Tempered Fabric. Granitic decorated sherds had incised rims and body sherds, as well as a rim with applique-nubbins. All decorated sherds were recovered from level 3 (10-15cmBS) with an associated dated of cal. AD 1024-1155.

Decorated sherds from the Rock Feature-1 were mostly rims. All decorated sherds belonged to the Granitic Family. Only three had punctation as part of a design on flat thickened rims, while the other rims exhibited single or double linear incisions on the top. Only one presented consecutive linear short-incisions on the outer face of the thickened lip. Some rims with single incisions presented shallow but broad lines (<3mm), and the single incised have a thinner incision, suggesting the use of different tools.

6.5.8 Culebra Ceramic complexes

Based on the recent excavations at Culebra site, and the subsequent analyses of the ceramic materials recovered from two trenches and the Rock Feature-1, two ceramic complexes can be defined. Before describing them, it is important to reiterate that a ceramic complex is understood here as 'the body of pottery made by a face-to-face group over a relatively short period of time' (Lathrap, 1962 p.223). It can be identified from its use of discrete attributes or modes within dimensions of variability in every production stage. Such distinct production sequence is the result of a learned craft in a given context, a technical practice or tradition which is learned and transmitted within a social group (Roux, 2011 p.81-82).

Understanding a complex as a technical tradition emphasizes its *praxis* facet, as a particular 'way of doing', maintained by repetitive actions embodied and incorporated from a learned model as a member of a group. It does not entail a cultural identity shared by the people who made them to explain its origin, transmission or association to the other styles in the area. To be able to ascertain such identity, additional evidence aside from the ceramic materials recovered is needed. The same principle applies to the concept of 'phase', which requires multiple proxies to be defined as a distinct 'culture'.

6.5.8.1 Early Culebra Complex AD 437 - 645

Culebra site was occupied through ca.720 years, between ca. AD 435-1155. Stratigraphic, technological and formal analyses suggest there are two main occupations periods. Early Culebra Occupation period took place in ca. AD435-645, in which one hypothetical ceramic complex with three different wares can be proposed.

The Early Culebra complex (i.e. hereafter EC) is tentatively defined since it is based on a relatively small sample (n=127) of highly fragmented ceramic sherds, from which no complete vessels forms were reconstructed. In this case, rim angle and lip treatment modes constituted the best evidence for vessel form reconstruction and as a result it is limited to the uppermost vessel segment. Clearly identifiable base sherds are absent, suggesting that vessels likely had rounded bases. The lack of body inflections (corner point, carination) may indicate vessels with simple contours. However, the state of sherd fragmentation precludes any firm conclusions. In addition, EC also lacked painted or plastic decoration, such as appendages and handles. In short, Early Culebra is a formally and stylistically simple and plain ceramic complex.

EC-Coarse Sand ware comprises the Coarse Sand and Black Coarse Sand macro-fabrics, characterized as part of the Granitic Family. This ware was made using an Fe rich residual clay with poorly sorted quartz, feldspars and biotite derived from a granitic weathered parent rock with different breaking stages, congruent with the local resources available in the Parguaza Granite formation where Culebra site is located. Forming techniques are limited to coiling, assembled in alternation and/or from the inside to the outside, jointed by drawing (i.e. *étirement*). This ware is composed of: (1) predominantly simple unrestricted vessels, with either out-sloping rims or flat-to-round lips and (2) rare simple restricted vessels with in-sloping rims and flat lips. This ware lacks any plastic or painted decoration. Due to erosion, further surface treatments are unknown.

EC-Cream Coarse Sand ware is the second ware present in the EC complex which corresponds to the Granitic Tempered Family. Made using a Fe poor sedimentary clay source tempered with sub-rounded quartz and microcline feldspars from a granitic derived parent rock, available in the local area. Only one rim/lip combination is reported for this fabric, an unrestricted vessel with a direct rim with flat to round lip. It lacked decoration.

Finally, EC-Fine Sand ware constitutes the last ware in this complex. This ware is comprised of mostly body sherds with only one exception: one out-sloping rim with a flat lip. Sherds form the EC-Fine Sand ware were fabricated with a very fine, poorly-sorted residual clay source making them easily distinguished from the rest of the assemblage. The paste used has a very similar composition to the one found on the EC-Coarse Sand ware, from the Granitic Family; however, the inclusions are finer and were probably crushed before adding them to the paste. These sherds were a minority among the sample and could be intrusive (trade imports); however, more formal elements are required to reach a definitive conclusion.

Given that no complete vessels were recovered from the EC-complex, the vessel set proposed for this period could not be reconstructed. From the few rims found on the excavations we can speculate on the existence of open mouth bowls or platters, simple contour hemispherical shapes, and the absence of griddles and bottles.

Likewise, neither complete nor large segments of vessels were recovered from the EC-complex, the vessel set proposed for this period could only be tentatively reconstructed for their upper vessel segment. From the few rims found we can speculate on the presence of open-mouthed bowls or platters (simple contours). Perhaps due to high fragmentation no clear griddle sherds were identified, although they may be, in fact, absent. Other vessels with marked contour inflections were not detected.

6.5.8.2 Late Culebra Complex AD 775 - 1155

Late Culebra complex (hereafter, LC) is dated between ca.AD775-1155. It contains four different wares. This complex is defined from 1,973 ceramic sherds from which only three different vessel forms were reconstructed. Although the fragmentation rate of the ceramic materials is greater in LC than in EC, their better preservation and additional diagnostic features allowed for a more reliable, fuller definition of this complex.

LC-Coarse Sand is a locally-made coarse ware which, in terms of paste, forming and fashioning techniques, preserves the same characteristics as the EC-Coarse Sand ware and only differs in formal and decorative traits. It is characterized by having mostly out-sloping rim angles. Round lips constitute the most popular choice during the early part of the late period, but in the opposite end they share preference with flat and tapered lips. Rare lip treatments such as the externally, internally and bilaterally flat lips, mostly associated to the out-sloping rims, only appeared in this late part but do not constitute the norm.

Hemispherical C-shaped and D-shaped handles, as well as ceramic body sherds bearing handle-scars, are associated with the LC-Coarse Sand ware. C-Shaped handles are undecorated, but a few D-shaped handles —found at the top of Trench A and the Rock Feature-1— present round applique or 'nubbin' decorations on the top. The latter's stratigraphic location on the trench seem to suggest they appeared after cal. AD 775-967 2σ (1158 ± 26 BP, OxA-34371).

Two bases: an annular and direct flat base, are associated to LC-Coarse Sand ware. Since these two base modes are rare, it is fair to assume that most of the base forms associated to this ware would be either flat or rounded. Given the high fragmentation of the ceramics, bases could not reliably be segregated from bodies.

The finishing and decorative stages associated present three different techniques: incision, punctation and applique. In the trenches, each technique has a specific decorative field. Incision is the most frequent and occurs as single or parallel narrow lines on the lip of the rim. The circular (dot) punctation is located on body sherds, mostly in pairs and in a random design which could not be ascertained. Nubbins are applied on top of D-shaped handles, single or in groups of three. All these decorations are limited to the upper part of the trenches, dating after cal. cal. AD 775-967 2σ (OxA-34371). However, a more diversely decorated LC-Coarse Sand ware is present in Rock Feature-1. There are flat thickened ‘T-shaped’ rims showing two incised parallel-lines. Incision also occurred in a rare body sherd with multiple, short horizontal incisions. Punctation occurs on body sherds, randomly or following a pattern of concentric circles.

A continuity in terms of raw materials, gestures and technical production suggests that the makers of the EC-Coarse Sand ware adopted new formal features such as thickened lip modes, annular bases, handles and decorative traits for a relatively short period of time, possibly influenced by contacts with a Barrancoid ceramic tradition reported further down river, prior to the Arauquinoid expansion through the Orinoco.

LC-Cream Coarse Sand ware, a continuation from its homonymous on the previous period in terms of paste preparation and associated forming techniques, varies in this period in the incorporation of new lip treatments. As with the LC-Coarse Sand ware, this fabric presents direct and out-sloping rims with round or flat lips as the preferred combinations for the entire sequence. However, during the late part of the sequence -associated with an AMS date of cal. AD1024-1155 (OxA-34373)- out-sloping rims with externally thickened round and flat lips are more common, although only on one of the excavated trenches (Trench B). Finally, one body sherd from this ware showed handle-associated scars, which suggest they could have been applied.

LC-Fine Sand ware presents some variations from the it is homonymous on the previous period. A sample of five rims excavated from Trench A which belonged to this ware, gave some additional information in terms of paste preparation and associated formal attributes. The clay used was a very fined poorly-sorted residual clay source, similar to the EC and LC-Coarse Sand wares but finer. Nevertheless, a third of the analysed samples associated to this ware in this period were made with a sedimentary clay source tempered with organic fibre siliceous inclusions, which correspond to unidentified plant vessels’ loose structures. Related rims corresponded mostly to out-sloping vessels with rounded lips. These rims were not big enough to give an approximate diameter, limiting the formal reconstruction of the vessel set.

LC-Fibre and Cauixí ware is an intrusive ware and must have been imported. The frequencies in which it was found at Culebra site for this period -ca. 4.5%- makes it a rare ware within the assemblage. However, its presence marks the entrance to the Late Period, along with the new implementation of formal and decorative attributes, somewhere around cal. AD775-967. None of these new attributes are reported within this ware. It uses a sedimentary clay source, similar to the one employed for the EC- and LC- Cream Coarse Sand, although in this case it is tempered with organic siliceous structures such as charred and un-charred tree bark, fibre siliceous inclusions and sponge spicules, in order of abundance. Sponge spicule frequencies are too low (≤10%) to confirm they are intentionally added or naturally occurring. Tree bark tempered inclusions share a unimodal elongated size, suggesting some sort of sieving and burning before adding them to the paste. Based on the latter, this ware was associated to the Mixed Fibre petrographic Family. Sherd size and high fragmentation rate did not allow to obtain information on forming and fashioning techniques associated to this ware. Two rim sherds which belonged to this ware correspond to one out-sloping and one In-sloping rim, both with round lips. No decorative traits were reported associated to this ware.

Vessel set associated to the Late Culebra complex is mostly limited to the sand wares -with quartz and feldspars inclusions-, which were larger and more complete. Most of the sherds correspond to circular horizontal cross sections. Overall, three different vertical cross section forms can be defined, as it can be seen in the vessel form summary for Culebra site ***Appendix 13***.

The identified forms in Culebra correspond to unrestricted vessels with simple contours and variable mouth width. These are Forms 1a, 2a, 3b and 3c, which present direct and out-sloping rim angles and pertain to moderately deep bowls and cylindrical vessels (see ***Appendix 14*** to see the description for each form).

6.6 PICURE (AM-2)

6.6.1 Geographic Context

Picure is one of the several islands located in the Átures Rapids, the first natural toll upriver, given its strong currents and narrow passages which difficult its passing without the use of a motor-boat. Along with Cotúa, Zamuro and Vivoral, these islands are remnants of the Middle Proterozoic Parguaza Granite formation, which crosses the Orinoco river towards the west in the form of igneous and metamorphic bornhardts and outcrops on the surface (Briceño and Schubert, 1989 p.125). This formation is characterised as a coarsely crystalline, porphyritic granite and biotite granite (US Geological Survey and Corporación Venezolana de Guyana, 1993 p.14).

Figure 6.6-1. *Aerial view of the north portion of the Átures Rapids. Image taken with a Phantom 2 Vision+. Source: Phil Riris, 2016.*

The rocky islands that comprise the rapids (***Fig.6.6-1***) are located less than 4km away from the main port of Puerto Ayacucho. Each of them has a soil layer and vegetation cover, formed by the accumulation of sediment. The deposition regime is dictated by the seasonal flooding. During the rainy season (April-November), the mean precipitation varies between 200-300mm a month, while in the dry season it lowers by half, with 100-125mm a month (Hamilton and Lewis, 1990 p.492; Schot et al., 2001 p.11). Recent reports by local fishermen claim the highest flooding does not reach the top of the islands, which remain above water level during this season (***Fig.6.6-2***).

Figure 6.6-2. *Dry (above) and wet (below) seasons on the Átures Rapids. Photographs taken on January 2016 and September 2015, respectively. Source: José R. Oliver, 2016.*

Although the vegetation on top of the islands reflects a recent and significant anthropogenic influence (e.g. mango trees [*Mangifera sp.*]), there are some areas that still preserve local species (***Fig.6.6-3***). Casmophitic vegetation, which grows directly on top or in the middle of the granitic slabs on the borders of the island, is commonly represented by 4-6m tall trees and bushes such as *Ficus sp., Vochysia venezuelana* or *Copaifera pubiflora.* (IGAC, 2014 p.123). It also contains higher trees in its interior, common in riverine areas, such as chestnut tree (*Guarea sp*.), cumare palm tree (*Astrocaryum chambira*) or black guarumo tree (*Pouroma aspera*) (IGAC, 2014 p.121).

According to the trench excavations, the sediments throughout the site are characterised by a fine sandy silt that, in various locations, included relatively well-sorted rounded to sub-angular fine and medium grained pebbles. Milky and translucent crystalline quartz, as well as yellow and red chert, are abundant on the surface and inside the trenches. Several chert fragments and other rocks were found as pendants or beads in different production stages, for which is believed they used the available material on the island to craft bodily adornments.

Figure 6.6-3. *Landscape inside Picure. In the back of an excavation unit, cucurito palms (Attalea maripa) and Ficus sp. trees can be recognized around the area. January 2016. Source: José R. Oliver.*

6.6.2 Site Description and Analysed Data

Site AM-2 is on the north portion of Picure Island. Five 2x1m test units (TU-01 to TU-05) were excavated in 2016, while TU-04 (started in 2016) was completed at the end of the 2017 season. Other activities undertaken in 2016 included recording of the rock art of the island and a systematic surface collection throughout the archaeological area. ***Figure 6.6-4*** provides the location of the excavations (TU-# or Unit- number), as well as the locations of grinding stones or *metates*, mortars, petroglyphs and filing grooves.

Most of the northern portion of Picure had been cleared recently by locals who occupied the island sporadically, using the slash-and-burn technique. Most vegetation was gone after this procedure, including grass. The latter facilitated the identification of archaeological materials on the surface and the posterior excavation of the units. Even though the excavations conducted by this project focused on the northern area of the island, it does not mean there is no evidence of ancient human occupation in the southern portion of the island, which remains unexplored.

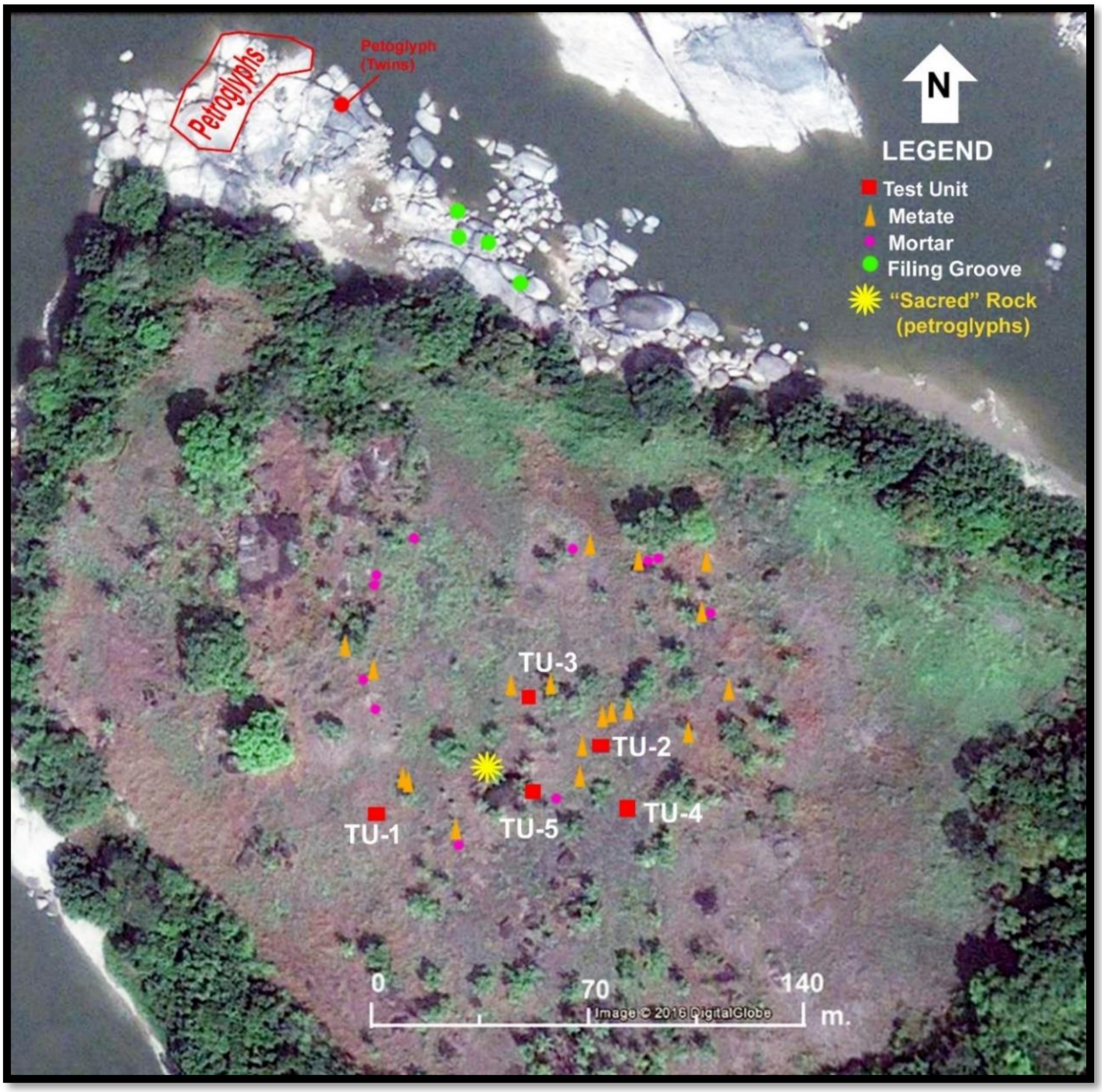


Figure 6.6-4. *Satellite image of Picure site (AM-2) showing the location of excavations TU-1 to TU-5 alongside other archaeological features. Source: José R. Oliver, 2016.*

Picure presented a very uneven surface, with both steep and gentle slopes and flat areas. Considering the lack of a total station on the fieldwork, it was decided not to implement a grid of square units for the survey. A straight line of five people located 5m from each other was set from the most northern limit of the island. Walking at the same pace, they stopped every 5m to make a surface collection. The circular collection spot was set using a 1m radius measurement. Each collection spot was given a Field Sample # (FS-#) and bag with the same ID, in which ceramic, lithics and beads were placed. An area of ca.15,000m² was surveyed using this method.

From the surface collection (***Appendix 15***), 3,176 artefacts were recovered, including ceramics, lithics and beads. As seen in ***Fig.6.6-5***, the distribution of artefacts is highly concentrated on the north-west portion -facing the rapids- with some isolated spots with significant accumulation of materials in the middle of the surveyed area (red and green-colour spots). Most of these last ones coincided with elevated areas, which resembled middens. They were distributed in a semicircle surrounding a large rock covered with petroglyphs on top and below, an important number of ceramic sherds. This rock was colloquially known henceforth as the 'Sacred Rock'. They were also surrounded by a significant number of grinding stones (n=17) and mortars (n=9), not found in any other surveyed area in the island.

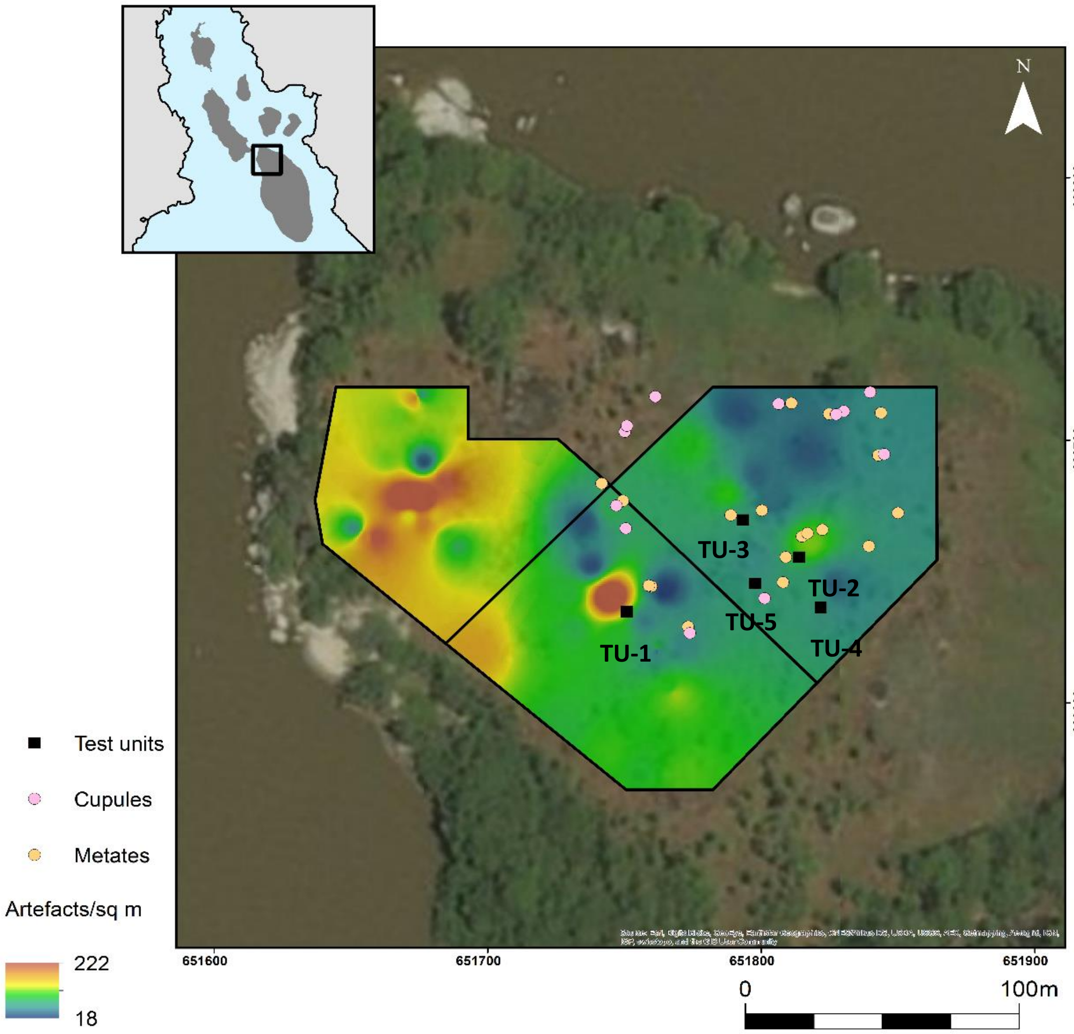


Figure 6.6-5. *Heat map built using R with the results of the surface artefact distribution according to frequencies in Picure. Courtesy of Phil Riris, 2016.*

The area with the main concentration of materials is located in a relatively flat terrain with a fairly high elevation and probably not prone to flooding during the wet season. The middle section of the surveyed area is in a slightly higher flat area, theoretically better located to see the coming visitors and passing boats, as well as better protected against flooding. Taking into consideration the topography, as well as the distribution of food processing artefacts, we chose to locate the excavation units towards the middle area of the island.

Trench excavation units were placed in areas with high artefact density except for TU-05. This last one was placed in the south slope of the Sacred Rock, in order to identify if and how deep into the subsurface the ceramic accumulation around the rock went. TU-01, TU-04 and TU-03 were located directly on top of elevated-high density collection spots, while TU-02 was located close to an accumulation of *metates,* in the middle of a flat terrain.

All trenches were 2x1m excavation units. TU-1, placed west from the 'Sacred Rock', yielded a total of 3,435 ceramic sherds in a 61cm deep trench, through five different stratigraphic contexts. From, TU-2, east of the rock, 1,228 ceramic sherds were recovered in four stratigraphic contexts. Finally, in TU-5, close to the south-east of the rock, only 164 potsherds were retrieved in a 30cm deep trench. On the other hand, TU-3 and TU-4 excavation units did not reach a cultural sterile level and were terminated due to logistical reasons. TU-3, north of the rock, presented a hardened soil and few artefacts, for which it only reached 15cm in depth, yielding just 302 ceramic fragments. Of all test units, TU-4, south-east from the rock, produced the highest number artefacts. It was excavated in 2016 and 2017, reaching a total of 4,856 ceramic sherds through three stratigraphic contexts in a 1.40m deep trench. Until the last level, even though the number of artefacts decreased significantly, the sterile layer was not found.

6.6.3 Picure Site Excavations

To understand the occupation sequence in Picure island, it is necessary to first discuss the stratigraphy, chronology and artefact distribution in each excavation unit and to compare them in order to detect similarities and differences. Most of the discussion will be focused on excavation units TU-01, TU-02 and TU-04 given that they provide an extensive profile with a significant number of artefacts and ^{14}C dates. TU-03 and TU-05, which do not have ^{14}C dates, will be briefly discussed in terms of their particularities with respect to the other three. Once the deposition patterns of the ceramic materials with their associated strata and dates for each trench is completed, a thorough analysis of ceramic wares in the surface collection and the excavation units will serve to introduce the *chaîne opératoire* reconstruction study.

6.6.3.1 Stratigraphy and chronology at Picure Site

Fifteen new radiocarbon dates (AMS) and three TL dates were obtained from Picure site. ^{14}C dates were performed using organic charcoals obtained from excavation units TU-01, TU-02 and TU-04, reported here with a 2σ calibration (***Table 6.6-1***). Two ceramic fragments from TU-04 were subjected to TL dating, one of which was broken in half and both portions were used individually for the same procedure (FS1154.01 and FS1154.02) (***Table 6.6-2***). As the two systems work on different error bases, these dates will be discussed separately, but compared using an approximate date range.

OxA#	TU	Cx.	Lv.	cmBS	Date	Error	δ13C	2σ (IntCal13)
34857	1	101/102	3	12	657	24	-27.3	AD 1280-1392
34856	1	101/102	3	12	533	24	-25.1	AD 1324-1436
34859	1	102	4	16	874	26	-27.6	AD 1045-1224
34860	1	102	4	19	488	25	-22.8	AD 1410-1447
34865	1	106	F1	50	496	25	-25.5	AD 1407-1445
34861	1	102	6	25	673	25	-26.1	AD 1275-1389
34863	1	102	7	31	633	24	-26.9	AD 1287-1396
34864	1	103	10	48	689	25	-29.8	AD 1270-1385
X-2716-27	1	104	11	55	2878	34	-24.8	1193-934 BC
34858	2	201	3	12	487	25	-27.7	AD 1411-1447
34890	2	201	6	33	769	25	-24.9	AD 1220-1280
34862	4	401	5	20-25	441	25	-26.8	AD 1422-1479
34866	4	401	8	40	509	24	26.7	AD 1400-1444
35975	4W	401	14	120	945	26	-26.7	AD 1027-1155
35728	4W	402	16	135	716	25	-24.7	AD 1258-1380

Table 6.6-1. *Radiocarbon dates for Picure site.*

Overall, the results reflect human occupations at Picure site through ca.1000 years, ranging between ca.AD450-1490. However, this site was not continuously occupied, even though it certainly does show reuse of the same locations within the island at different moments. The re-excavation of certain areas in the past -as seen specifically in TU-01-, caused a degree of disturbance in the obtained data, which is reflected in the omission of several dates associated with a feature. To explain their exclusion, and the identification of different occupations, it is necessary to describe the stratigraphic contexts and their associated dates in each trench.

FS#	TU#	Cx.	Lv.	cmBS	Date *y.a.*	Error (%)	TL Date	+/-	Date range
1148	4	401	11	50-55	561	16.77%	AD1458	94	AD1365-1553
1154.01	4	402	16	125-135	1412	13.85%	AD607	196	AD411-803
1154.02	4	402	16	125-135	1721	13.85%	AD298	231	AD 67-529

***Table 6.6-2**. TL dates for Picure site. Each date is given in y.a (years ago from 2019), a calendar date and a range according to the individual error of each sample.*

- ***6.6.3.1.1 TRENCH UNIT 1 (TU-01)***

Excavation unit TU-01 presented five stratigraphic contexts within 61cm below surface (hereafter cmBS), from which a total of 3,435 ceramic sherds were recovered (***Fig.6.6-6***). The elevation datum, recorded at a bubble line level, was placed at 20cm above the surface of the SE corner of the unit. The GPS-based coordinate on the SE corner in decimal degrees were: N 5.64044 – W 67.62979, 68±5mASL. Arbitrary levels of 5 and 10cm were excavated, using shovels and trowels as appropriate. The soil was dry-screened through a fine wire-mesh of ⅛ inch and artefacts were bagged and labelled (FS-#). The soil matrix was given a context-number according to colour and/or texture.

Context 100 (Cx.100), closest to the surface (+4cmBS), comprised mostly a dense mat of grass which covered the topsoil, followed by a silty sand greyish brown (10 YR 5/2) soil with poorly-sorted sub-angular pebbles. Underneath, Cx.101 (0-12cmBS) was also a silty sandy soil with light rooting and poorly sorted sub-angular gravel but with a dark greyish brown colour (10YR 4/2) and occasional mineral concretions. Within this context, between 10-13cmBS, a bioturbation was noted along the south and west walls (***Fig.6.6-7***). The burrow was probably made by a small *cachicamo* or armadillo (*Dasypodidae sp*.). Since we did not notice this disturbance until reaching Level 3 (10-15cmBS), it is possible that some artefacts dug-out by the *cachicamo* may have been mixed with materials from Levels 1 and 2.

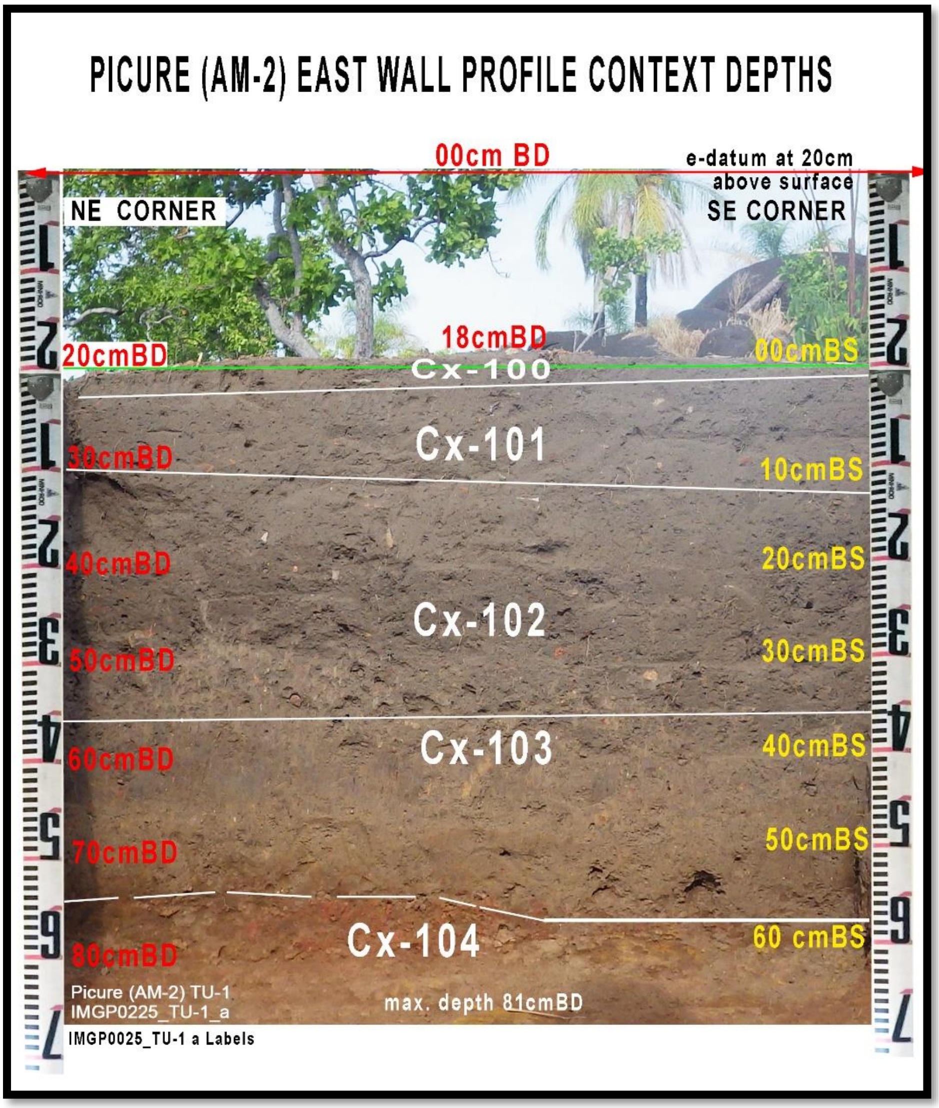


Figure 6.6-6. *The East Wall Profile of TU-01 showing the approximate context 'boundaries. The change is gradual except at the border of Cx-103 with Cx-104, which is distinct. Cx-104 is the natural basal stratum that underlies the occupations at this locus in Picure Island. A date of cal.1193-993BC was obtained at 65cmBS, where Cx-103 transitions to Cx-104. Courtesy of José R. Oliver, 2016.*

Two charcoal samples from Level 3 (OxA-34857/OxA-34856, ***Table 6.6-1***), the transition level from Cx.101 towards Cx.102, were dated with AMS and yielded cal. AD 1280-1392 (2σ 657 ± 24BP) and cal. AD 1324-1436 (2σ 533 ± 24BP), respectively. The former date appears to be too early, when compared to the dates from levels 6 and 7 (bottom part of Cx-102; ***Table 6.6-1***). Two possible explanations can be proposed: that the sample was translocated through the bioturbation noted in the SW corner or that this charcoal intruded along with Feature-1 (F1). The later was a vessel stack that was first identified in Level 9, and which dated cal. AD 1407-1445 (2σ 496 ± 25BP, OxA-34865). This last sample was found near where, in Levels 9/10, Feature-1 would be identified.

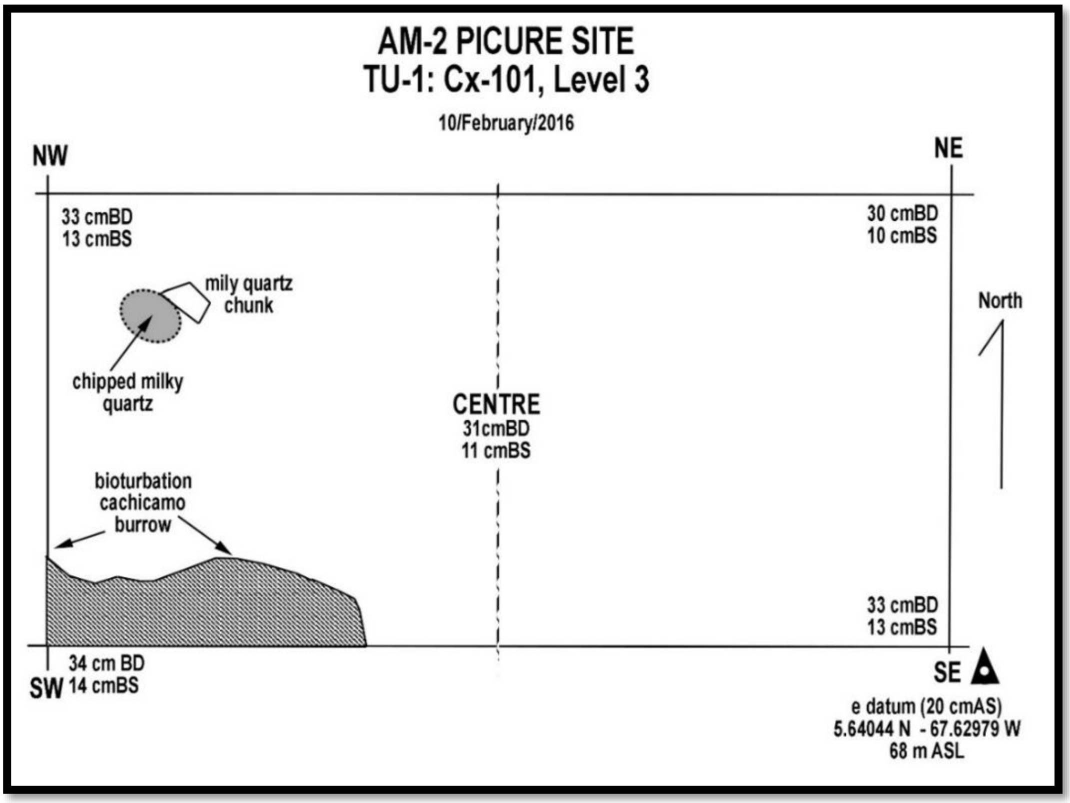


Figure 6.6-7. *Plan View of TU-01, at the base of Level 3 at 10-15cmBS. Note the bioturbation at the SW corner. Courtesy of José R. Oliver, 2016.*

Cx.102 (12-36cmBS), retained a similar silty sand texture with poorly sorted and smaller sub-angular and sub-rounded pebbles, but its colour lightened towards a greyish and yellowish brown (10YR 5/2-5/4). When moistened from the rainfall during the excavation, the soil colour switched to very dark greyish brown (10YR 3/2). In level 7 (30-35cmBS), the burrow feature was spotted again against the west wall and close to the NW corner (***Fig.6.6-8***). However, towards the end of Level 8 (35-40cmBS), the soil colour had changed to a light yellowish brown (10YR 6/4), and there were larger pebbles and gravels, making the transition towards the next context.

In Cx.102, two charcoal dates were obtained from Levels 6 and 7 (OxA-34861 and OxA-34863), which yielded cal. AD1275-1389 and cal. AD 1287-1396, respectively. Both dates overlap with each other and are statistically equivalent to the ones reported in the transition from Cx.101 to Cx.102. Even though the animal burrow does penetrate all the way up to level 7, it must also be considered that the main differences between both contexts are mostly based on colour rather than texture, for which it could be part of the same stratum but with a gradual bleaching process.

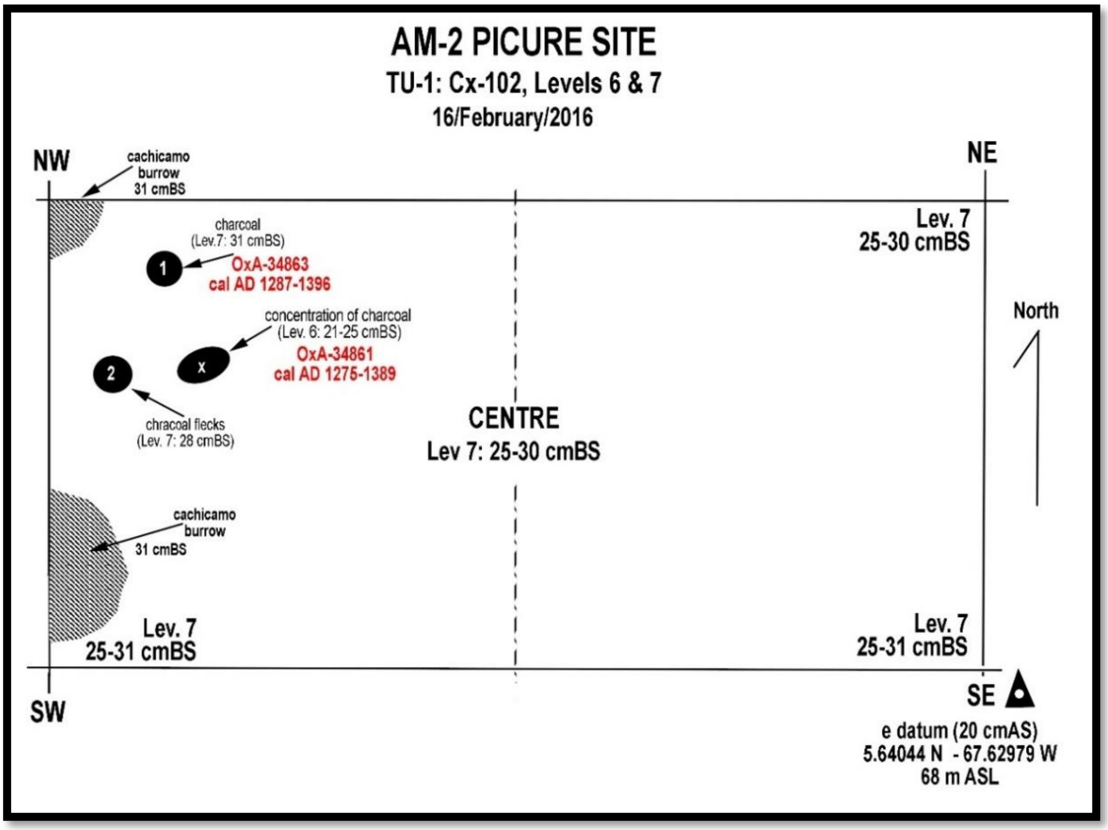


***Figure 6.6-8**. Plan view of TU-01 at **level 6** (25-30-cmBS) showing the location of the charcoal concentrations (with the calibrated dates) and the cachicamo burrow features. Note that the burrow of the SW corner shows again between 8 and 27 cm along the West wall, and 13 cm east into the unit. A new animal burrow feature emerged in Level 7 at 31cmBS in the NW corner. The dated charcoal samples are not associated with or affected by the animal disturbances. Courtesy of José R. Oliver, 2016.*

Next, Cx.103 (36-58cmBS) was characterised as having a medium to fine sand texture and a greyish to yellowish brown colour (10YR 5/3-6/4) with mottling in the main matrix. Sub-rounded gravel and pea-sized inclusions are frequent, but less so than in Cx-102. Concretions of what appears to be iron oxide were also reported. Levels 10 and 11 were only excavated in the eastern half (1x1 m) of the unit. These were the only two levels excavated in 10cm spits since artefacts in both levels were not abundant (n=117 and n=8, respectively). Charcoal fragments and flecks were also present.

One charcoal sample from level 10 (OxA-34864) was analysed with AMS and dated cal. AD 1270-1385. This date is statistically equivalent to the level 6 date (OxA-34861). Aside from the mottling, concretions and a somewhat coarser sand texture, this stratum displayed similar characteristics to the previous Cx.102, but with a somewhat lighter yellowish colour and sub-rounded gravel and pea-sized inclusions. As with the previous context, the charcoal dates and general description of the soil points to a common stratum with a bleaching process and, in this case, a slightly coarser texture.

Finally, Cx.104 (58-61cmBS), was only reported for level 12, excavated in the east quarter of the unit. This context is characterised by a highly compacted, hard-pan of brown (10 YR 5/3) soil with abundant red mottling giving it a reddish-brown (5 YR 4/3-4/4) coloration. The texture is medium to fine sand with abundant sub-angular gravel inclusions. This stratum lacked artefacts and contained no charcoal. For this reason, the excavation was terminated at this point. At a depth of 55cmBS, close to the transition point from CX.103 to Cx.104, a charcoal sample was AMS-dated (OxA-X-2716-27) (***Table 6.6-1***), yielding cal. 1193-993 BC (2σ). The laboratory at Oxford (ORAU) noted that this sample had a very low combustion yield, hence the “X” label in the ID number. Although this date cannot be ruled out, it is not associated to any artefact and so it is not taken as evidence of human occupation in Picure site.

Lastly, Feature-1, which was mentioned briefly as one of the possible disturbances which might have caused some artefact and dates mixing, was not detected until level 10 (45-55cmBS) was being excavated. A soil change was noted against the north wall, which turned out to be an intrusive pit (Cx-105: cut) filled with sediments and several large fragments of pottery (Cx-106: fill + artefacts) (***Fig. 6.6-9*** and ***6.6-10***). Both Cx.105 and Cx.106 constitute

Feature-1 and it contained 271 artefacts; all of which were ceramics. The pit reached a depth of 54cmBS. The fill consisted of a loose, light brown sand (10 YR 5/3) that included charcoal lumps and flecks. The sediment is only detectable from the surrounding matrix (i.e., Cx-103) by its loose compaction and, of course, the circumscribed bundle of large ceramic fragments within.

Figure 6.6-9. *Natalia Lozada-Mendieta and Phil Riris are excavating Feature-1 in TU-01. Note the large size of the pot sherds. Source: José R. Oliver, 2016.*

Figure 6.6-10. *Detail of Feature 1 in TU-01 with some vessel fragments still in situ. Source: José R. Oliver, 2016.*

The point of entry almost certainly was further above this depth and it went unnoticed during the excavation of the previous levels. Based on radiocarbon dates, an argument can be made that the point of entry Feature-1 is likely to be around the depth of Levels 3 or 4 (10-20cmBS). A charcoal sample obtained close to the bottom of the pit feature (50cmBS) was submitted for AMS dating (OxA-34865) and yielded cal. AD 1407-1445. This date substantially overlaps with OxA-34859 (cal. AD 1045-1224 2σ, 874 ± 26BP) and OxA-34860 (cal. AD 1410-1447 2σ, 488 ± 25BP), both from Level 4, Cx.102. According to field notes, the dated charcoal from Level 4 was obtained in the vicinity of the north wall where, subsequently, Feature-1 was identified, which can possibly explain why it is out of sequence. Here, it is argued that these younger dates in Level 4 came from charcoals associated to Feature-1, retrieved when we had not yet become aware of the feature's presence.

- ***6.6.3.1.2 TRENCH UNIT 2 (TU-02)***

Trench TU-02 was excavated through seven levels until it reached 61cmBS. Four different stratigraphic contexts were recorded in this excavation, which yielded 1,228 ceramic sherds in total (***Fig.6.6-11***). The arbitrary elevation datum stake was in the SE corner and a bubble line-level was placed at 20cm above surface. The SE corner is W 67.62922 – N 5.64061 and the elevation is 54m ± 5m (established by GPS). Arbitrary levels of 5 and 10cm were excavated using shovels and trowels as appropriate and soil was dry screened using a fine wire-mesh of ⅛ inch.

Context 200 (Cx.200) (Surface-0cmBS), consisted of the top grass roots and a fine silty sand soil with a dark greyish brown colour (10 YR 4/2). This colour might have been motivated by the high content of ash from the recently burnt savanna where this unit is located. Next in line, Cx.201 (0-30cmBS) was a medium compacted fine silty sand with a greyish brown to yellowish brown colour when dry (10 YR 5/2-54) and a dark brown colour (10 YR 3/3) when moist. The matrix had occasional oxidised concretions and some gravelly inclusions with a lustrous patina.

In levels 3 and 4 (10-25cmBS), the matrix became somewhat coarser, giving a 'gritty' feeling when trowelling. In particular, most of the artefacts were larger in size and concentrated in level 4. As seen in ***Fig.6.6-11***, the west wall profile at this depth (20-25cmBS) shows a slightly arched line of larger potsherds and some lithics, which suggest they rested on a former surface or floor-level of the deposit. A dates sample (OxA-34858) from level 3 (12cmBS) returned a date of cal. AD 1411-1447 (2σ 487 ± 25BP).

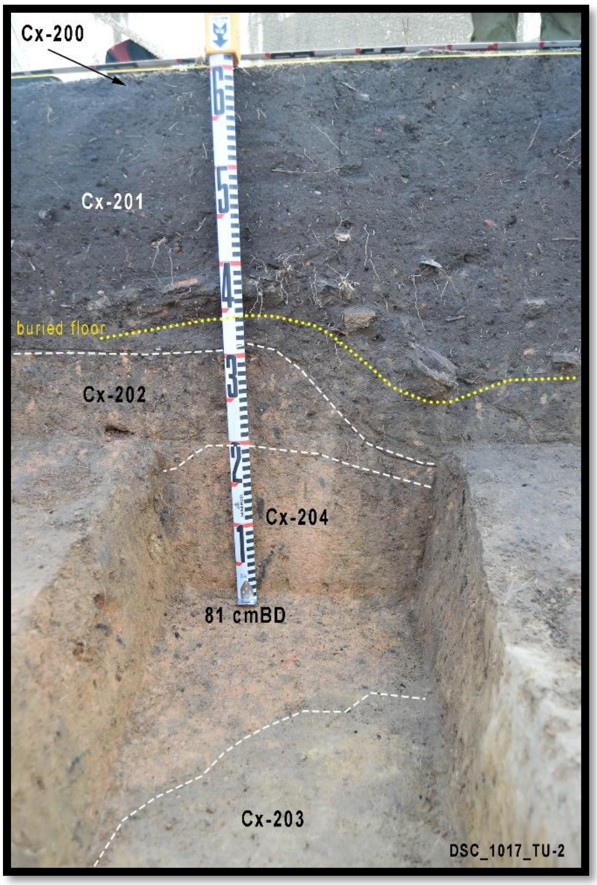


Figure 6.6-11. *TU-02 View of the central segment of the West Wall Profile and Window Excavation. Source: José R. Oliver, 2016.*

By level 6 (30-35cmBS), the sediment began to change. Towards the bottom of the level, the very dark greyish brown (10 YR 3/2) soil with predominantly sub-rounded gravelly inclusions started to exhibit yellowish (10YR 6/8) mottling with sub-angular inclusions. A carbon soot from a ceramic sample collected in the transition from Cx.201 towards Cx.202 at 34cmBS was AMS-dated (OxA-34890) to cal. AD 1220-1280. This date seems to mark the beginning of the cultural deposit of Cx.201.

Finally, Cx.202 (36-42cmBS) was characterised by a highly compacted medium sand sediment with a dark greyish brown (10 YR 3/2) colour, sub-rounded gravel inclusions and abundant large mottling of reddish (5 YR 5/6) and brownish yellow (10 YR 6/8) colours which eventually dominate over the greyish brown matrix. Artefact count in this context augmented in size and number with respect to the previous level. No dates are available for this context.

At the close of level 7 (35-45cmBS) a distinct feature appeared nearly at the centre of the unit (***Fig.6.6-12***). It was excavated as Feature Cx.203, first seen at 41cmBS. A 50x100cm rectangular window was demarcated to explore and excavate the feature. This feature had an irregular oval outline when viewed from the top. It also exhibited a highly distinctive matrix, with a brownish yellow (10 YR 6/6) fine silty sand soil that lacked any mottles, gravelly inclusions and organic materials. No cultural artefacts were encountered within it.

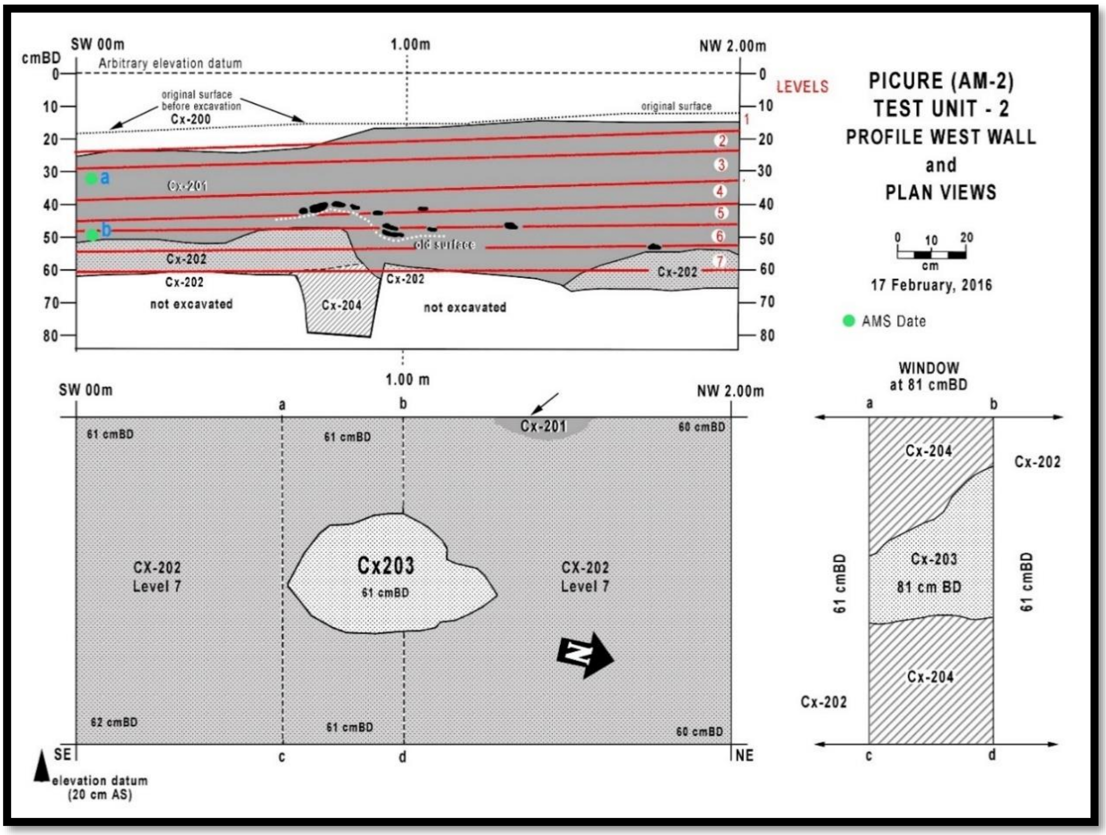


Figure 6.6-12*. West Wall Profile and Plan Views for Level 7 and Window of TU-02. Levels are indicated by red lines. Green dots correspond to AMS samples. Cx-203 consists of a pit or cut feature of a homogeneous brownish yellow fine silty sand that lacked any inclusions and cultural materials. Cx-203 originates in Cx-202 at 41cmBS (61cmBD) and cuts into Cx-204. The pit's border dramatically changed shape with depth (see plan view of Window, bottom right). Courtesy of José R. Oliver, 2016.*

The feature cuts through Cx.202 and into Cx.204. Both, the feature cut, and fill were designated as Cx.203. This feature did not extend into any of the walls of the excavation (***Fig.6.6-13***). Its point of entry is within Cx.202; and there was no evidence of disturbance through Cx.201. It appears to be a natural pit-and-fill; given that it lacks rootlets stains or charcoal. Its funnel shape towards the bottom end of the window suggest it might correspond to an animal burrow.

The sediment matrix surrounding the feature (Cx.204), is characterised by a compacted oxidised, yellowish red (5 YR 5/6) medium sand with yellow brown (10 YR 5/4) mottling. Just as Feature Cx-203, no cultural materials were recovered from Cx.204. Thus, Level 7 (Cx.202) is the deepest level of occupation in the unit. Based on the N and S wall profiles of the window, there were no more than 1-2 cm left to excavate of Cx.202 before encountering the culturally sterile Cx.204. Hence, the excavation in TU-02 was terminated.

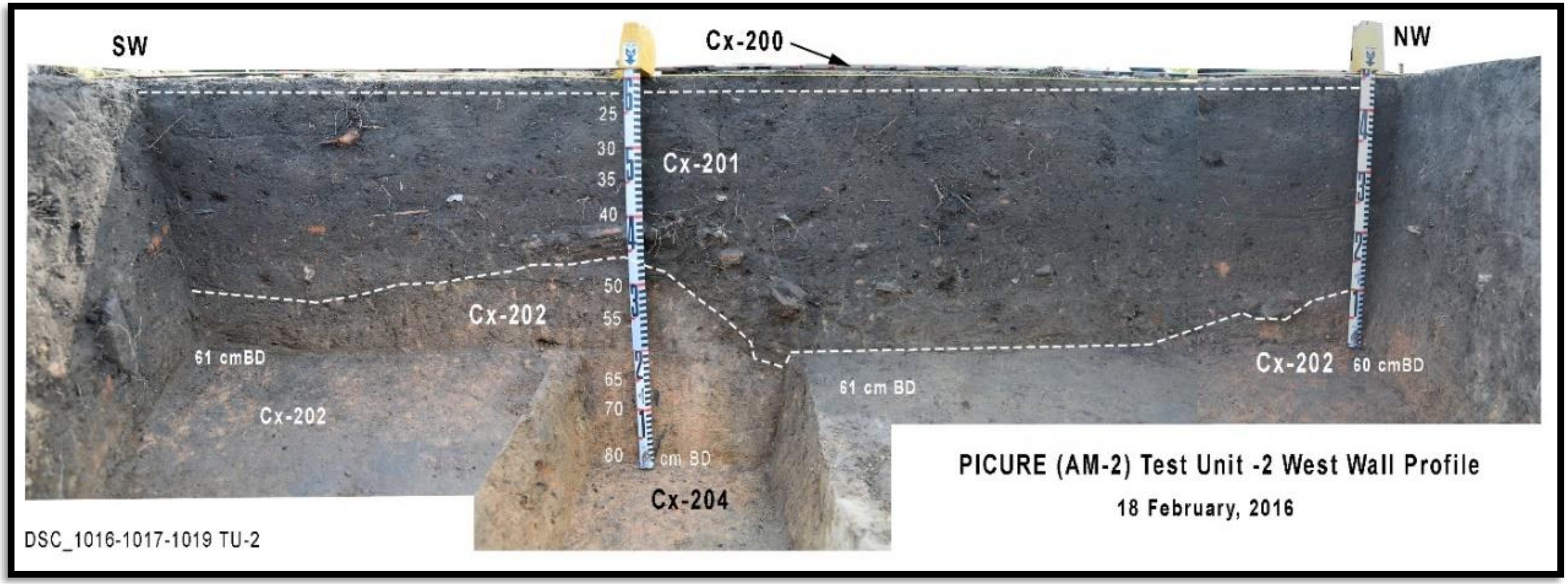


Figure 6.6-13. *Stratigraphy, TU-02 West Wall after completion. Note the arched line of flat ceramics resting on top of CX-202, between 25-30cmBS (45-50cmBD in photo) suggesting a possible buried surface 'floor' at the start of the deposit accumulation. Composite photography. Courtesy of José R. Oliver, 2016*

- ***6.6.3.1.3 TRENCH UNIT 4 (TU-04)***

Trench unit TU-04 was excavated through sixteen levels and reached a 135cm in depth, yielding a total of 4,856 ceramic artefacts. Despite being the deepest trench excavated at Picure, it exhibited only three different stratigraphic contexts. This trench was located on a raised, mounded area, south-east of TU-02. Its coordinates in decimal degrees are: N 5.640435° - W -67.629151°, 62±5mASL (GPS). It was chosen because it was one of several low but visible 'mound-like' loci found in an arch on the south perimeter of a flatten-depressed area, possibly a refuse disposal midden. The 2x1m excavation unit was excavated using arbitrary levels of 5 and 10cm, with shovels and trowels as appropriate. Soil was dry screened using a fine wire-mesh of ⅛ inch.

Excavation of TU-04 begun on 19 February of 2016 and during this season it reached 40cm below surface (cmBS) using 5cm arbitrary levels. The excavation was not completed as time ran out, and so a tarpaulin sheet was laid on the floor and walls of the unit, and then backfilled. The unit was re-opened on 10 February 2017 and the protective tarpaulin removed, exposing the unexcavated layer (i.e., top of Level 9). The elevation datum rod was re-positioned in the SW corner, but this time it had a new arbitrary elevation horizon of 10cm above surface (not 20cm as in 2016).

It is necessary here to explain some changes in the measurements from the reopening. When the unit was re-excavated in 2017, level 9 constituted the top soil. A depth measurement taken at the surface resulted in 25cmBS. In theory that depth should have been equivalent to 35cmBS had we used the 2016 e-datum figure of 20cm above surface. But there is an obvious 5cm discrepancy, since in 2016 the bottom Level 8 terminated at 40cmBS, not 35cmBS. This difference was almost certainly the result of shovelling the surface in and around the edges of the unit during the backfill operation in 2016. Although this difference is recorded on the profile seen at ***Fig.6.6-14,*** the depths given are adjusted and use the 2016 surface as reference.

From the 16 levels excavated in both seasons, the first 11 levels (55cmBS) were excavated using 5cm spits. Level 12 (55-65cmBS) was a 10cm spit of 1x1m area on the western half of the unit. In the same level, a 25x35cm window excavation was also started at the SE corner, excavated in one 20cm spit level, thus combining Level 12 and 13 (10+10cm) together. Hereafter, the window was extended to cover an area of 40x80cm. Level 14 was excavated in one 40cm spit, stopping every 10cm to clean the profiles and check for soil changes. Some specific samples, such as charcoal and seeds, were given the depths of recovery within this level. Finally, within the extended window, levels 15 and 16 (115-135cmBS) were excavated in 10cm spits each, as soil changes (Cx.401 to 402) were noticed.

Cx.400 (0-5cmBS), comprises the surface and the uppermost active organic root-mat. The highly compacted sediment matrix is a dark greyish brown (10 YR 4/2) silty sand, stained by the ash from the burned savanna. Inclusions consisted of small sub-rounded to sub-angular pebbles. This context was followed by Cx.401 which extends from 5 to 125cmBS, a 120cm thick layer. It is characterised by a compacted dark to greyish brown (10 YR 5/2-4/2) silty sand soil with small sub-angular pebbles, few concretions and charcoal fragments/flecks. The field notes indicated that among the pebble inclusions, there were small ones with a whitish-yellow patina and red cores that were good raw material candidates for the manufacture of beads and actual beads in various finishing stages.

A charcoal sample (OxA-35728) from level 5 (20-25cmBS) was dated to cal. AD1422-1479 2σ (487 ± 25BP). Another sample (OxA-34866) taken from level 8 (35-40cmBS) yielded an AMS date of cal. AD1400-1444 2σ (509 ± 24BP). The two dates are substantially overlapping and statistically equivalent, both pointing to a 15th century occupation of the island. Likewise, these dates are congruent with a TL date submitted from this context. A ceramic sherd (FS-1148) from the level 11 (50-55cmBS) was sent to Kotalla Laboratory in Germany for TL dating. The ceramic is tempered with coarse sand and has characteristics affiliated with the Valloid series, which is known to chronologically overlap with the Arauquinoid series and thus pertains to the late pre-colonial into the early colonial period. It returned a median date of AD1459, from a date range of AD1365-1553 (16.77% error) (***Table 6.6-2***).

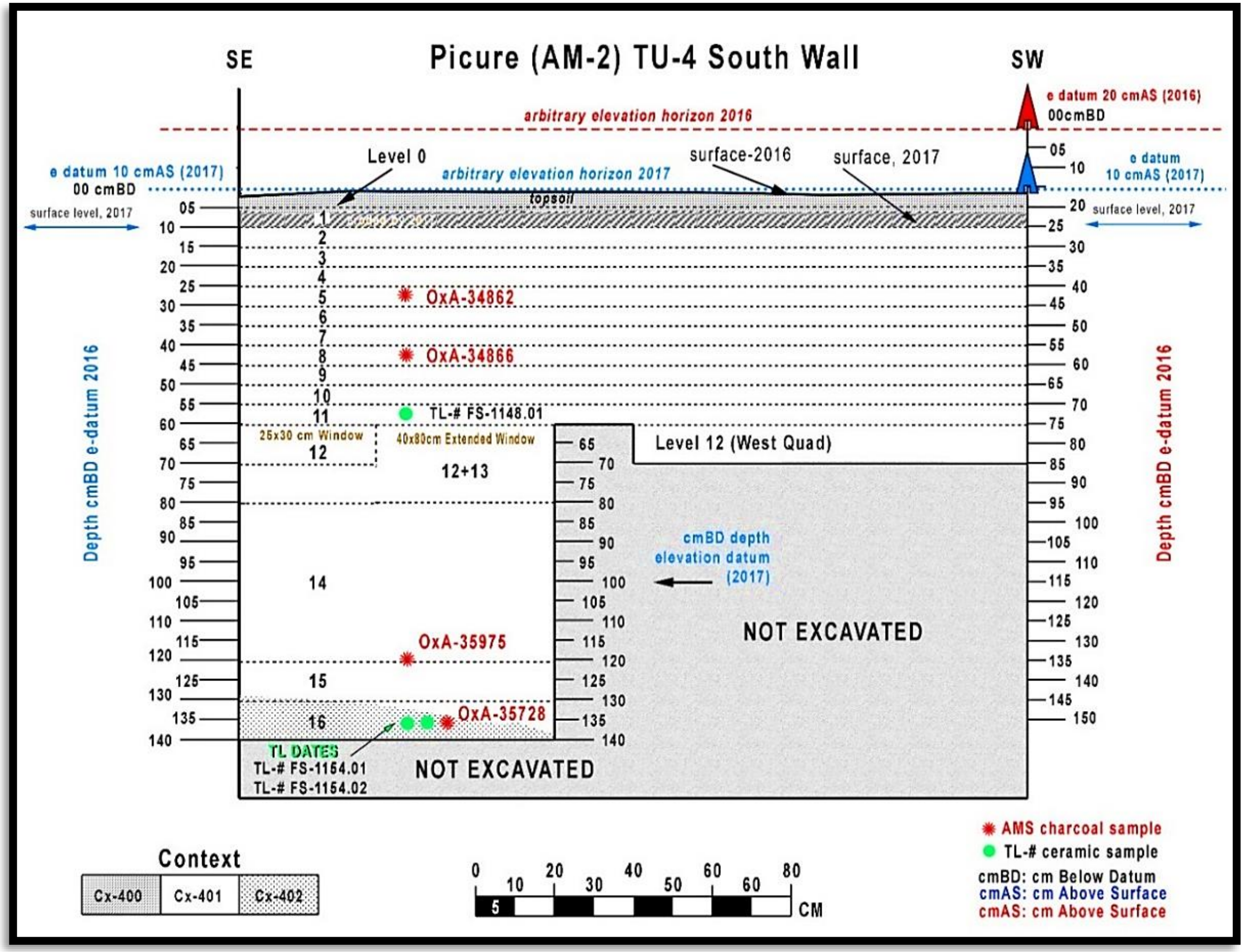


Figure 6.6-14. South Wall of TU-04: Correspondence of levels and depths cmBD (below datum) obtained from 2016 and 2017 elevation data and level boundaries (Levels 0-16). TL and AMS (OxA-) date sample locations. The 2017 e-datum was used only from Levels 9-16. Courtesy of José R. Oliver, 2017.

Level 11 was the last one excavated in a 5cm spit covering the entire 2x1m area of TU-04. From here, the excavation continued in half of the trench for a 10cm spit and through a window located in the west half of the unit (***Fig.6.6-15***). The area reduction at level 12 responded to time limitations, while the window was thought as to ascertain at what depth would Cx.401 changed to a different soil matrix.

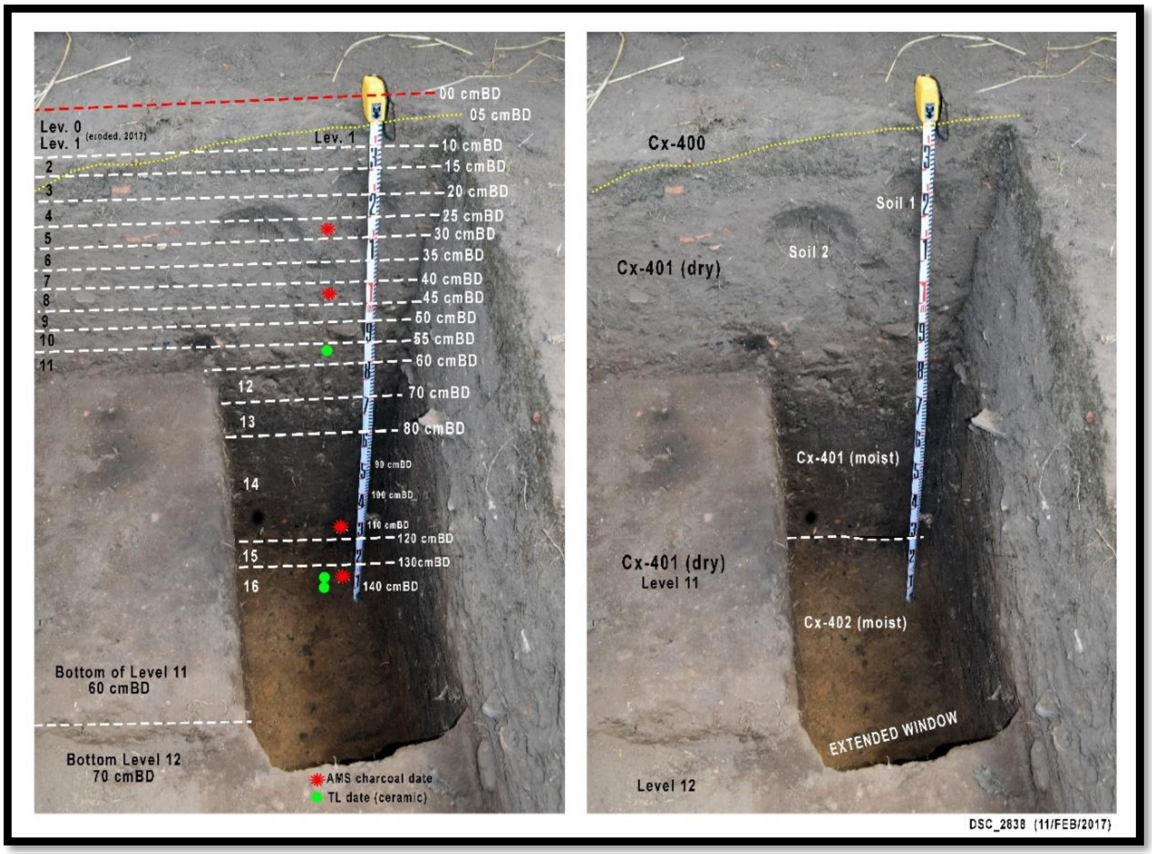


Figure 6.6-15. *Extended Window in TU-04. View toward the East. Depth in cmBD (2017 e-datum 10cm above surface) and arbitrary levels are shown on the left; context borders and the location of the soil samples (taken in 2016) are shown to the right. Source: José R. Oliver, 2017.*

In the window, the sediment characteristics remained the same as in Cx.401 until the end of level 15 (115-125cmBS), where a dark yellowish-brown colour (10 YR 4/6-3/6) started to appear at the bottom. Just before the end of this level, at the bottom of level 14, an AMS date from a charcoal sample (OxA-35975) collected at 110cmBS yielded a date of cal. AD1027-1155 2σ. Given that this date is located close to the beginning of Cx.401, it could be argued that such context extends from ca. AD1030 to 1480.

Cx.402 (Level 16/125-135cmBS) can be described as a lighter yellowish brown (10 YR 5/4-4/4) matrix with yellowish red (5 YR 4/6) mottling that did not have distinct borders. The texture is medium to fine silty sand with well-sorted sub-rounded gravel inclusions with sparse and hair-thin roots. This context comprised one arbitrary level of 10cm with very few artefacts. Of the total 16 potsherds, there were specimens apparently of Ronquín affiliation and a specimen tempered with fibre, possibly affiliated with the Cedeñoid series defined by Zucchi and Tarble (1985). Charcoal and charred cucurito palm seeds (*Attalea maripa*) were collected. One of the seeds was AMS dated (OxA-35728) yielding cal. AD1258-1380 2σ (716 ± 25BP) (***Table 6.6-1***). This date is too young and does not align with the three other dates from Levels 5 to 11. A possibility is that the charred seed had mechanically intruded from overlying layers.

To check on this charcoal date, two sand-tempered potsherds with a Ronquín stylistic affiliation were sent to Kotalla Laboratory for TL dating. Two fragments from the same pot were sent. Sample FS-1154.01 returned a median date of AD607 (13.85% error) and Sample FS-1154.02 a median date of AD298 (13.85% error) (***Table 6.6-2***). Both dates ranges overlap from AD400-500. Given that the TL date from level 11 yielded an accepted date range within Cx.401 in relation to AMS dated charcoal samples, we are confident these two other TL dates are reliable and should reject the AD1258-1380 date, as a possible seed intrusion from above.

- ***6.6.3.1.4 TRENCH UNIT 3 (TU-03) AND TRENCH UNIT 5 (TU-05)***

TU-03 unit was placed near along a trail, 25m NW of TU-2 (***Fig.6.6-16***). Its coordinate in decimal degrees are: N5.640737°- W-67.629408°, 63±5mASL (GPS). Its location was chosen as it appeared to be on a slight rise (+1-2 m) above the grassland to the east and south. This trench only reached 20cmBS in an area of 2x1m. Two stratigraphic contexts were defined as Cx.300 and Cx.301. The elevation datum was placed on the SE corner of the unit and the arbitrary horizon was set at 20cm above the surface. All the sediments were dry-screened through a ⅛ inch wire mesh.

Cx.300 comprised the top soil. The surface was composed of dry grass, gravel and pebbles of varying sizes. On the contrary, Cx-301 (0-20cmBS) was characterised as an extremely compacted soil matrix, possibly because this area was a well-trotted path. The colour of the soil was brown (10 YR 4/4) and its texture was fine sandy silt containing sparse rootlets. Inclusions consisted of a few iron-oxide concretions and rootlets were present but no abundant. Because of the extreme hardness of the soil and the relatively low yield of artefacts, it was decided not to finish this level and close TU-03.

Figure 6.6-16. *View to the east of TU-03 from the top of the "Sacred Rock". The unit (2x1m) is next to the group on the left. Courtesy of Juan Carlos García, 2016.*

Tu-05 excavation unit was placed adjacent to the east side of the Sacred Rock (***Fig.6.6-17***). Its coordinates in decimal degrees are: N 5.640518°-W-67.629368°, 73±5mASL (GPS). All around this boulder and under the overhang at ground level, there was a dense superficial deposit of artefacts, primarily lithics and ceramics that stand out in comparison to the surrounding open grassland. Among the diverse ceramics collected around the rock, there were a noticeable number of sand-tempered sherds with extended rim flanges and incised decoration.

These attributes are hallmarks of the Ronquín Sombra-like ceramics in the region. We did not expect the latter to be on the surface, as Saladoid/Barrancoid ceramics are chronologically early. Hence, TU-05 was designed to check whether the sediments fringes around the Sacred Rock were stratified and how deeply buried was the cultural deposit.

Figure 6.6-17*. View of TU-05 looking west and "Sacred Rock" in the background. Courtesy of José R. Oliver, 2016.*

For this unit (2x1m) we measured the depth below surface, and no arbitrary e-datum was established. The cultural deposit was, for all practical purposes superficial (0-15cm); the excavation reached a maximum of 15cmBS in the unit and 30cmBS in the small window.

Cx.500 (top soil) and Cx.501 (0-15cmBS) were part of the active organic horizon. The texture of sediment matrix was medium sand with a dark greyish brown colour (10 YR 4/2). Inclusions were abundant, consisting of poorly sorted, coarse sub-angular pebbles and a heavy mat of roots. The soil was somewhat loose but difficult to excavate due to the root density.

Cx.502 (15-30cmBS) was only visible on an excavation window of 30x30cm against the west wall (***Fig.6.6-18***). The window did not contain artefacts. Here, sediments were more compact as the roots became somewhat smaller and less packed. Soil was medium to fine sandy silt and its colour was dark yellowish brown (10 YR 5/4-4/4). The absence of artefacts indicates that the abundant pottery found around the surface of the Scared Rock is largely a superficial deposit.

No charcoal was dated from these two excavation units.

***Figure 6.6-18**. View of the west wall (NW corner at right) showing Cx-500 (surface) and Cx-501 (dark soil) confined to the first 15 cmBS. The dark yellowish brown (10 YR sediment) of Cx-503 is only visible in the window extending from 15 to 30 cmBS. The cultural materials were confined to Cx-500 and Cx-501.A 'mano' or* grinding stone *is protruding from the wall. Source: José R. Oliver, 2016.*

6.6.3.2 Contrasting deposition regimes

There are some important similarities between Cx.101/102/103, Cx.201, Cx.401 and Cx.501. All of them share a silty sand texture with a dark greyish brown colour (10YR 4/2). They also present light rooting, frequent poorly sorted sub-angular gravel and sub-rounded pebbles, along with occasional mineral concretions and charcoal fragments. Despite their likeness, there are some important disparities in terms of thickness, most likely associated to the character of the area in which the units are located.

TU-01 and TU-04 both have a very thick layer associated to this first stratigraphic context. Although in TU-01, Cx.101, 102 and 103 differ in terms of a progressive lightness of colour in conformity with depth, a similar texture and the AMS dates confirm they all belong to the same stratum, a 53cm layer dated between AD1270-1436. Likewise, in TU-04, Cx.401, with the same characteristics in terms of texture and inclusions, consisted of a 120cm layer dated between AD1027-1474. On the contrary, in TU-02, Cx.201, part of the same stratum that runs across the island, is a 30cm layer dated between AD1220-1447. This difference might correspond to the fact that TU-01 and TU-04 are refuse areas where more artefacts and sediments were concentrated, hence the elevated 'mound like' features in the landscape to which these two units were associated. TU-02, located on a deflated area with a high concentration of grinding stones, seems to correspond to a habitation area, with less artefact concentration.

An earlier stratum with cultural artefacts is present in TU-04 and TU-02 in a deeper layer. This stratum corresponds to Cx.402 and Cx.202, respectively. Both contexts exhibit a yellowish-brown colour (10YR 5/2-5/4) with yellowish red mottling (5 YR 4/6), and medium to fine sand texture. Inclusions comprise well-sorted sub-rounded gravel and spare roots. While for TU-04 there were only10cm exposed of this layer (125-135cmBS) due to time limitations, in TU-02 this layer was only 6cm thick (36-42cmBS), followed by a 20cm thick culturally sterile layer (Cx.204). The only available dates for this stratum correspond to two TL samples which yielded AD450 (medium date) (***Table 6.6-2***). However, ceramic materials encountered in TU-04 for this layer do not resemble the ones found on TU-02 and demand further discussion to explain their stratigraphic association.

Further assessments based on the distribution, technology and stylistical traits of ceramic materials found in Picure will inform and help separate these distinct horizons described for the island in pre-colonial times.

6.6.4 Artefacts Distribution Patterns

<u>6.6.4.1 Surface Collection</u>

A total of 1,989 ceramic fragments were recovered from a ca.15,000m² area on the surface of Picure island. Out of 52 collection units, 32 contained both lithics and ceramic artefacts. With a few exceptions, (collection units: C5, C7, C8 and C12), the artefact assemblages of all units were dominated by ceramic sherds, with an average of 72 sherds per unit (see ***Appendix 15).*** Few units yielded over 100 sherds, most of which were located on the north-west portion of the island. All sherds were divided into macroscopic fabric groups and diagnostic sherds were drawn and used for vessel form reconstruction.

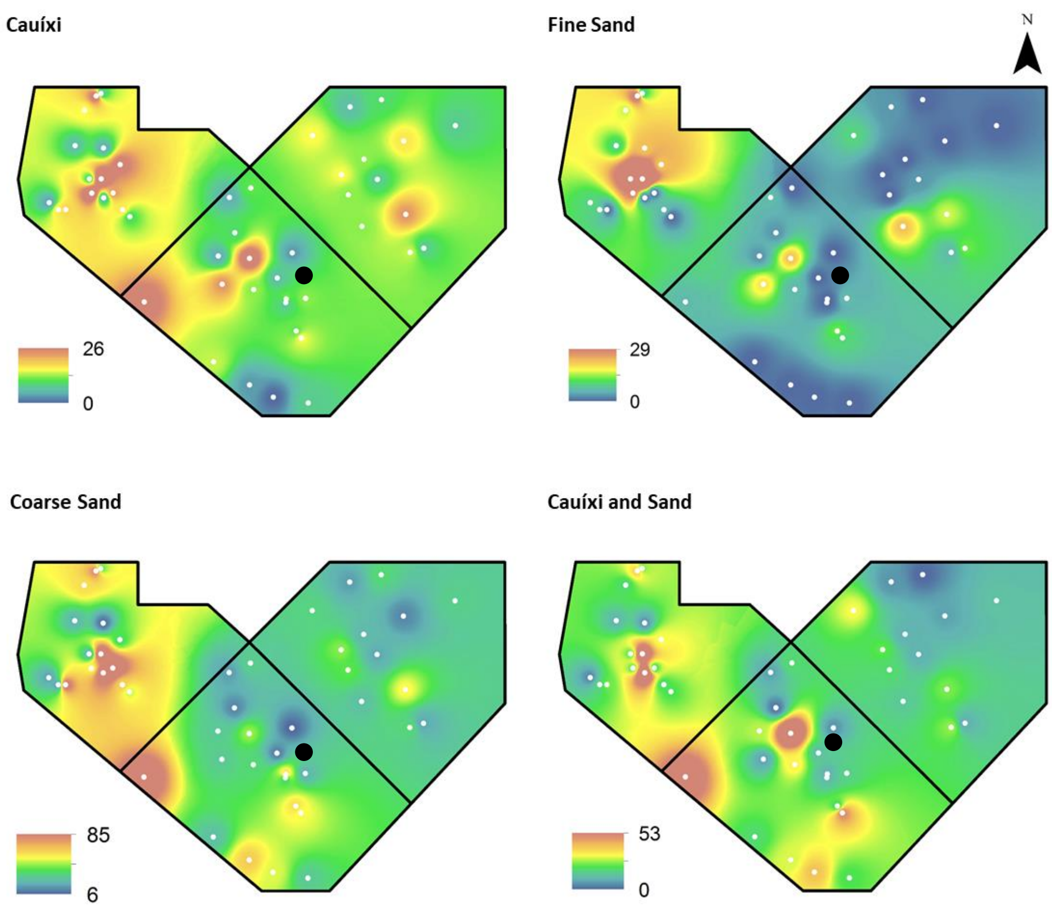


Figure 6.6-19*. Heat map composite built using R showing macro group frequency distribution on the surface of Picure, based on data from surface collection units. Black dot shows the location of the Sacred Rock – a granitic boulder with petroglyphs- Source: Phil Riris, 2016.*

As seen in ***Fig.6.6-19,*** the distribution of the various macroscopic fabrics overlaps one another in certain parts of the island. Most fabrics coincide in the north-west area, where the Cauixí and Fine Sand fabrics report their higher counts. Coarse Sand and Cauixí and Sand fabrics do have some important concentration in the north of the island, but the highest counts are registered towards the west flank, which faces the rapids. These two last fabrics have a very similar distribution with a striking exception of a collection unit directly west of the Sacred Rock, where more than 50 sherds of Cauixí and Sand were collected, along with fewer Coarse Sand sherds. This collection unit was chosen to locate trench unit TU-01.

The Cauixí fabric is more widespread on the surface, with a significant presence on both the west and east areas. In a rather low count area on the north-east side of the Sacred Rock, there was a significant concentration of this macro group. This collection unit is seen on ***Fig.6.6-19*** as a red and yellow dot in the Cauixí 'heat' map and was chosen to locate trench unit TU-02. The same collection unit is visible in the Fine Sand heat map distribution. This macro fabric is only reported in very few proportions on the east side, with most of its sherds recovered from the north area and practically absent in the west and south areas.

Although ceramics characterised by the presence of sponge spicules seem more widespread on the surface, there are more sherds with coarse sand in general. The blue areas corresponding to this last macroscopic fabric show few fragments rather than none. The latter fabric is the most common on the surface and its low readings are comparably larger than the medium or high readings of the sponge spicules and fine groups.

6.6.4.2 TU-01

Trench TU-01 returned a total of 6,859 artefacts, with 3,424 lithics and 3,435 ceramic sherds within a 2x1m excavation unit (***Fig.6.6-20***). Artefacts were registered per arbitrary level of 5cm and per context. In the following description, the materials recovered from the SW corner (n=36 ceramic sherds) associated to the alleged burrow and the ones from the Feature-1 (n=271 ceramic sherds) are not considered, leaving a total of 3,128 ceramic sherds. Overall, material refuse in TU-01 presents a bimodal distribution (***Fig.6.6-21A***), with an initial increasing tendency between levels 10 and 8 (30-50cmBS), a decreasing tendency between levels 7 and 5 (20-30cmBS) followed by a final growing tendency between levels 5 and 1 (0-23cmBS). The later has an important exception in level 2 (5-10cmBS), where there is a 40% decrease of materials, making this last tendency discontinuous.

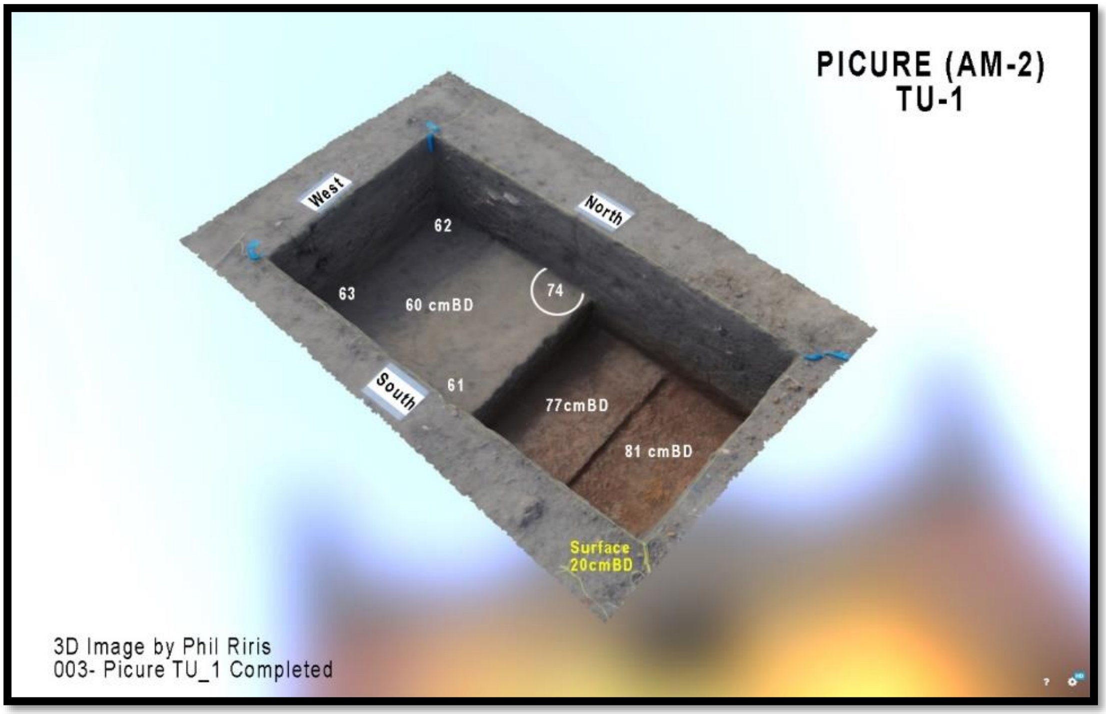
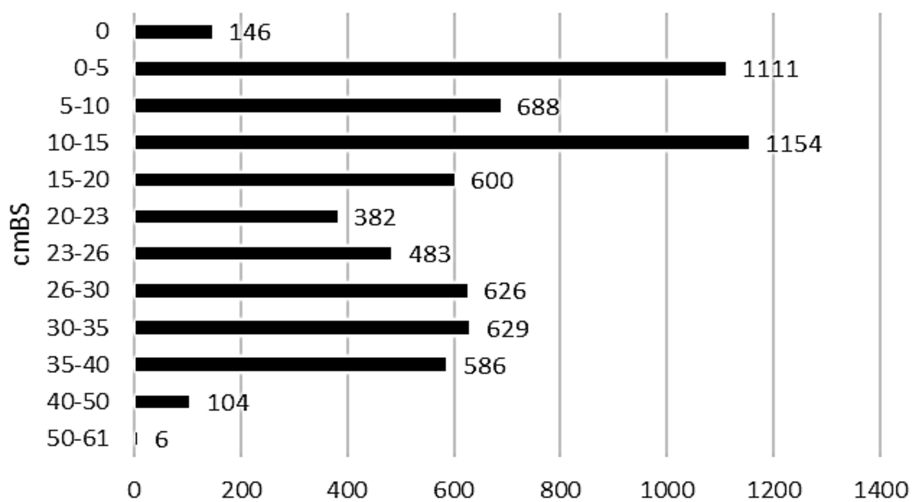


Figure 6.6-20*. 3D Image of TU-1 before the Feature excavation. The west half shows Cx.103 (60cmBD/40cmBS). The eastern half shows Cx.104 near its top (77cmBD/57cmBS) and bottom of the excavation (81cmBD/61cmBS). Source: Agisoft Photoscan. Courtesy of Phil Riris, 2016.*

While there is an important 82% initial increase of artefacts between levels 10 to 9 (35-50cmBS), in the following level it only reached a 16% growth (30-35cmBS). The decreasing trend coincides with the transition between Cx.103 (36-58cmBS) towards Cx.102 (12-36cmBS), in which there is an initial 0.5% reduction from level 8 to 7 (26-35cmBS), followed by a 21-23% decrease in the following two levels (20-26cmBS). This tendency in reversed in level 4 (15-20cmBS) with a 36% rise in material count, followed by a 48% increase towards level 3 (10-15cmBS). Finally, in the transition from level 3 towards level 2, which coincides with the beginning of Cx.101 (0-12cmBS), there is again a 40% drop and a final 38% increase for level 1 (0-5cmBS).

When compared to the ceramic material distribution (***Fig.6.6-21B***), the same decreasing and increasing tendencies described for the total artefact's counts are replicated, and mostly coincided with the stratigraphic contexts' transitions. Decrease from level 8 to 7 (26-35cmBS) corresponded to 26%, during the transition from Cx.103 to Cx.102; while the transition from Cx.102 towards Cx.101 peaks with an increase of 32% from level 4 to 3 (10-20cmBS).

A



B

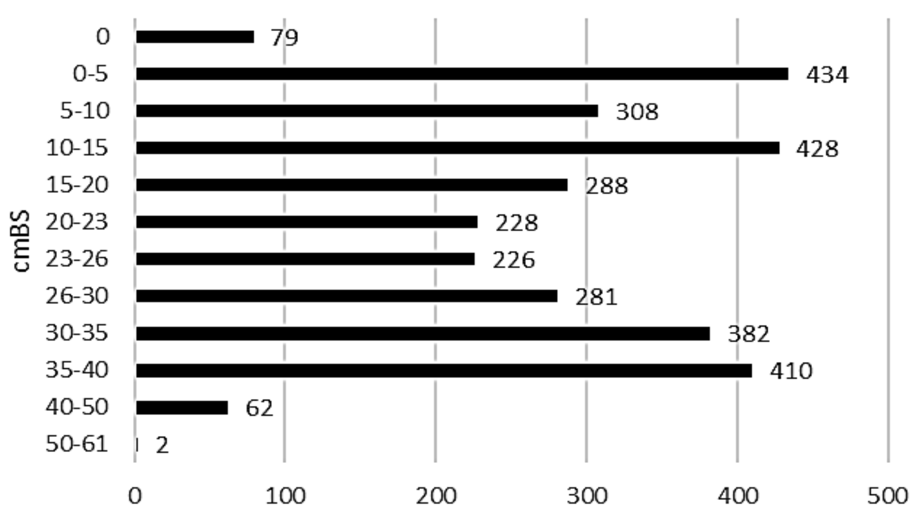


Figure 6.6-21. *Materials recovered at Picure, TU-01, registered per arbitrary level (cm below surface -BS-). A) Total artefacts recovered per level, B) Total ceramic sherds recovered per level.*

In contrast, lithic artefacts have an inverse tendency during the context transitions (***Fig.6.6-22A***). In Level 7 (26-30cmBS), where there is a transition to Cx.102, lithic materials increased by 28% in relation to the previous level. Likewise, from level 4 to level 3 (10-20cmBS), towards Cx.101, lithic materials increased by 57%. In level 3 (10-15cmBS), as in level 7 (26-30cmBS), lithic materials surpass ceramic sherds in terms of frequency. While in level 7 there were only 18% more lithics, in level 3 the difference is more pronounced, with 41% more lithics. The tendency of lithics over ceramics was maintained until the top-end of the trench. In level 2, lithics constitute 18% more materials than pottery sherds, while in level 1 this difference increases to 35%.

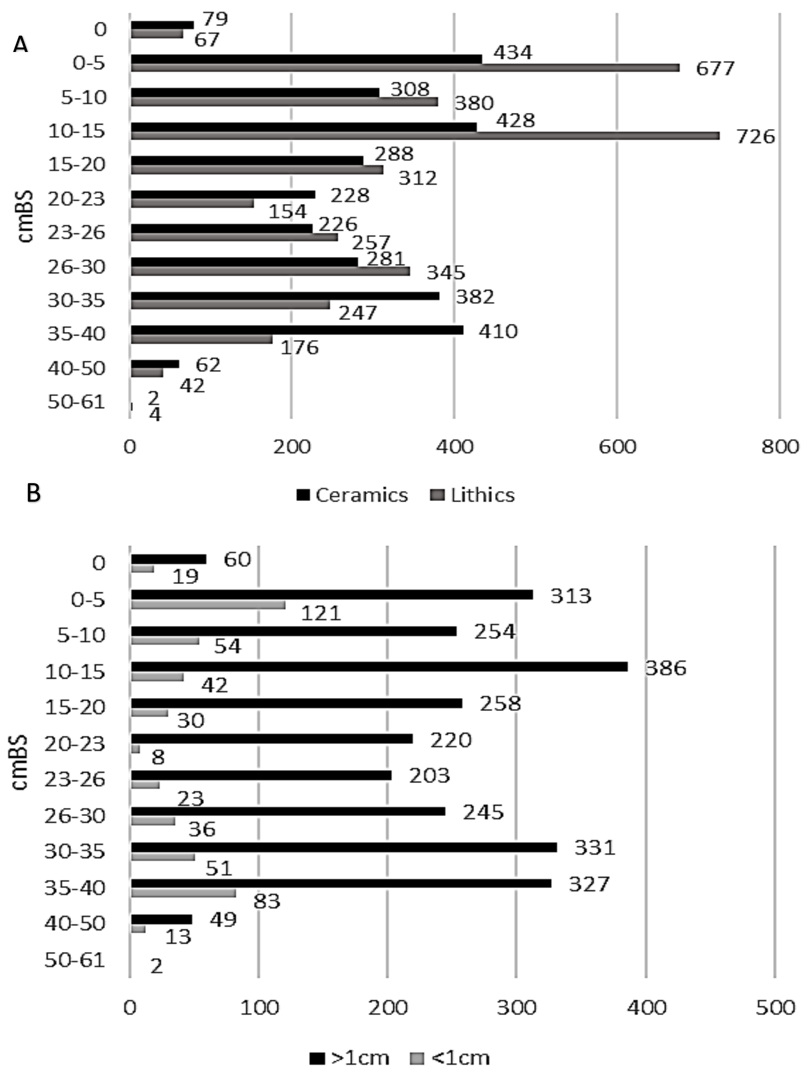


Figure 6.6-22. *Materials recovered at Picure, TU-01, per arbitrary level (cm below surface -BS-). A) Total artefacts discriminated by type of material (ceramics and lithics), B) Total ceramic sherds per level discriminated by size (grey=<1cm² and black=>1cm²)*

‘Minced’ pottery sherds (<1cm²), referred as ‘Others’ (i.e. undeterminable) due to their small size (which prevented their classification), have a similar distribution to the one described for the total artefact count and the ceramic sherds count. Decreasing and increasing tendencies in this case do not coincide entirely with the stratigraphic context transitions, with levels 8 (30-35cmBS) and 4 (15-20cmBS) as the turning points instead of levels 7 and 3 (***Fig.6.6-22B***). The lowest point of minced pottery occurs in level 5 (20-23cmBS), where they represent only 3% of the total ceramic sherds recovered. Meanwhile, ‘Others’ sherds are most abundant in levels 9 (35-40cmBS) and 10 (40-50cmBS), where they constitute about 17% of the total sherds in each level. There is also a concentration of these sherds in the upper levels -levels 0 to 2 (0-10cmBS) within Cx.101- where they represent between 15 to 22% of the total sherds.

When discussed in terms of the stratigraphic contexts, the material distribution trend is somewhat replicated, with Cx.102 (12-36mBS) concentrating most of the artefacts. Cx.101 (0-12cmBS), a dark greyish brown silty sandy soil with light rooting and poorly sorted sub-angular gravel, yielded ca. 742 ceramic sherds and 1,057 lithic materials, which represents the 28% of all the materials recovered at this trench. On the other hand, Cx.102 (12-36cmBS), with the same texture but a light greyish and yellowish-brown colour, returned 1,833 pottery fragments and 2,041 lithics, about 59% of all materials from TU-01. Finally, Cx.103 (36-58cmBS), a medium to fine sand greyish and yellowish-brown soil, concentrated a total of 474 sherds and 222 lithics, which constitutes about 10% of all excavated materials.

There is not a significant difference on the distribution of the smallest ceramic sherds in relation to each context, with Cx.101 and Cx.102, having 36% and 39% of minced pottery, respectively. However, in Cx.103, only 20% of the total ceramics correspond to minced pottery sherds. Based on this data, it could be argued that Cx.101 and Cx.102 reflect a greater degree of activity and perhaps more trampling in the area. The fragmentation rate is accentuated in the top 5cm of Cx.101, with 28% of the pottery sherds corresponding to the minced pottery category, which could mean a more intense presence in the area towards the end.

Bearing in mind the volume differences between contexts, the amount of ceramic materials is somewhat greater in Cx.102. While Cx.101 has 0.24m³, Cx.102 has doubled its size with 0.48m³, and the excavated portion of Cx.103 is ¼ larger, with 0.3m³. However, when using 1m³ as a common volume unit and the frequency of ceramic materials found on each context as a base rate, Cx.101 has only 19% less sherds (n=3092) than Cx.102 (n=3819). The difference is more pronounced in relation to Cx.103, with 58% less sherds (n=1,580) than Cx.102, evidence of a less intense deposition. In terms of ceramic materials concentrated in arbitrary levels, level 1 (0-5cmBS) exhibits the largest number of sherds within a 0.1m³ in this trench, with 434 ceramic fragments. When compared with Cx.101 ceramic sherds rate per 1m³, this level has 28% more sherds (n=4340), which makes it the main contributor within this context of ceramic materials. This concentration reinforces the argument of an important activity period in the late occupation of this area.

***Figure 6.6-23**. General view of TU-01 towards the east, with the "Sacred Rock" in the background. Its mound like shape is visible. Courtesy of Jose R. Oliver.*

All three stratigraphic contexts in TU-01 share similar textures and AMS dates. Two dates are available for Cx.102 (12-36cmBS), which locates it between cal.AD1275-1396. Three of those dates (***Table 6.6-1***) are statistically equivalent, which suggest an important material accumulation within a relatively short amount of time (ca.120 years). Cx.101 (0-12cmBS) is definitely later than the dates found on Cx.102 and might correspond to one of dates located in level 3 (OxA-34856), ranging between cal. AD1324-1436 which overlap with the one located within Feature-1, a vessel stack dated between cal.AD1407-

1445 (OxA-34865) found deeper on the trench. Finally, Cx.103 (36-58cmBS), has one date in the middle level which dates cal.AD1270-1385 (OxA-34864). This last date is equivalent to the ones reported for Cx.102.

Ceramic materials in each context reveal there are some important differences in terms of accumulation rates. As seen before, Cx.103 presents the least amount of pottery sherds and its deposition rate is far away from the more closely related rates of Cx.101 and Cx.102. This is confirmed by the deposition pattern within the lithic materials. Using a $1m^3$ volume projection measure for comparison, Cx.102 presents only 3.4% less lithics (n=4,252) than Cx.101 (n=4,404) while having 82% more lithics than Cx.103 (n=740). Lithic materials are still waiting for a more detailed analysis; therefore, we can only use their frequencies as an indicator of significant deposition differences between contexts.

In contrast, minced pottery sherds ($<1cm^2$ potsherds size) show a greater difference regarding deposition rates when projected into $1m^3$ volume. Using this comparative measure, Cx.101 has 45% more minced sherds (n=729) than Cx.102 (n=396) and 55% more than Cx.103 (n=327). Minced pottery can be associated to some more trampling or erosive episodes such as flooding, which according to these rates, seems to have been particularly pronounced in the upper context. This could indicate a less intense activity performed in the early stages of the use of this area in the island. Likewise, it must be highlighted that the amount of minced pottery is not directly associated to the context with more artefacts - Cx.102- but rather with upper Cx.101, which might strengthen its association with more trampling, flooding or intense activities being performed on site.

Further geomorphological analysis and radiocarbon dates are needed to clearly distinguish the three stratigraphic contexts. Nevertheless, based on the ceramic materials, similarities and differences which permit the identification of a single or several occupations will be discussed further when wares, production sequences and vessel forms and their association with the other trenches are established.

- ***6.6.4.2.1 Macro fabric distribution***

Macroscopic fabrics, the broadest classification unit according to paste attribute, considers the type of inclusions and paste colour of ceramic sherds from a macroscopic *in-situ* evaluation. Distribution of the macro-fabrics for TU-01 (***Fig. 6.6-24***) was recorded per stratigraphic context and depth cmBS- below surface (***Table 6.6-3***), and with arbitrary levels of 5cm (***Table 6.6-4***). Levels 5 to 7 present different thicknesses between 3 and 4cm, due to problems with the level bar during fieldwork, which were nonetheless registered and do not affect the results. Heavily fragmented sherds -under 1cm² in size- were registered as 'Other' (i.e. undetermined). The distribution of the macro-fabrics in Test Unit 1, here described, does not include the sherds form level 8 SW corner and the Cx.106 or Feature 1 (n=271), which will be discussed separately.

Cx.	cmBS	Total	FS	C	CS	C+S	C+F	BCS	Other
100	0	79	0	11	41	8	0	0	19
101	0-10	742	30	84	351	65	20	17	175
101+102	10-15	428	20	32	261	45	4	24	42
102	15-35	987	28	79	600	99	4	80	97
103	35-50	890	18	62	497	43	4	119	147
103+104	50-60	2	0	0	0	0	0	0	2

Cx.	cmBS	Total	FS	C	CS	C+S	C+F	BCS	Other
100	0	100	0	13.92	51.90	10.13	0	0	24.05
101	0-10	100	4.04	11.32	47.30	8.76	2.70	2.29	23.58
101+102	10-15	100	4.67	7.48	60.98	10.51	0.93	5.61	9.81
102	15-35	100	2.84	8	60.79	10.03	0.41	8.11	9.83
103	35-50	100	2.02	6.97	55.84	4.83	0.45	13.37	16.52
103+104	50-60	100	0	0	0	0	0	0	100

***Table 6.6-3**. TU-01 Macro-fabrics distribution per stratigraphic context, by number of sherds (top) and percentages (bottom).*

The deepest stratigraphic contexts, Cx.103+104 (50-60cmBS), were excavated in a 50x50cm window at the south-east corner of the unit. It yielded only 2 minced sherds (i.e. Others), which are thought to have been mechanically displaced form the upper levels. The upper context, Cx.103 (35-50cmBS) returned 890 sherds from a 1x1m window, 69% of which correspond to the Coarse Sand and Black Coarse Sand fabrics, which belong to the Granitic Family, followed by far by the cauixí tempered fabrics, belonging to the Sponges and Mixed Fibre Families, with 12% of the assemblage. Minority fabrics as the Fine Sand fabric, which belongs to the Mixed Sponges Family in this site, only represents 7% of the sherds. Finally, the Others have a high percentage with 17%, making it the third most frequent tendency in this context.

Cx.	cmBS	Total	FS	C	CS	C+S	C+F	BCS	Other
100	0	79	0	11	41	8	0	0	19
101	0-5	434	23	56	190	30	14	0	121
	5-10	308	7	28	161	35	6	17	54
101+102	10-15	428	20	32	261	45	4	24	42
102	15-20	288	9	11	175	47	0	16	30
	20-23	228	9	22	152	23	0	14	8
	23-26	226	6	20	138	14	4	21	23
	26-30	281	4	26	155	21	0	39	36
	30-35	382	18	20	208	30	0	55	51
103	35-40	410	0	31	239	7	4	46	83
	40-50	62	0	11	30	0	0	8	13
103+104	50-61	2	0	0	0	0	0	0	2

Table 6.6-4. *Macro-fabrics frequencies per level in TU-01. Legend: FS=Fine Sand, C=Cauixí, CS=Coarse Sand, C+S= Cauixí and Sand, C+F=Cauixí and Fibre, BCS= Black Coarse Sand.*

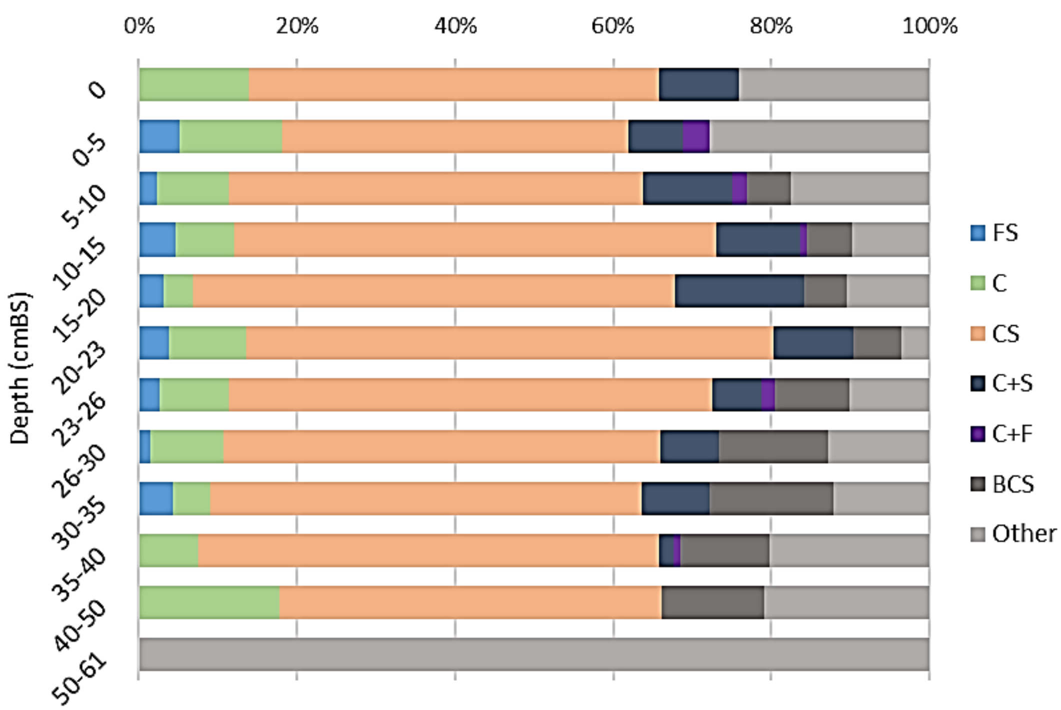


Figure 6.6-24. *Macro-fabrics percentages per arbitrary level in TU-01. Legend: FS=Fine Sand, C=Cauixí, CS=Coarse Sand, C+S= Cauixí and Sand, C+F=Cauixí and Fibre, BCS= Black Coarse Sand.*

The next stratigraphic context, Cx.102 (15-35cmBS), produced 987 fragments, from which 65% correspond to the Coarse sand fabrics and the 17% to the cauixí tempered ones. Minority fabrics continues to be the Fine Sand macro-fabric (4%) and the Others still represent a significant percentage within the sample (9%). Similar percentages are replicated in the Cx.102+101 (10-15cmBS) with 428 ceramic sherds. Based on this percentages, there was a minor increase within the cauixí temper groups while the Others was reduced.

The top stratigraphic context, Cx.101 (0-10cmBS), presented a total of 742 potsherds. As seen in the previous context, most of the sherds belonged to the coarse sand fabrics (Granitic Family) (49%), while the cauixí tempered ones (Sponge and Mixed Fibre) add up almost a quarter of the sample (22%). The least common was, as always, the Fine Sand fabric (4%) (Mixed Sponges), while the Others constituted 23% of the sample. While the Cauixí tempered fabrics have a significant increase of 5% in comparison to the previous context, the Others increased almost three times that same amount (14%) and the coarse sand fabrics lost 16%.

Finally, Cx.100 yielded 79 sherds, half of which (51%) correspond to the Coarse Sand macro-fabric, followed by both Cauixí tempered ceramics and minced pottery sherds (Others), each of which represents 24% of the total. This trend continues the increasing amount of sponge spicule sherds seen in the last couple contexts.

The arbitrary level excavation was useful to identify significant changes within each stratigraphic context (***Table 6.6-4, Fig.6.6-24***). For Cx.103, level 9 (35-40cmBS) concentrated most of the recovered potsherds and minced pottery of this context. The latter even surpasses the sponge spicule tempered ceramics, suggesting an important trampling and/or erosion concentrated within this level. For Cx.102, in level 7 (26-30cmBS) is where a significant decline of the total of ceramic materials is observed, also reflected in a reduction of the minced pottery sherds. This might be the result of less activity in the area. During the transition level 4 (10-15cmBS) towards Cx.101, an important rise in ceramic artefacts was registered, in which cauixí tempered potsherds increase by 28% with respect to the previous level, almost as much as the coarse sand fabrics with a 32%. Finally, level 1 (0-5cmBS) concentrates 58% of the materials form Cx.101 and is also where a final rise of 30% of ceramic frequencies can be registered. In this level, 23% of the sherds have cauixí and 43% of coarse sand, shortening their initial distance in Cx.103 -level 9 (35-40cmBS) by 40%. Feature-1, also denominated as Cx.106, yielded 271 sherds, which corresponded to three semi-complete vessels, stacked together in the pit. This first form corresponded to the bottom of a globular bowl from the Coarse Sand macro group and constituted 68% (n=184) of the total potsherds in the feature. The second form, a griddle, belonged to the Cauixí and Fibre macro fabric, with 29% (n=79) of the total sherds. Finally, eight fragments (3%) from another vessel, too small to reconstruct its form, were recovered. The latter sherds were part of the Cauixí macro fabric.

6.6.4.3 TU-02

Figure 6.6-25. *View to the East of TU-02 after completion. The grinding stone or metate is in situ, as it was found in 2016. Courtesy of José R. Oliver, 2016.*

Trench TU-02 yielded a total of 2,417 artefacts, with 1,189 lithics and 1,228 ceramic sherds within a 2x1m excavation unit (***Fig.6.6-25***). Artefacts were recorded per context and per arbitrary levels of 5 and 10cm. Two peaks of artefacts can be identified throughout the sequence. At the bottom of the sequence, 276 artefacts were recovered before the culturally sterile level, a 10cm thick level. When adjusted to the 5cm thickness of the previous levels, the number of sherds can be hypothesised to correspond to half of the reported (n=138), implying an increasing tendency from bottom to top and until level 4 (20-25cmBS).

As seen in ***Fig. 6.6-26A,*** there was an initial increase of 32% from level 7 to 6, while in the upper two arbitrary levels (levels 5 and 4, 20-30cmBS) it almost doubled the amount of materials with a 44% and a 53% increase, respectively. A significant drop of 72% less materials was registered from level 4 to 3 (10-20cmBS), bearing in mind level 3 was 10cm thick, for which half of the total materials registered (n=219) is taken for direct comparison with level 4. The decline in the quantity of materials continues in level 2, with 56% less materials, followed by the second and final increase of 61% between the surface and 5cm below.

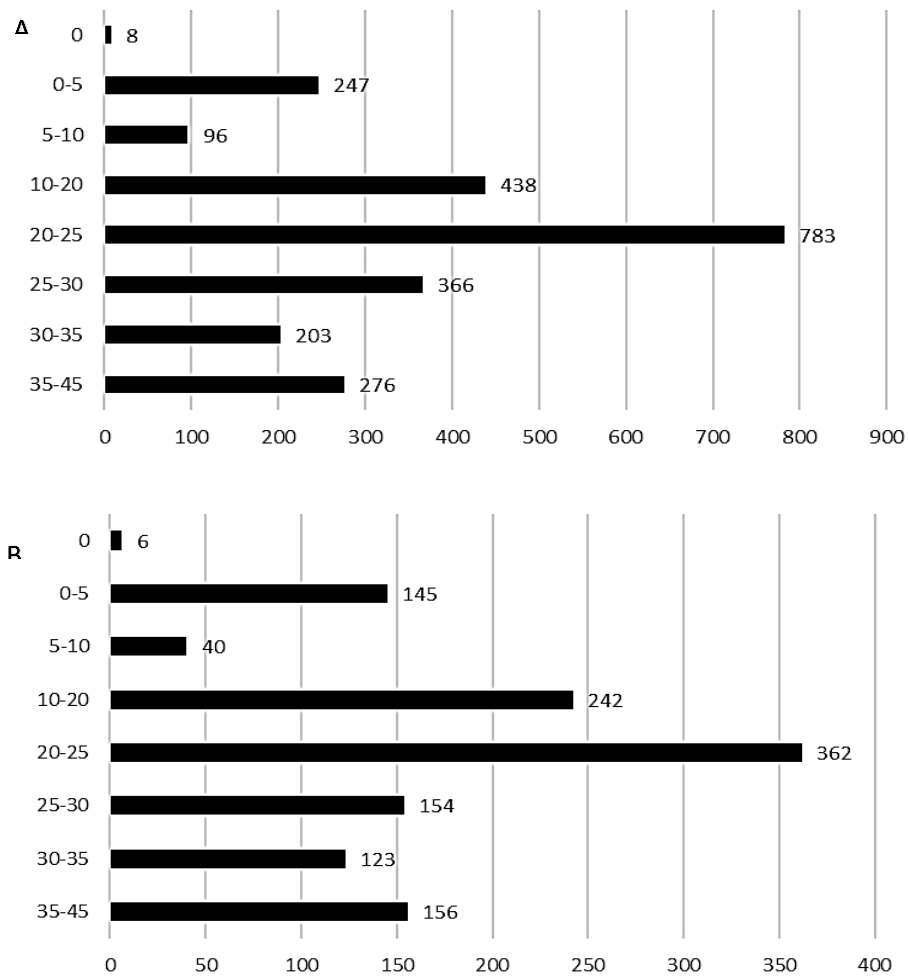


Figure 6.6-26*. Materials recovered at Picure, TU-02, registered per arbitrary level (cm below surface -BS-). A) Total artefacts recovered per level, B) Total ceramic sherds recovered per level.*

The formerly described pattern is similar for ceramic materials (***Fig.6.6-26B***), with an initial increase of 36% between levels 7 and 6 (30-45cmBS) -adjusting the result to 5cm thick levels-, followed by a 20% rise in level 5 (25-30cmBS) and more than double (57%) in level 4 (20-25cmBS). Decline in levels 3 and 2 (5-20cmBS) corresponds to 66% each, while the final increase of materials was of 72% in the top 5cm. An associated date in level 3 (OxA-34858) of cal.AD1411-1447 seems to mark the end of the increasing tendency which began in the lower levels, while the level 6 date (OxA-34890) indicates the beginning of this trend by placing it around cal. AD1220-1280. Finally, a rise of 72% in level 1 (0-5cmBS) marks a strong rise in the amount of ceramic artefacts with respect to the previous decline observed in level 2.

Although lithics follow a similar trend than ceramics throughout the sequence, is interesting to see how they surpass the number of ceramic sherds in the two levels where the latter showed an increasing trend (***Fig.6.6-27A***). For levels 5 and 4 (20-30cmBS), lithics increase to 62% and 49% respectively, surpassing the total of pottery fragments recovered. In contrast to ceramics, their growth in level 5 (25-30cmBS) is three times that was registered for potsherds, while in level 4 (20-25cmBS) is 8% less.

The minced pottery (<1cm²) proportion is very minor in comparison with larger pieces (>1cm²), never surpassing 10% of the total pottery fragments per level, except for level 1 (0-5cmBS) where they represent 19% of the total sherds (***Fig.6.6-27B***). Noticeably, there were no ‘Others’ sherds in level 5 (25-30cmBS), which is just below the alleged former-surface or floor described as part of level 4 (20-25cmBS). In this level, only 8% of the potsherds corresponded to minced pottery. Whereas a larger number of minced pottery sherds can be associated with more trampling or erosive episodes -i.e. flooding- in the upper levels, the lack or very small fraction of them in the lower levels -levels 7 to 4 (20-45cmBS)- can be interpreted as evidence of a different activity, traffic and/or function having taken place in this area.

Reduced trampling is usually associated to a decreasing activity and or less traffic in the area. The area where TU-02 was located is particularly flat, with an even surface (***Fig.6.6-28***) and surrounded with mound-like formations, probably corresponding to middens. Two alleged ‘middens’ were excavated by units TU-04 and TU-03. The analysis of the materials in these two units, as well as the vessel form analysis from the sherds recovered in TU-02 will be used to address the relationship between these areas and their probable associated function and/or activities.

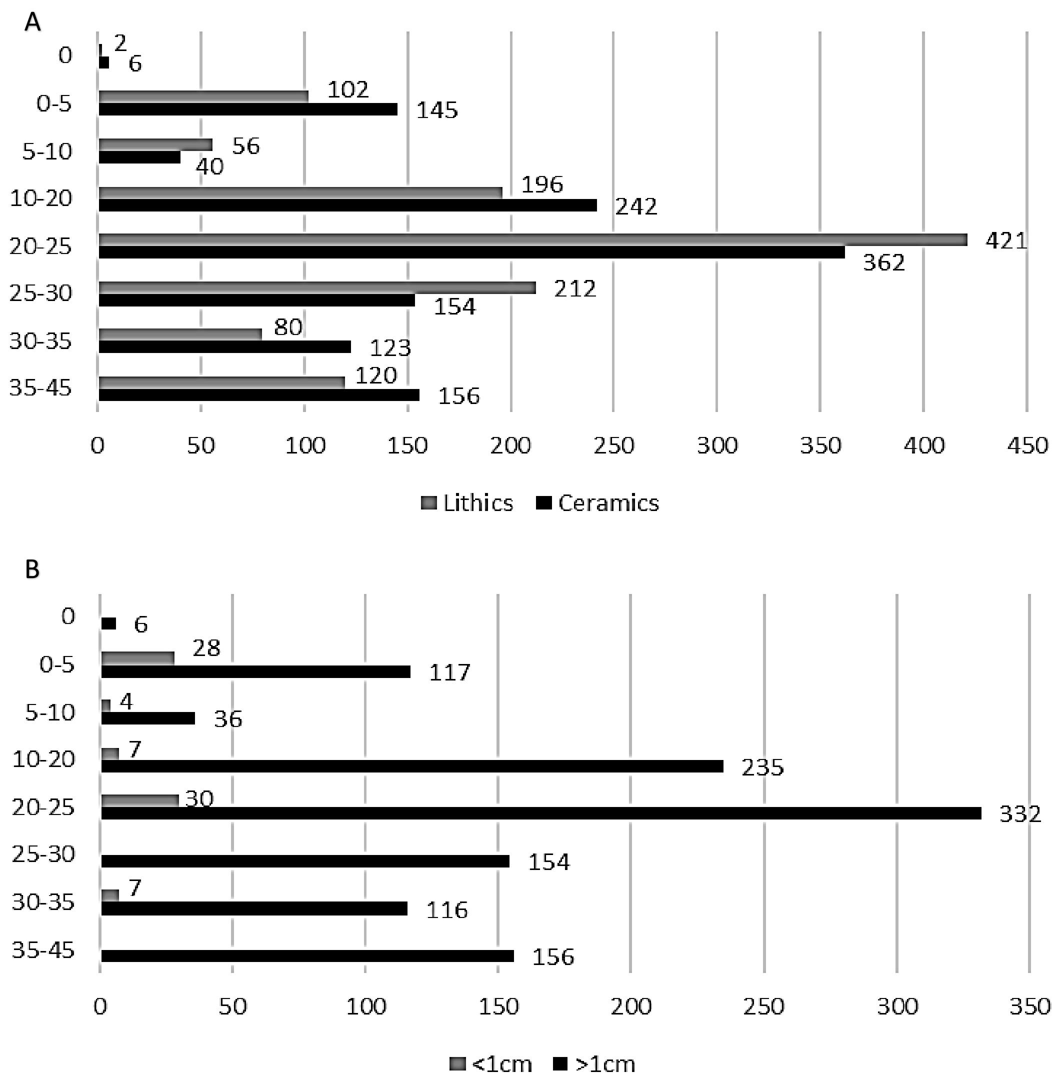


Figure 6.6-27. *Materials recovered at Picure, TU-02, per arbitrary level (cm below surface -BS-). A) Total artefacts discriminated by type of material (ceramics and lithics), B) Total ceramic sherds per level discriminated by size (grey=<1cm² and black=>1cm²).*

The stratigraphic context Cx.201 (0-30cmBS) concentrates most of the artefacts of this unit. Cx.200 only refers to the surface collection and the cleared layer to open the unit. From here, only six potsherds and two lithics were recovered (0.33% of the total artefacts). Cx.201, characterised as a fine silty sand soil with a greyish brown to yellowish brown colour with occasional oxidised concretions and gravelly inclusions, yielded 943 ceramic sherds and 987 lithics, which represent 79% of all the materials recovered from TU-02. The following transition at level 6 (30-35cmBS) reported 123 ceramic sherds and 80 lithics equivalent to 8.4% of the total artefacts. Finally, in Cx.202 (35-45cmBS), a very dark greyish brown soil with sub-rounded gravelly inclusions and yellowish mottles, 156 ceramic fragments and 120 lithics were recovered, which corresponds to 11.4% of the total artefacts found.

Figure 6.6-28. *View to the North of TU-02 at the start of excavation. Note the flat terrain and the ashes from the recently burned savanna. Courtesy of José R. Oliver, 2017.*

Even though there is a clear difference in the number of artefacts recovered in each context, it was initially thought to be the product of a volume difference. While Cx.201 (0-30cmBS) has a 0.6m³ volume, the transition Cx.201+202 (30-35cmBS) has a sixth of that volume (0.1m³) and Cx.202 (35-45cmBS) only a third (0.2m³). However, when using a 1m³ volume as a standard unit for comparison and the amount of ceramic sherds per context as a base rate, the difference between them is less accentuated. Regarding ceramic sherds, in Cx.201 there are only 21% more sherds (n=1,572) than the ones reported for Cx.201+202 (n=1,230) and 50% more than Cx.202 (n=780). When discerned by level, the ceramic sherds in level 4 (20-25cmBS) and level 1 (0-5cmBS) are the ones that most contribute to Cx.201 concentration of this type of artefact. When projected in the 1m³ volume unit, level 4 deposition rate produces 56% more ceramic sherds (n=3,620) than Cx.201, while level 1 has only 7% less (n=1,450).

Minced pottery sherds (<1cm² in size) in each context are almost all concentrated in Cx.201 (90%), and when projected into a 1m³ volume, it has 39% more minced sherds (n=115) than Cx.201+202 (n=70). Finally, in a 1m³ volume, Cx.201 (n=1,645) has twice as much lithics than Cx.201+202 (n=800) and 63% more than Cx.202 (n=600).

Both ceramics and minced pottery sherds reveal a different deposition rate between Cx.201 and Cx.201+202, with an average of 30% more ceramics artefacts on Cx.201. On the contrary, for pottery sherds in total, Cx.202 has a half of the deposition rate reported for Cx.201, strengthening the soil texture argument, which suggested Cx.202 might constitute a different occupation. The latter is confirmed by the lack of minced pottery in this context and the very low amounts of lithics, which might suggest less trampling or erosive episodes, as well as a different activity taking place in this area in the early stages of its occupation.

- ***6.6.4.3.1 Macro fabric distribution***

Distribution of the macro-fabrics for TU-02 was recorded per arbitrary level (***Fig.6.6-29*** and ***Table 6.6-6***) and per context (***Table 6.6-5***). From the 1,228 ceramic sherds recovered in this trench, 12% correspond to the lower context, Cx.202 (35-45cmBS). In here, all six macro-fabrics are represented, with a sand-based prominence (68%) between Coarse Sand and Black Coarse Sand fabrics, from the Granitic Family, followed by Cauixí groups (22%), from the Sponges and Mixed Fibre families, and a minority Fine Sand macro fabric (9%), from the Mixed

Sponges Family. The Others, correspond to minced pottery sherds, which were not classified due to their size, are absent in this context.

Following Cx.202, the transition level 6 (Cx.201+202) contains 10% of the ceramic sherds recovered from TU-02. In here there were some important differences, starting with two macro-fabrics that are absent: Black Coarse Sand and Cauixí and Fibre. The Coarse Sand fabric predominates (67%), followed by the sponge spicule fabrics (15%) -Cauixí and Cauixí and Sand groups- and a minority Fine Sand macro fabric (11%). In relation with the previous context, the Fine Sand macro fabric increases while the Others (minced pottery sherds) appears for the first time in small proportions (5%). Lastly, Cx.201 (0-30cmBS), with 76% of all ceramic materials from this trench, presents all six macro-fabrics again, with slightly different proportions. The sand-based fabrics still dominates the sample (65%), followed by Cauixí fabrics (22%) and a minority of the Fine Sand sherds (5%). The minced potsherds increase 2% in relation to the previous context (7%).

Cx.	cmBS	Total	FS	C	CS	C+S	C+F	BCS	Others
200	0	6	5	1	0	0	0	0	0
201	0-30	943	53	85	526	115	6	90	69
201+202	30-35	123	14	5	83	14	0	0	7
202	35-45	156	14	6	87	20	9	20	0

Cx.	cmBS	Total	FS	C	CS	C+S	C+F	BCS	Others
200	0	100	83.3	16.7	0	0	0	0	0
201	0-30	100	5.62	9.01	55.67	12.2	0.64	9.54	7.32
201+202	30-35	100	11.4	4.07	67.48	11.38	0	0	5.69
202	35-45	100	8.97	3.85	55.77	12.82	5.77	12.8	0

Table 6.6-5. *TU-02 Macro-fabrics distribution per stratigraphic context, by number of sherds (top) and percentages (bottom).*

All three contexts have a similar macro fabric distribution, with an average of 66% Sand based fabrics from the Granitic Family and 19% of Sponges and Mixed Fibre families, which represents around a third of the former fabrics. The Fine Sand fabric is the one that shows more frequency variation between contexts, with a particular rise in the transition level 6 (Cx.201+202) and an average 8% of the total sherds. Minced pottery (<1cm² size potsherds) has a similar proportion in

Cx.201 and the transition level 6, with an average of 6.5% over the total. Significantly different is Cx.200, which corresponds to the surface collection when the unit was levelled and only presents two different macro-fabrics. In here, the former minority group Fine Sand becomes the dominant group with 83% of the sample (n=5), followed by the Cauixí fabri,c with only 1 sherd (17%).

The analysis of the frequencies per arbitrary level (***Table 6.6-6, Fig. 6.6-29***) shows a less steady pattern throughout the unit. In level 4 (20-25cmBS) there is an important inflexion point, with all macro-fabrics showing increasing tendencies and only the Fine Sand fabrics appears to have a decline by more than half with respect to the previous levels. In level 3 (10-20cmBS), a 10cm thick level, only half of the sherds from each macro-fabric were compared with the totals for the previous 5cm thick level, from which a 70% average decrease in all groups is registered except for the Fine Sand fabric, which only decreases 18% with respect to level 4. This decreasing tendency continues in level 2 (5-10cmBS) with the Fine Sand fabric briefly disappearing from the sequence. This is overturned in level 1 (0-5cmBS) when almost all fabrics, except for the Fine Sand, Black Coarse Sand and the Cauixí fabrics -which remain the same or reappeared completely in the case of the Fine Sand fabric- experience an average increase of about 73%.

Cx.	cmBS	Total	FS	C	CS	C+S	C+F	BCS	Others
200	0	6	5	1	0	0	0	0	0
	0-5	145	11	9	74	21	2	0	28
	5-10	40	0	9	19	8	0	0	4
201	10-20	242	13	26	138	27	0	31	7
	20-25	362	8	33	206	47	4	34	30
	25-30	154	21	8	88	12	0	25	0
201+202	30-35	123	14	5	83	14	0	0	7
202	35-45	156	14	6	87	20	9	20	0

Table 6.6-6 *Macro-fabrics frequencies per level in TU-02. Legend: FS=Fine Sand, C=Cauixí, CS=Coarse Sand, C+S= Cauixí and Sand, C+F=Cauixí and Fibre, BCS= Black Coarse Sand.*

As stated before, level 4 has been interpreted as a possible buried floor, from which the increasing tendencies which peak in this level could be explained. The dramatic reduction of ceramic materials in the immediate upper levels 3 and 2 -which are also contained within Cx.201- is interesting given that it probably suggests a change of activity or a partial abandonment of this locus of the site. This is reinforced by the number of minced pottery sherds in levels 2 and 3, where they exhibit an 87% fall with respect to level 4, from which one could suggest a dramatic decrease of trampling in the area. The decreasing trend observed in the upper levels (2-3) is also associated with a reduction of Granitic Family sherds and a minor increase of Sponge Family fabrics. Black Coarse Sand sherds are absent (level 1 and 2) and Coarse Sand potsherds show a significant decrease of 72% in level 2. Meanwhile, in this same level, sponge spicule pottery sherds are reduced only by half that proportion, with an average decrease of 34% in relation to the previous level. While in levels 1 and 2, sand-based sherds doubled sponge spicule fabrics (57% more sherds), in the lower levels (level 5 and 6) they surpass them by 79%.

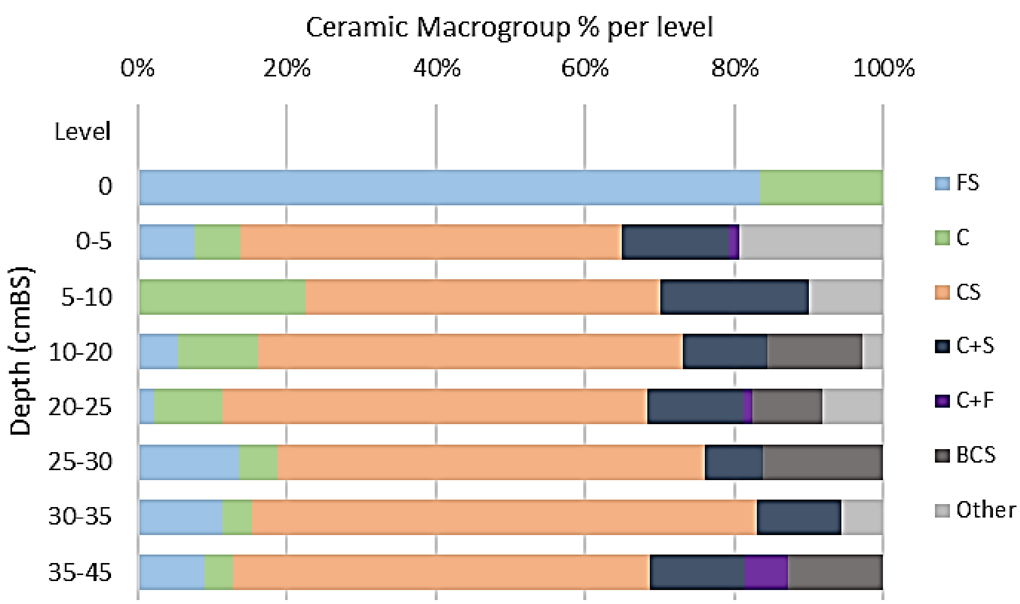


Figure 6.6-29. *Macro-fabrics percentages per arbitrary level in TU-02. Legend: FS=Fine Sand, C=Cauixí, CS=Coarse Sand, C+S= Cauixí and Sand, C+F=Cauixí and Fibre, BCS= Black Coarse Sand.*

The increasing presence of cauixí pottery in the late part of the trench might contribute to argue for change of activity or paste preparation preference in the area. This explanation will be tested by the *chaîne opératoire* reconstruction and the vessel form analysis.

6.6.4.4 TU-04

Trench unit TU-04 returned a total of 6,850 artefacts, 1,994 of which corresponded to lithics and 4,856 to ceramic sherds within a 2x1m excavation unit (***Fig.6.6-30***). Artefacts were registered per arbitrary level and per context. Overall, artefact refuse in TU-04 presents a variable distribution (***Fig.6.6-31A***), with a brief increase between level 15 and 16 (115-135cmBS), an extended very low artefact count in level 14 (75-115cmBS), followed by a constant and perhaps the longest increasing trend until level 10 (45-50cmBS) and a final extended decreasing trend from level 9 and 8 (35-45cmBS). After a brief rise between level 7 and 6 (25-35cmBS), there is an erratic behaviour from levels 5 until the top (0-25cmBS) with intercalated rise and fall tendencies.

Figure 6.6-30. *View to the South of TU-04 after completion of Level 0 (surface+4cm), Context 400. Courtesy of José R. Oliver, 2016.*

The aforementioned tendencies were calculated considering the volume differences between the excavated window (40x80cm) from levels 12+13 (55-75cmBS) and until level 16 (125-135cmBS), the half unit (1x1m) excavated in the SW portion of the trench in level 12 (55-65cmBS) and the rest of the unit, which from level 1 until level 11 (0-55cmBS) was excavated in 5cm levels in a 2x1m unit (see pg.17 for full details on the excavation methods in TU-04).

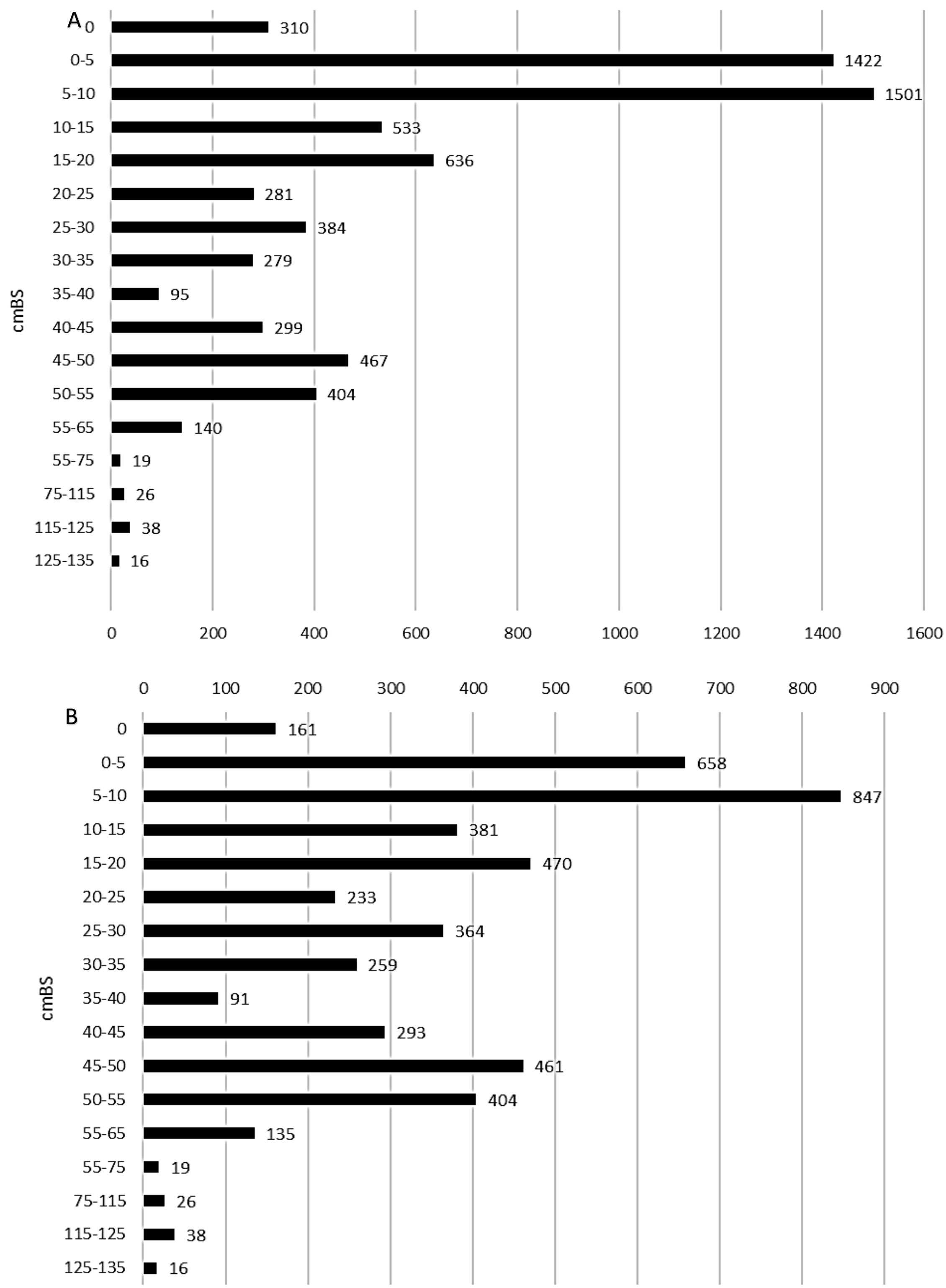


***Figure 6.6-31**. Materials recovered at Picure, TU-04, registered per arbitrary level (cm below surface -BS-). A) Total artefacts recovered per level, B) Total ceramic sherds recovered per level.*

The total artefact count (***Fig.6.6-31A***) had an initial significant increase between levels 16 and 15 (115-135cmBS) of 58%, which means an increase of artefacts which doubled the amount of materials previously registered. This change coincides with a stratigraphic context transition between Cx.402 (125-135cmBS) and Cx.401 (5-125cmBS). The associated median TL dates for level 16 locates these artefacts' deposition somewhere between AD298-607, while level 15 is somewhat older than the AMS date (OxA-35975) of cal. AD 1027-1155 located in the bottom of level 14 (75-115cmBS).

This initial rise in the number of artefacts associated with a soil texture change was followed by an 82% fall in level 14 (75-115cmBS). There was a 31% artefact count rise after 40cm of just 26 artefacts in total -related to a fleeting occupation somewhere between early 11th and second half 12th century'es (OxA-35975)- in level 12+13 (55-75cmBS). The increasing tendency continued until level 10 (45-50cmBS) with an average increase per level of 45%. An associated TL date with a range of AD1365-1553 (16% error) from level 11 (50-55cmBS) helps to locate this tendency in the chronology as early as the second half of the 14th century.

In levels 9 and 8 (35-45cmBS) there was a decreasing trend, with an average fall of 52% per level, dated to cal. AD1400-1444 from an AMS sample in level 8 (OxA-34866). This brief reduction was followed by an equally short-term rise in artefact count with a 47% average increase between levels 7 and 6 (25-35cmBS). Finally, from level 5 and until the top, rise and fall tendencies per level oscillate between 16% and 78%, with an important peak of artefact count in level 2 (5-10cmBS). Level 5's turning point is associated to an AMS date (OxA-35728) of cal. AD1422-1479, which significantly overlaps with the level 8 date, leaving reservations on how far apart did the increasing and decreasing periods took place.

The distribution of ceramic materials in the unit follows a similar pattern to the total artefact count (***Fig.6.6-31B***), with levels 14 (75-115cmBS), 9 (40-45cmBS), 7 (30-35cmBS) and 5 (20-25cmBS) as the turning points for the above described decreasing and increasing shifts. On the contrary, lithic materials (***Fig.6.6-32A***) follow a different trend, with very low counts in the deepest levels and a significant initial increase of 80% until level 7 (30-35cmBS). The increasing tendency with an average of 52% per level continued until the top of the unit, except for level 3 (10-15cmBS), where an 8% fall in lithics counts was registered. Even though both the increase of lithics from level 7 (30-35cmBS) and their decrease in level 3 (10-15cmBS) coincide with similar behaviours in the ceramic materials, the overall increasing tendency from bottom to top is not comparable. The increasing number of lithics in levels 5 (20-25cmBS) and 1 (0-5cmBS) overcame the general artefact and ceramic decreasing count, suggesting the activity which involved stone-made tools, artefacts and beads increased despite a reduced activity or transit on the area where TU-04 is located.

Another line of evidence is provided by the distribution of minced pottery sherds (<1cm² in size), whose presence or absence can reveal periods of more or less activity, erosion and/or traffic in a more direct way. As seen in ***Fig.32B,*** an initial increasing count is registered between levels 11 and 9 (40-55cmBS), succeeded by a prolonged decreasing and even absence count between levels 8 and 5 (20-40cmBS), with a minor presence of minced potsherd in level 6 (25-30cmBS) -i.e. under 2%-. Finally, there is an increasing count from level 4 until 1 (0-20cmBS).

During the initial rise, the average increase of 45% coincides with the one reported for artefacts and ceramic counts in general, associated with a TL date range of AD1365-1553. After a 42% fall in level 9 (40-45cmBS), and until level 5 (20-25cmBS), the absence of minced sherds for almost 20cm strikes as a clear evidence of a decrease activity and/or trampling on site, perhaps even a partial abandonment of this area on the island somewhere between cal. AD1400-1479, based on level's 8 (OxA-34866) and 5 (OxA-35728) AMS dates. This decreasing trend is inverse to the increasing pattern reported for lithics and ceramics for most of this portion of the trench, which could also mean it was used more as a refuse point but with less traffic or erosive/flooding episodes. Lastly, between level 4 and 1 (0-20cmBS), a 61% average increase per level suggest a re-occupation or significant increase of trampling and/or use of this area, which coincides with the lithics artefact count rise. Whether these two variables are related is not possible to confirm until further analyses are made with the lithic artefacts found on site.

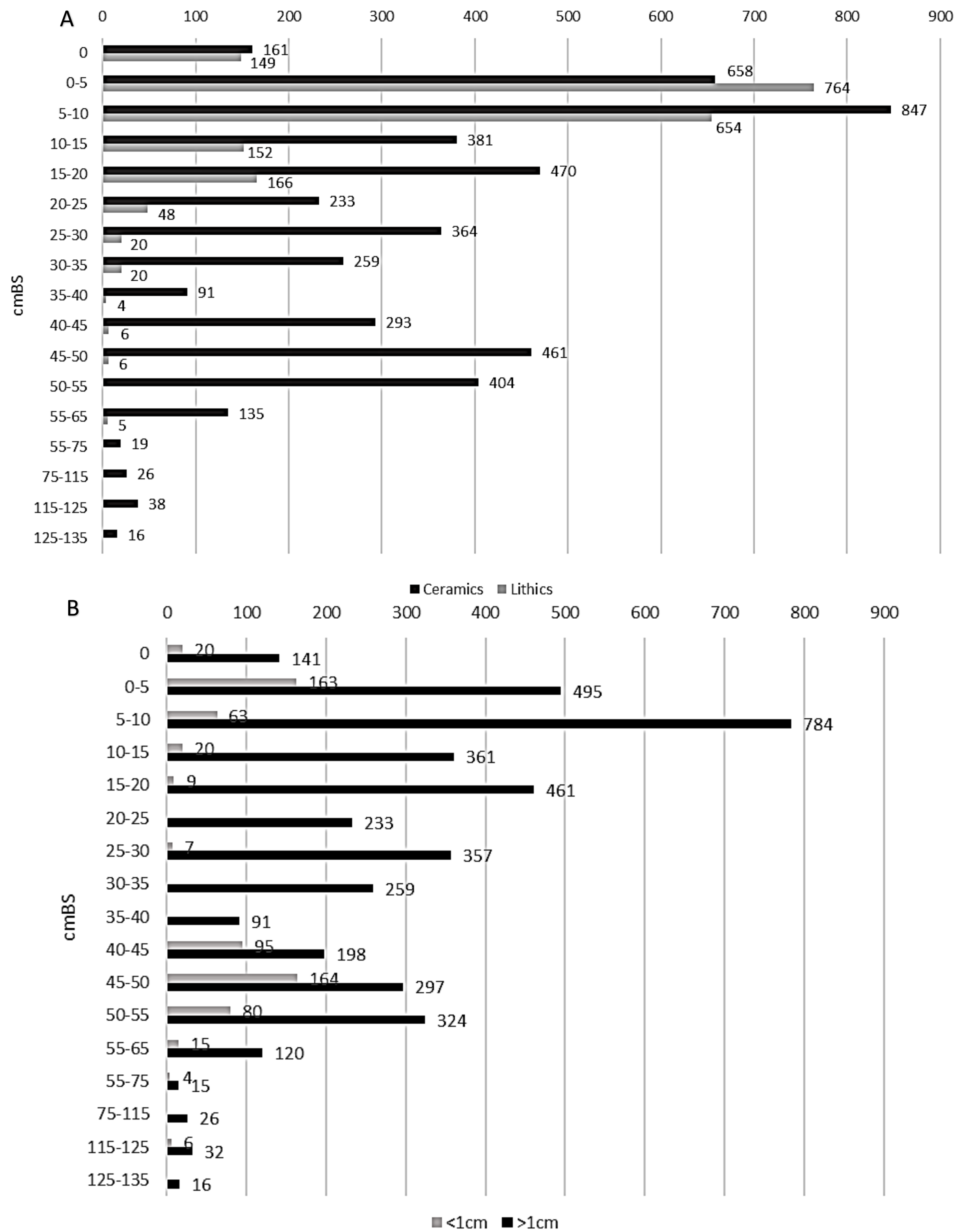


***Figure 6.6-32**. Materials recovered at Picure, TU-04, per arbitrary level (cm below surface -BS-). A) Total artefacts discriminated by type of material (ceramics and lithics), B) Total ceramic sherds per level discriminated by size (grey=<1cm² and black=>1cm²).*

Regarding the stratigraphic contexts, most of the artefacts in TU-04 are concentrated in Cx.401 (5-125cmBS), which comprises 74.5% of the total artefacts in the trench (n=5102). This compacted dark to greyish brown silty sand soil with small sub-angular pebbles and a few concretions and charcoal flecks, also contains 82% of all ceramic sherds (n=4021) and 54.2% of all lithics (n=1081). On the other hand, Cx.400 (0-5cmBS), which includes the surface and the uppermost active organic root mat, is a highly compacted dark to greyish brown silty sand soil in which 25.3% of all artefacts (n=1723) are located. This 5cm thick layer also comprises 17% of all ceramic sherds (n=819) and 45.8% of all lithics (n=913), which means it has 57% less materials than Cx.401. Finally, Cx.402 (125-135cmBS), a lighter yellowish-brown matrix with yellowish red mottles and a fine silty sand texture and sub-rounded inclusions only yielded 0.2% (n=16) of all artefacts in the unit, with 0.3% of all potsherds (n=16) and no lithics, which translates into 99% less materials than Cx.401.

Nevertheless, the thickness difference between the contexts makes it necessary to apply a different method of comparison. While Cx.400 (0-5cmBS) has a volume of $0.1m^3$, Cx.401 (5-125cmBS) has almost thirteen times its size ($1.292m^3$) and forty times the volume of Cx.402 (125-135cmBS) ($0.032m^3$). Using a common volume unit of $1m^3$ for comparison and the number of ceramic sherds and lithics per context as a base rate, the difference between them changes considerably. In terms of ceramic sherds. Cx.400 has 62% more sherds (n=8190) than Cx.401 (n=3112) and 94% more than Cx.402 (n=500). Likewise, Cx.400 has 91 % more lithics (n=9130) than Cx.401 (n=836). The former strongly suggests the uppermost context is the one with more artefact deposition in the trench, with more than double the amount of material than Cx.401. Finally, minced pottery rate projection in a $1m^3$ reinforces this argument by showing Cx.400 has 80% more minced sherds (n=1830) than Cx.401 (n=358). Small sized potsherds are associated to a more intense activity, use or traffic in the area.

Cx.400 (0-25cmBS) lacks associated AMS or TL dates but is certainly later than AD1422-1479 (OxA-35728 AMS date form level 5). The high ceramics and lithics deposition rate in the upper levels is evidence of an intense occupation of this area of the island in the late 15th century. On the other hand, very low deposition rates in Cx.402 (125-135cmBS) -which did not reach the sterile level- suggests a brief and feeble occupation between AD100-500 -based on the TL median dates. The increase of material deposition coincides with soil texture changes and confirm the differences between these two stratigraphic contexts.

Further differences in terms of paste, production sequence and vessels forms will be addressed to confirm whether these differences correspond to distinct occupations or are rather the result of more or less intense use of the site by the same groups.

- ***6.6.4.4.1 Macro fabric distribution***

Macro-fabrics, or categories which consider type of inclusions and paste colour, were identified from an *in-situ* analysis of ceramic potsherds from TU-04. This groups represent the first step to reconstruct the *chaîne opératoire*, from the raw materials and inclusions used in the paste preparation all the way to the final product. Their distribution was recorded per context (***Table 6.6-7***) and arbitrary level (***Table 6.6-8, Fig.6.6-33***). A total of 4,856 ceramic sherds were recovered from TU-04, 0.2% of which were found on Cx.402 (125-135cmBS). Three macro-fabrics are present in this context, dominated by Coarse Sand sherds (69%), from the Granitic Family, followed by Cauixí (19%) and Fine Sand (12%), from the Sponges and Mixed Fibre families. The Others ceramic fragments -small size <1cm² sherds which are not classifiable- are absent in this context.

Cx.	cmBS	Total	FS	C	CS	C+S	C+F	BCS	C+CP	Others
400	0-5	819	29	87	358	112	11	39	0	183
401	5-125	4021	117	492	2022	473	50	375	29	463
402	125-135	16	2	3	11	0	0	0	0	0

Cx.	cmBS	Total	FS	C	CS	C+S	C+F	BCS	C+CP	Others
400	0-5	100	1.2	13.7	54.7	14.3	3.1	0.6	0	12.4
401	5-125	100	2.9	12.2	50.3	11.8	1.2	9.3	0.7	11.5
402	125-135	100	12.5	18.8	68.8	0	0	0	0	0

***Table 6.6-7**. TU-04 Macro-fabrics distribution per stratigraphic context, by number of sherds (top) and percentages (bottom).*

In the upper levels, Cx.401 (5-125cmBS) yielded 82.8% of all ceramic sherds reported in this trench. Here, seven macro-fabrics are present, making it the most diverse context in terms of paste. Among the seven, two Granitic fabrics, Coarse Sand and Black Coarse Sand, dominate the assemblage with 60%, while Sponge, Mixed Fibre and Mixed Sponges fabrics, Cauixí, Cauixí and Sand, Cauixí and Fibre and Cauixí and Clay Pellets, only represent a quarter (26%) of the total. Nevertheless, in relation to the previous context, sand fabrics lost almost a sixth of its sherds, while sponge spicule sherds increased in 3%. Fine Sand macro-fabrics, related to Mixed Sponge Family, remained a minority with 3% of the sherds. Other sherds in this case constitute almost a tenth of the assemblage (11%), well above some of the sponge spicule fabrics and even the Black Coarse Sand fabrics.

The uppermost Cx.400 (0-5cmBS), with 17% of the total ceramics from this unit, reported six different macro-fabrics. Sand-based fabrics are predominant with 55.3% of the sherds, followed by Cauixí fabrics with 31.1%, small size potsherds (Others) with 12.4% and minority Fine Sand macro fabric with 1.2%. Sand fabrics were once again reduced in relation to the previous context, losing 5%, which were gained by the sponge spicule groups. Fine Sand macro fabric were also reduced almost by half, while Other sherds grew almost 1%.

Overall, the three contexts have similar proportions, with a general tendency of sponge spicule groups increasing towards the top of the trench. Sand fabrics are predominant in every context, however, while in Cx.402 there are three times more sand sherds than cauixí ones. In Cx.401 they double sponge spicule fragments and in Cx.400 they have less than 30% more potsherds.

When compared by level (***Table 6.6-8, Fig.6.6-32***), the distribution of macro-fabrics shows smaller scale process of increasing and decreasing tendencies or certain groups within contexts. The bottom levels of the excavation window (levels 12+13 to 15, 55-125cmBS) only present three different macro-fabrics, strongly dominated by the Coarse Sand macro fabric, with 66% average per level, followed by Cauixí and Sand and Cauixí and Fibre macro-fabrics, representing an average

21% per level. This narrow spectrum of paste recipes begins to change in level 11 (50-55cmBS), where three new macro-fabrics are introduced in the sequence: Fine Sand, Cauixí and Cauixí and Clay pellets. Although all three are minor groups, their presence is evidence of a more diverse assemblage in which sponge spicule sherds, along with additional inclusions, are growing. Cauixí and Clay pellets macro-fabrics, which never surpass 3% of the total sherds per level, is especially diagnostic in this sense given that is only restricted to levels 9 to 11 (40-55cmBS).

Cx.	Level No.	cmBS	Total	FS	C	CS	C+S	C+F	BCS	C+CP	Others
400	0	0	161	2	22	88	23	5	1	0	20
	1	0-5	658	27	65	270	89	6	38	0	163
401	2	5-10	847	50	185	406	70	6	67	0	63
	3	10-15	381	14	40	190	51	0	66	0	20
	4	15-20	470	15	68	276	56	0	46	0	9
	5	20-25	233	2	29	103	46	12	41	0	0
	6	25-30	364	1	30	186	67	0	73	0	7
	7	30-35	259	6	52	98	42	0	61	0	0
	8	35-40	91	0	20	43	7	0	21	0	0
	9	40-45	293	14	10	129	29	12	0	4	95
	10	45-50	461	8	14	218	29	16	0	12	164
	11	50-55	404	7	25	234	45	0	0	13	80
	12	55-65	135	0	18	84	17	0	0	0	16
	12+13	55-75	19	0	0	13	2	0	0	0	4
	14	75-115	26	0	0	16	8	2	0	0	0
	15	115-125	38	0	0	26	4	2	0	0	6
402	16	125-135	16	2	3	11	0	0	0	0	0

Table 6.6-8*. Macro-fabrics frequencies per level in TU-04. Legend: FS=Fine Sand, C=Cauixí, CS=Coarse Sand, C+S= Cauixí and Sand, C+F=Cauixí and Fibre, BCS= Black Coarse Sand, C+CP=Cauixí and Clay Pellets.*

Towards levels 8 and 7 (30-40cmBS), where an important drop of ceramic sherds is registered, a minor number of cauixí ceramics, which had appeared in the previous levels, vanished and gave room to another sand-based fabric: Black Coarse Sand. Even though sponge spicules doubled in number with respect to the previous level, the overall distribution is still heavily dominated by sand fabrics, which represent 70% of the potsherds per level. Within Cx.401 there is another turning point in level 5 (20-25cmBS), where oscillating tendencies of increase and decrease material counts intercalate until the top of the trench. In these levels, minor cauixí fabrics as the Cauixí and Fibre re-appeared, and others as the Fine Sand and Cauixí have a continuous growing tendency from bottom to top. Finally, in Cx.400, Fine Sand groups are reduced again, while Coarse Sand and Cauixí fabric's frequencies grow closer.

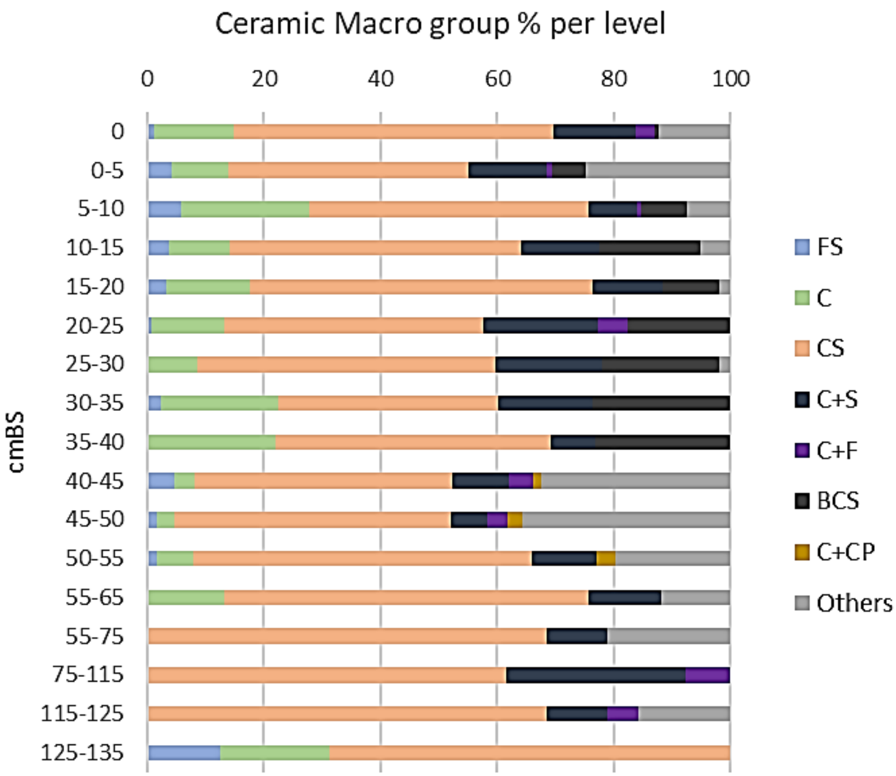


***Figure 6.6-33**. Macro-fabrics percentages per arbitrary level in TU-04. Legend: FS=Fine Sand, C=Cauixí, CS=Coarse Sand, C+S= Cauixí and Sand, C+F=Cauixí and Fibre, BCS= Black Coarse Sand, C+CP=Cauixí and Clay pellets.*

The three tendencies identified within the sequence -based on the presence or absence of more diverse macro-fabrics and the reduction or increase of sand-based fabrics- are also associated to the Others distribution. As seen on ***Fig.6.6-33***, a strong rise on minced pottery sherds occurs in levels 9 and 10 (40-50cmBS), while on level 7 and 8 (30-40cmBS) these sherds disappear. Finally, from level 5 (20-25cmBS) and until the top of the trench, there is a continuous growing tendency of minced potsherds. Their growing numbers can be associated to periods with more activity and trampling in the area, which coincide with the presence of more different pastes with sponges towards the late part of the sequence.

6.6.4.5 TU-03 and TU-05

Test unit 03 yielded a total of 674 artefacts, with 372 lithics and 302 ceramic potsherds. As stated before, this unit was not excavated down to the base of the cultural layer and does not have associated radiocarbon dates. The material distribution through three 5cm thick arbitrary levels does not reveal a clear pattern which can be correlated with the other trenches. However, some conclusions can be made from the data obtained in this excavation unit.

First, the bottom level 3 (10-15cmBS) contained 50% of the total artefacts from this trench (***Fig.6.6-34A***) and 59% of the total ceramic sherds from the unit (***Fig.6.6-34B***). In relation to the previous level 2 (5-10cmBS), there is an average 66% drop in terms of number of total artefacts and ceramic sherds, which indicates an important change, either in terms of activity or its intensity, which caused a significant reduction of artefacts on this area. This trend is contrary to the increase in materials observed in previous trenches in the upper level.

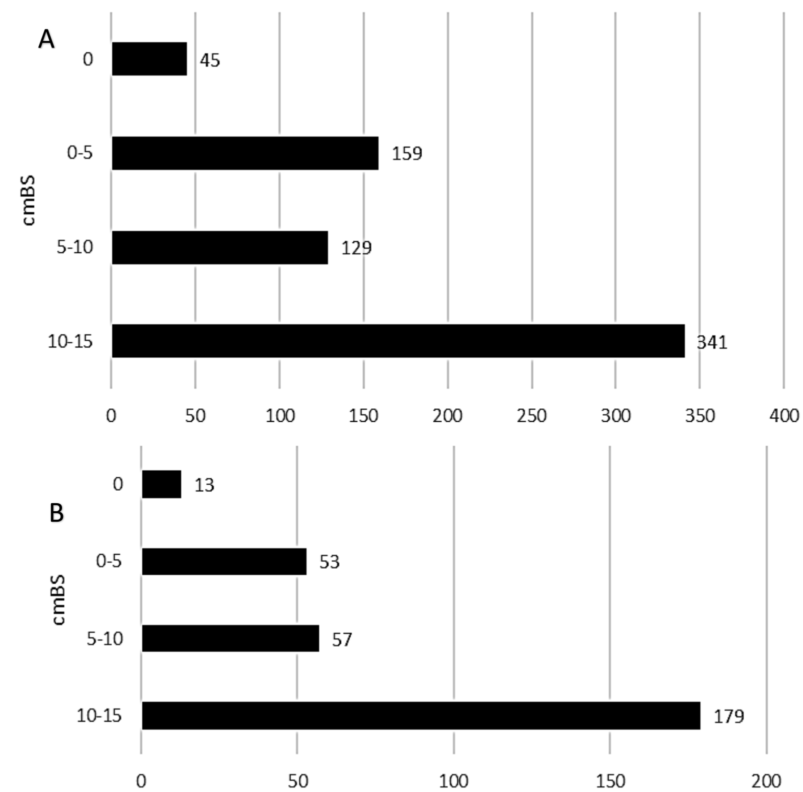


Figure 6.6-34. *Materials recovered at Picure, TU-03, registered per arbitrary level (cm below surface -BS-). A) Total artefacts recovered per level, B) Total ceramic sherds recovered per level.*

Secondly, lithic frequencies surpass the number of ceramic materials in the upper levels by an average of 43% (***Fig.35A).*** This trend was also observable in the upper levels in TU-01 (levels 1-4) and some levels in TU-02 (levels 2, 4 and 5), for which is thought to correspond to a common activity performed in various areas in the island which involved the use of quartz and chert materials in a large scale. Likewise, minced pottery sherds (<1cm²) went from 11% in level 3 (10-15cmBS) to 24% of the total ceramic sherds in the upper levels (***Fig.6.6-35B***). The increase of minced pottery sherds in the upper levels was also reported in TU-01 and TU-02 and supports the argument of more trampling or erosive episodes in the latest part of the occupation.

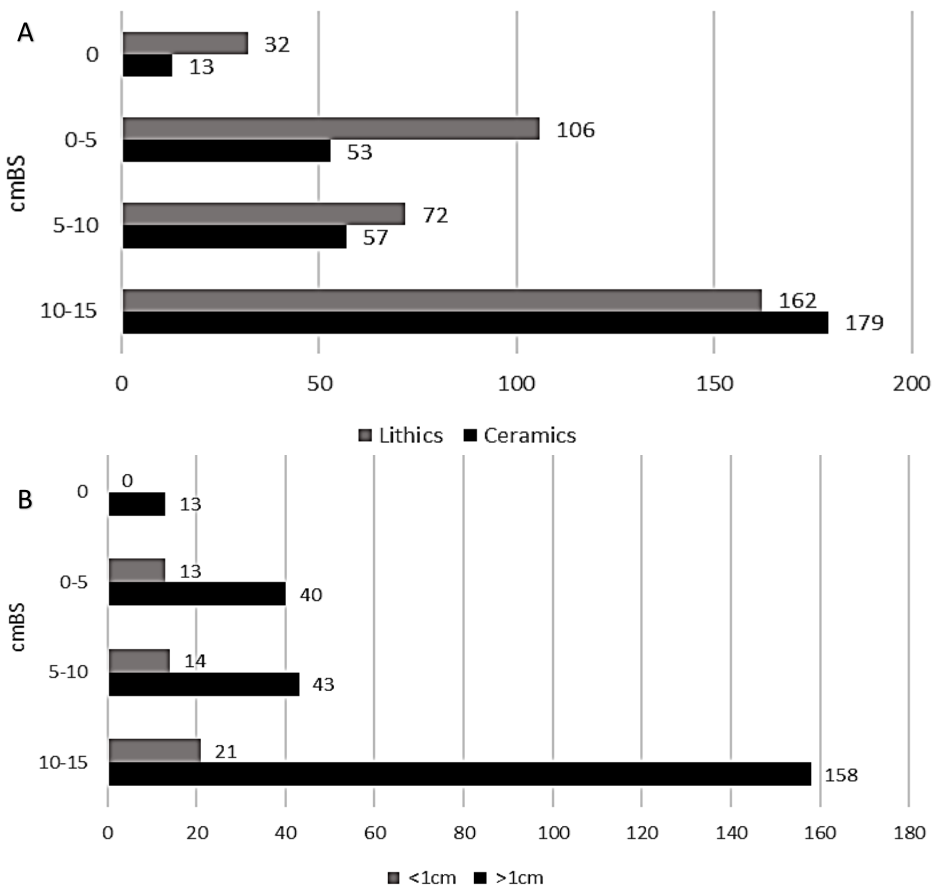


Figure 6.6-35*. Materials recovered at Picure, TU-03, per arbitrary level (cm below surface -BS-). A) Total artefacts discriminated by type of material (ceramics and lithics), B) Total ceramic sherds per level discriminated by size (grey=<1cm² and black=>1cm²).*

TU-05 was excavated down until the sterile level and only yielded 241 artefacts (77 lithics and 164 ceramic sherds). On the surface (level 0) only 14 potsherds were recovered. 66% of the total artefacts were found on level 1 (0-13cmBS), which also concentrated 57% of all ceramic sherds (n=94) and 84% of all lithics (n=65). In level 2 (13-18cmBS), 56 ceramics and 12 lithics were recovered. No minced sherds were reported throughout the unit.

Considering the difference in thickness between levels, the number of ceramic materials recovered in each one was used as a base rate to compare both levels projected into a common $1m^3$ volume unit. While level 1 yielded 94 ceramics in $0.26m^3$, level 2 produced 56 in $0.1m^3$. When projected into $1m^3$, level 1 has 35% less potsherds (n=361) than level 2 (n=560), suggesting a reduction in ceramic deposition towards the upper levels.

- ***6.6.4.5.1 Macro-fabrics distribution***

Macro-fabrics present in TU-03 predominantly belong to the Coarse Sand and Black Coarse Sand fabrics, from the Granitic Family, with an average of 60% of the total sherds per level, while Cauixí sherds, from the Sponges Family, only represent between 15 and 20% of the total (***Fig.6.6-36***). In level 3, where most ceramic sherds from TU-03 were found (n=129), 80% of the potsherds belonged to the Coarse Sand fabric, while 15% were part of the Cauixí and Sand fabric, accompanied by a minor 5% of Fine Sand fabric sherds. While in the bottom level there are four times more sand sherds than sponge spicule ones, in the upper levels 1 and 2 there are only three times more sand potsherds. The increasing tendency of cauixí ceramics in the late part of the trench coincides with those observed for TU-01 and TU-02.

Concerning TU-05, macro-fabrics in level 1 (0-13cmBS) are more diverse, with six different fabrics present, while level 2 only exhibited four. As seen in ***Fig.6.6-37,*** even though in both levels the Coarse Sand fabric dominates with more than half of the total ceramic sherds, the cauixí group increased in the upper level. When comparing macro-fabrics distribution, level 1 has 8% more sponge spicule ceramic sherds than level 2. Likewise, whereas in level 2 there were 60% more coarse sand sherds than sponge spicule ones, in level 1 there were only 25% more. The growing number of sponge spicule sherds coincides with what has been reported in the other units in the island for the upper levels.

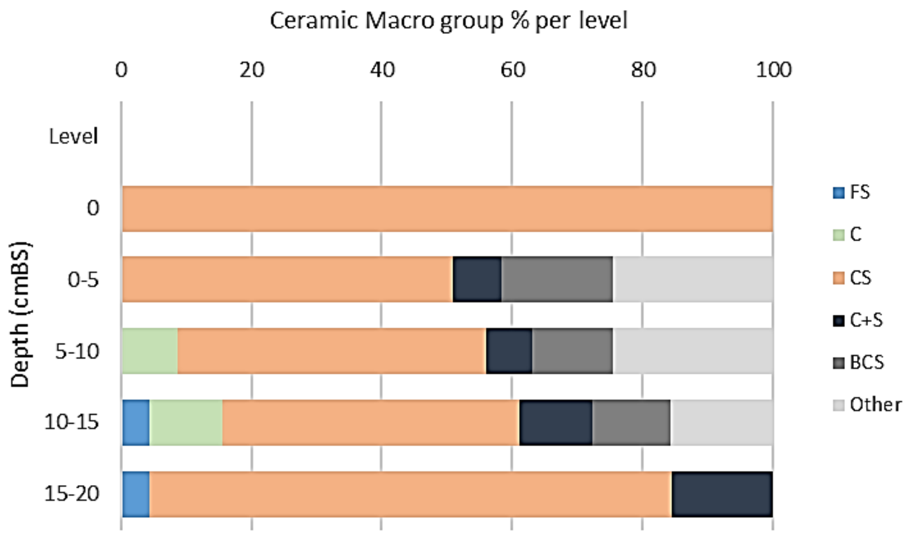


Figure 6.6-36. *Macro-fabrics percentages per arbitrary level in TU-03. Legend: FS=Fine Sand, C=Cauixí, CS=Coarse Sand, C+S= Cauixí and Sand, BCS= Black Coarse Sand.*

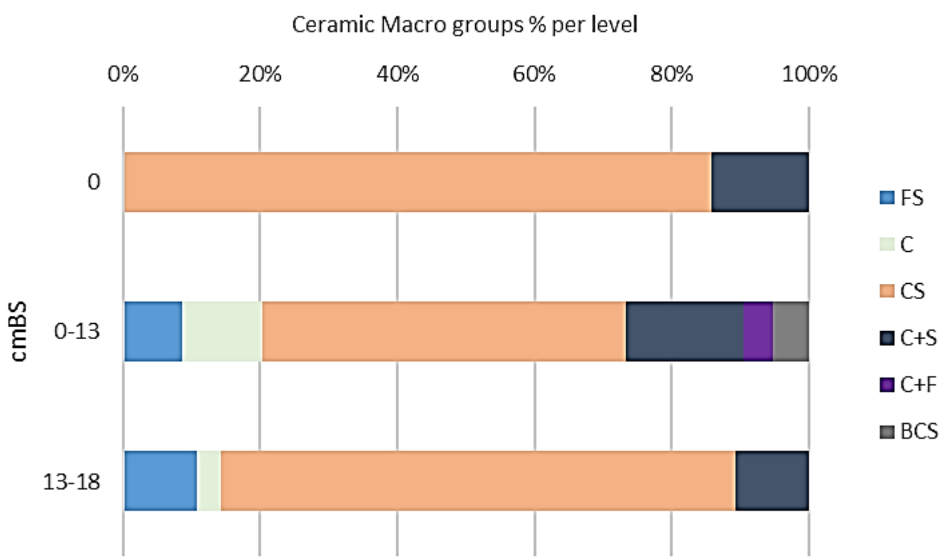


Figure 6.6-37. *Macro-fabrics percentages per arbitrary level in TU-05. Legend: FS=Fine Sand, C=Cauixí, CS=Coarse Sand, C+S= Cauixí and Sand, C+F=Cauixí and Fibre, BCS= Black Coarse Sand.*

6.6.5 Identifying Ancient Pottery Production Practices at Picure Site

To reconstruct the production sequence of the ceramic artefacts recovered at Picure site, a discussion on each one of the already defined dimensions of analysis will take place in the following section. The identification of certain differences in each stage and their combination will allow to infer distinct occupations by groups with different pottery making practices or variations through time within the sequence by the same group.

6.6.5.1 Geochemical characterization

The fabrics from 50 ceramic sherds recovered at Picure site were characterised using portable X-ray fluorescence spectroscopy (pXRF). The accuracy of the obtained net counts was assessed and nine elements with an error of ≦25% (Co, Ga, Fe, K, Nb, Rb, Sr, Ti and Zr) were chosen for further analysis.

A Compositional Variation Matrix (CVM) was calculated using these nine elements to assess the chemical variability of the recovered samples (***Table 6.6-9***). The total variance (vt) obtained for this assemblage corresponded to *vt*=2.5337, a remarkably high variability, most likely associated to polygenic populations (Buxeda, Cau and Gracia, 1999; Buxeda i Garrigós and Kilikoglou 2003; Belfiore et al., 2007; Fantuzzi and Cau, 2018 p.764). Only one sample, PIC-051, was excluded from these analyses based on its very low readings on all elements (below 0.003 in all elements), perhaps due to its very small size which did not occupy the whole pXRF machine window.

The CVM also shows which elements are more variable within the sample, helping to distinguish which ones are responsible for the high internal differences. In this case, the elements with the highest variation (*Ti*) were K (*Ti*=9.1870), Co (*Ti*=5.8540), Sr (*Ti*=5.7854) and, Zr (*Ti*=4.6450), while the one with the least variation was Rb (*Ti*=3.4046). Potassium amounts are usually associated to the presence of K-feldspars (microcline and orthoclase) and/or K-mica (muscovite). On the other hand, Co values are concentrated in metallic iron and olivine. As mentioned before, Sr is associated to K and Na feldspars, as well as carbonates and its amount is relative to the degree of weathering, whereas Zr is related to high-energy environments and heavy weathering -e.g. fluviatile sedimentation- (Degryse and Braekmans, 2014 p.194).

	Co	Fe	Ga	K	Nb	Rb	Sr	Ti	Zr
Co	0	0.1232	0.9756	0.7383	0.9751	0.6159	1.0721	0.3710	0.9827
Fe	0.1232	0	0.6628	0.5765	0.6726	0.3540	0.7742	0.2864	0.6424
Ga	0.9756	0.6628	0	1.6416	0.1065	0.3477	0.2708	0.3781	0.2014
K	0.7383	0.5765	1.6416	0	1.4023	0.6214	1.7430	1.0456	1.4185
Nb	0.9751	0.6726	0.1065	1.4023	0	0.2722	0.3722	0.3308	0.1511
Rb	0.6159	0.3540	0.3477	0.6214	0.2722	0	0.5173	0.3532	0.3229
Sr	1.0721	0.7742	0.2708	1.7430	0.3722	0.5173	0	0.5576	0.4783
Ti	0.3710	0.2864	0.3781	1.0456	0.3308	0.3532	0.5576	0	0.4477
Zr	0.9827	0.6424	0.2014	1.4185	0.1511	0.3229	0.4783	0.4477	0
$T_{i.}$	5.8540	4.0921	4.5844	9.1870	4.2829	3.4046	5.7854	3.7705	4.6450
vt/τ_i	0.4328	0.6192	0.5527	0.2758	0.5916	0.7442	0.4379	0.6720	0.5455
$r\ v,T$	0.2525	0.1536	0.8310	0.3899	0.8108	0.8204	0.8953	0.9326	0.8487
vt	***2.5337***								

Table 6.6-9. *The compositional variation matrix (CVM) calculated for Picure sample on the following elements: Co, Fe, Ga, K, Nb, Rb, Sr, Ti, Zr.*

Potassium, one of the most variable elements in the assemblage, and Niobium, one of the least variable, were used for a bivariate scatterplot. These two elements, which are not co-dependent, are well suited to visualize the tendencies within the Picure sample. As seen in ***Fig.6.6-38***, three clusters were identified. Two of the groups have a similar range of K concentrations (0 to 2-2.5) but differ in their amount of Nb, one with concentrations below 0.003 and the other with higher concentrations that reached 0.0055. The third group presents average Nb values (0.0025-0.0035) with higher K amounts (3-5). K and Nb concentrations can reflect differences in K-bearing minerals (i.e. feldspars, micas) and Nb rich inclusions such as zircons, for which these three tendencies do not necessarily represent distinct clay sources and more minerals are needed to assess their differences.

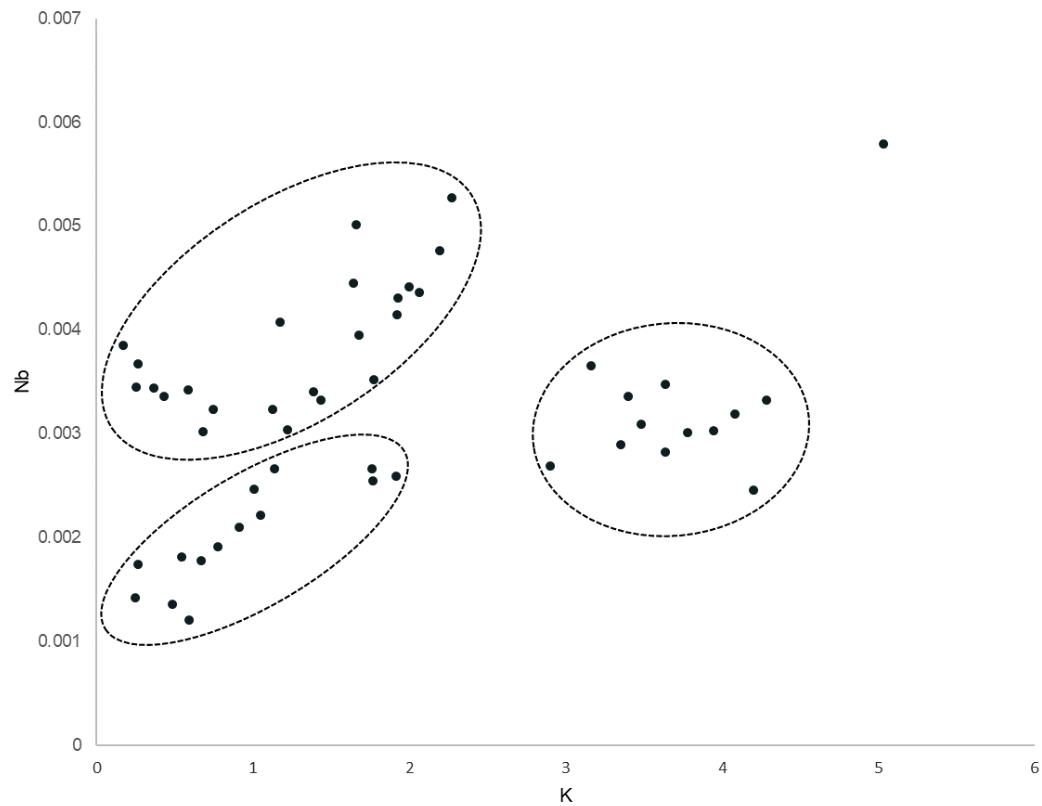


Figure 6.6-38. *Bivariate scatter plot using Nb and K with highlighted tendency groups. Ellipses are for illustration purposes only and do not represent confidence intervals of group membership.*

Following Aitchison (1986) and Buxeda i Garrigós (1999), concentrations from the previously chosen nine elements on all 50 samples were transformed with log-ratio, using Rb as the divisor. This last element was chosen based on the CVM results, where it presented the highest ratio *vt/ti* (n=0.7442), which corresponds to the element which less affects the total variation. The resulting data (***Appendix 16***) was used for Principal Component Analysis (PCA) and Hierarchical Cluster Analysis (HCA), the latter using a centroid agglomerative method and the square Euclidean distance.

Results from PCA and HCA (***Fig.6.6-39***), used to distinguish geochemical groups in the sample, show a good correspondence, with various tendencies which suggest the use of different paste compositions. Group A has four different samples on the upper left quarter of the PCA graph, which are separated from the rest of the assemblage based on its high Zr (0.04-0.08) and low K (0.2-0.4) concentrations. Sample PIC-050, located on the left edge of this quarter of the graph, is an outlier of this group, detached because of its very low K values (≈0.16). Nearby Group B, just below Group A, comprises 15 samples and is characterised from its very low readings in Fe (≈2.6), Zr (≈0.03), Nb (≈0.002) and K (≈0.77). Low Fe readings can be associated to less ferric oxides in the clay fraction. Likewise, Zr and Nb lower values are associated to the absence of zircons while K poor concentrations are most likely due to a reduced presence of K-feldspars and micas (Degryse and Braekmans, 2014 p.194-195). Internal differences respond to variation in Ga and Sr concentrations, the latter usually associated to more weathered fractions, for which it could suggest different weathering stages.

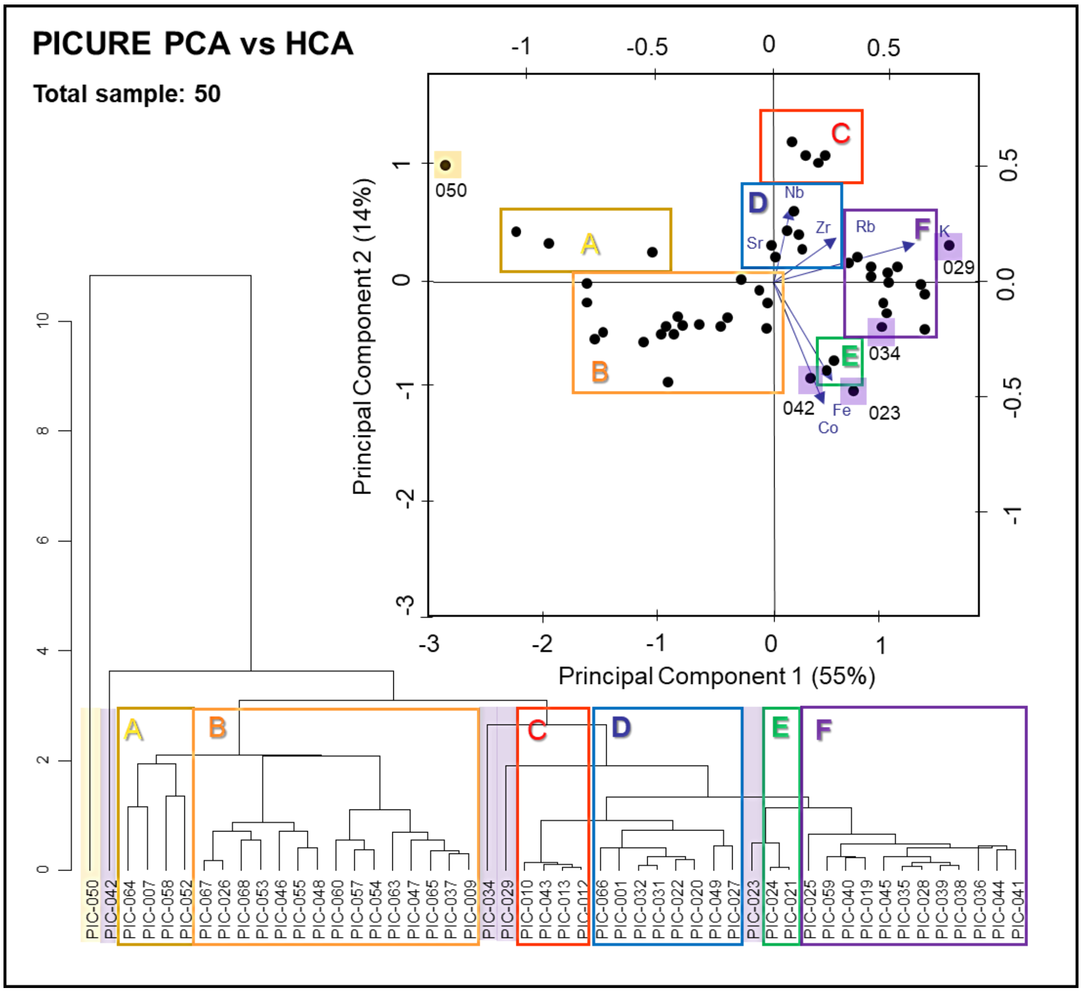


Figure 6.6-39. *Cluster tree of Picure site ceramics using the centroid agglomerative method and square Euclidian distance performed on log-ratio transformed concentrations, with Rb as divisor. Top corner: scatter plot of PCA analysis, which accounts for 69% of the composition between the first two principal components.*

Groups A and B share similar compositions, only varying significantly in terms of their Zr values (>0.03). This could be associated to relatively higher quantities of zircons or other heavy minerals, as well as to a possibly more weathered profiles and high energy environments (Degryse and Braekmans 2014 p.194). The subtle difference between weathering degrees or certain heavy minerals does not constitute a definitive reason to consider each group represents a different clay source.

In contrast, Group C, with only four samples has higher amounts of K (>1.9), Nb (>0.043) and Rb (>0.020) and lower concentrations of Fe (≤1.5). K and Rb are positively correlated elements associated to potassium rich minerals present in K-feldspars and micas. Conversely, Nb accumulates in silicate phases, is associated to heavy and titaniferous minerals and is resistant to weathering (Degryse and Braekmans 2014 p.194; Bonjour and Dabrad, 1991 cited in Degryse and Braekmans, 2014 p.195).

For clay sourcing, Nb is believed to be a reliable element to assert provenance given its high resistance to weathering, however, trace element analysis on archaeological glasses might suggest it can also be the product of silicate rich inclusions in certain paste recipes. Following recent studies on Late Bronze Age plant ash glasses (Shortland, 2005; Shortland and Eremin, 2006; Shortland et al., 2007; Walton et al., 2009), it is suggested that certain elements, such as Sr, Rb, Zn, Ni, Mn, Y and Nb, are common on wood ash glass. While elements such as Sr and Rb can vary based on the specific plant or wood ash used as raw material for the glass production, Nb values seem to originate from the silica source composition (Wedepohl and Simon, 2010).

It could be argued that the silica-rich fraction in ceramic sherds also comprises bark, wood, ashes and fibre inclusions which are silica rich structures. These siliceous structures of organic origin add up, along with the quartz amounts inside the paste, to the Si values. Although Si concentrations were not included in the calibration, higher Nb and Rb values do seem to be associated to the presence of such organic structures. Based on this association, higher concentrations of these elements seem to respond to the frequency and type of inclusions rather than from the base clay itself. If such hypothesis was accepted, the main difference with respect to the previous groups A and B would reside in the lower Fe values and higher K concentrations in group C. The amount of reduced iron might indicate a different source since it is usually associated to the ferric oxides absorbed by the clay minerals.

Group D, comprises eight samples and is characterised by high Ga (≤0.002) and K (≈1.4) values. As mentioned before, differences in potassium concentrations can be due to K-felspars and micas, while gallium differences are most likely associated with aluminosilicates present in clay minerals or feldspars. Niobium and rubidium values are very similar to the ones reported in Group C and might also be associated to the silica rich organic structures present on the paste recipe. Both groups C and D might correspond to a common clay source with minor differences associated to feldspar concentrations.

Remaining groups E and F are both characterised by very high Fe (>4) and Co (>0.16) values. The former group, with just two samples, is slightly separated from the latter because of lower K concentrations (<1.9). Meanwhile, group F, with 12 samples, has particularly high K (>3.4) and Rb (>0.23) values. Iron values are mostly related with ferric oxides in the clay fraction while Co is concentrated in metallic iron and olivine inclusions (Degryse and Braekmans, 2014 p.194). In this sense, and given that both groups have similar Fe concentrations, it could be suggested they use a common clay source. Variations in terms of K and Rb, positively correlated, are due to inclusions in the clay paste such as microcline and orthoclase, as well as muscovites and biotites.

Some outliers from group F, shaded in purple in the PCA and HCA graphs, are explained in terms of variations of certain elements. Sample PIC 042 and PIC 023 are slightly away because of their lower K values (<1.7) while PIC 034 and PIC 029 are separated from their higher Nb concentrations (>0.005).

Although both PCA and HCA reveal the same six groups, some of these are separated based on the concentration of certain elements, possibly associated to different inclusions rather than its clay source. As explained before, these clusters can be reduced to three when comparing the subtle differences that split the groups. Groups A and B are very likely using a common clay source, which, based in its Zr values, is more weathered and probably has a very low amount of K-feldspars and micas. These groups correspond to one of the tendencies seen in the bivariate plot with low K and Nb values (***Fig.6.6-38***). On the other hand, the bivariate plot group with similar K values but higher Nb concentrations corresponds to Groups C and D, distinguished from the former by its Ga, K and Rb higher values. These variations refer to aluminosilicates and feldspars in the paste, however, the Nb difference remains problematic since it might signal a different clay source, or it can also be reflecting a concentration of silica rich plant structures -such as bark and/or fibre- inside the paste. Finally, the last group from the biplot, with the highest K values, corresponds to groups E and F, which share very high Fe and Co values. The latter probably corresponds to a less weathered clay source with an important amount of ferric oxides and possibly K-feldspars and micas as inclusions.

6.6.5.2 Petrographic analysis vs Geochemical data

A petrographic analysis of 50 ceramic sherds from Picure, which were chemically assessed using a portable X-ray fluorescence spectrometer, was performed, among other purposes, to confirm certain observations in terms of texture and minerology (see ***Appendix 2*** for detailed descriptions of each petro-fabric). As mentioned before, the presence of particular minerals and their size can affect the elemental analysis and might explain groupings or clusters which do not necessarily refer to a different clay source. As depicted in ***Fig.6.6-40,*** a PCA graph portraying all the petrographic family fabrics in each group suggests a strong heterogeneity. However, when viewed in terms of the main components within each trend group or possible clay sources identified in the previous section, there are some important common features which need to be further explained.

The groups A and B comprise mostly sponge spicule bearing fabrics. From a total of 16 sherds, 57% (n=9) correspond to the Sponge Spicule Family, 18% (n=3) were made with carbonized and non-charred fibre and another 18% (n=3) belonged to the Mixed Fibre Family. The remaining 7% (n=1) corresponds to the Granitic Family.

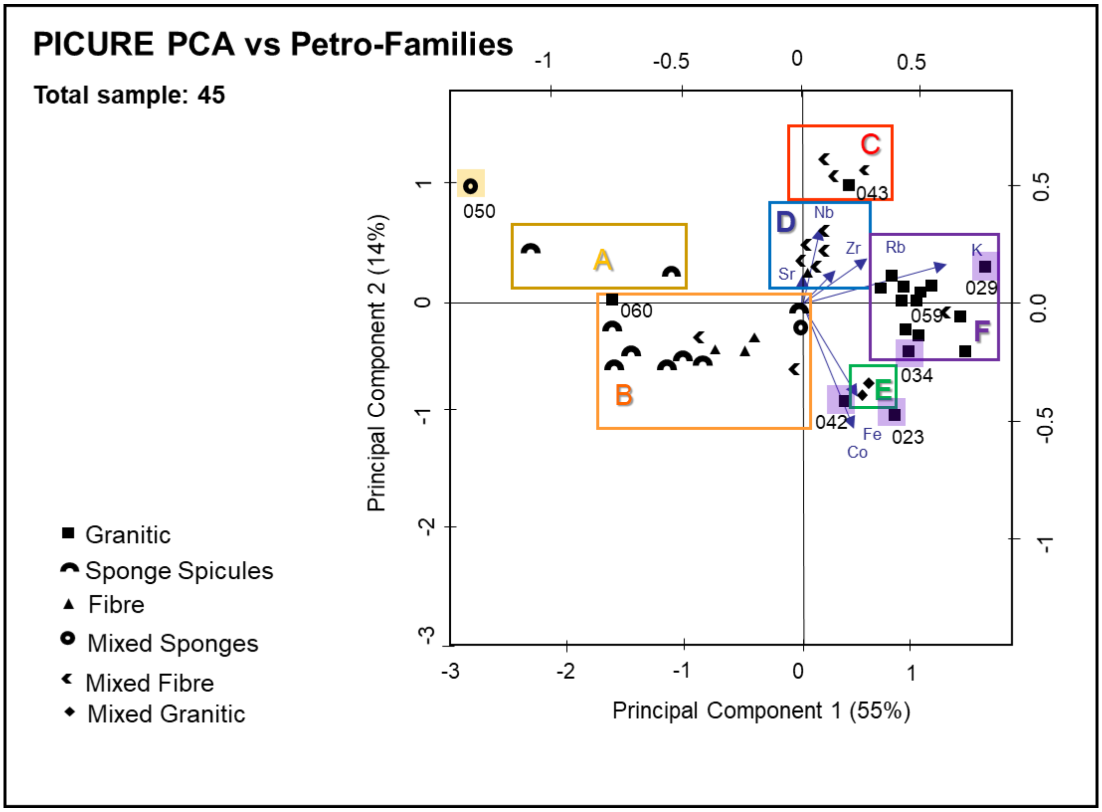


Figure 6.6-40. *Scatter plot of PCA analysis performed on log-transformed results from Picure site. Petrographic families are depicted vs different geochemical groups, highlighted with different colours.*

Despite some differences in their silica-rich components, all sherds share a scarce presence of mineral inclusions. As seen in ***Fig.6.6-41,*** sponge spicules, fibre and/or tree bark structures constitute between 30-40% of the paste, while rounded quartz, the main mineral present in the samples, have an average abundance of 5-8%. Quartz particles have varying sizes between 0.04-0.06mm which correspond to coarse silt to fine sand grain sized inclusions. Only one sample (PIC-052) presented coarse sand sized (0.5mm) rounded quartz. Sub-rounded microcline and muscovite inclusions are rare (1-2%).

Rounded fine quartz predominance suggests a silty clay source, possibly alluvial, derived from a highly weathered granitic parent rock. Alluvial deposits are located on the banks of the Orinoco river (***Fig.3-1***), which were formed by the weathering of the pegmatite and mineralized veins of the granitic geological formation, along with the sediments brought by the river during seasonal flooding (US Geological Survey and Corporación Venezolana de Guyana, 1993 p.89).

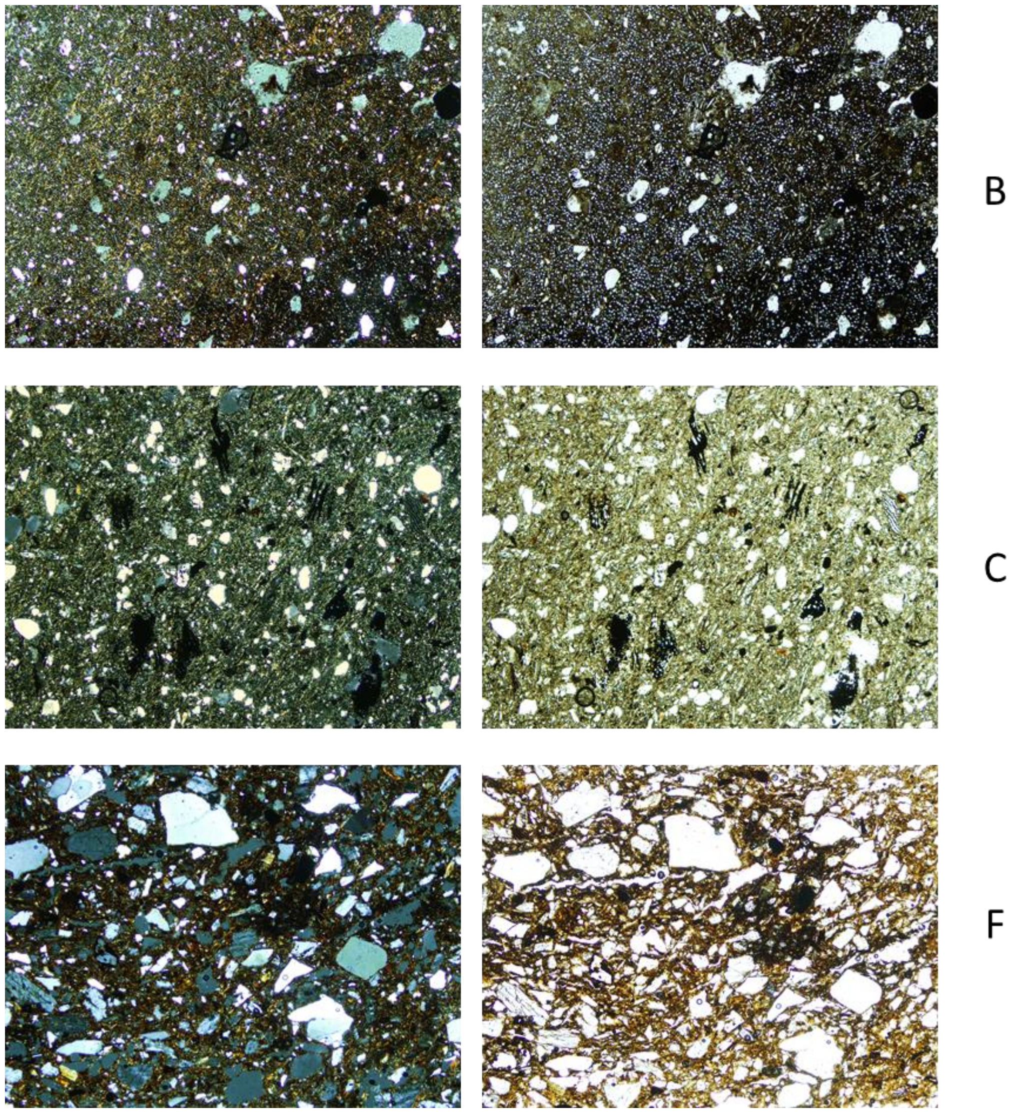
On the other hand, groups C and D are mostly composed of mixed fabrics. In these two groups, which comprise 11 samples in total, 81% of the sherds (n=9) correspond to the Mixed Fibre Family, and only one (9%) is from the Fibre Family. Lastly, a remaining sherd (9%) corresponds to the Granitic fabric. Unlike the former groups, the latter samples exhibit more diverse mineral inclusions. While the elongated fibre and bark structures -some of them carbonized- constitute between 5-15% of the paste, mineral inclusions such as quartz, microclines and biotites are frequently found in the same or higher proportions (15-25%) (***Fig.6.6-41***). They exhibit a sub-round shape which indicates some erosion, confirmed by a lesser number of feldspars and micas. Finally, its grain size is between fine and medium sand. Based on the roundness of its inclusions and a lesser amount of feldspars, it can be inferred that these were a transported from the source of origin and suffered some weathering. The latter suggest a sedimentary clay source, probably deriving from a medium-grained igneous rock of acidic composition, most likely microgranite, commonly found in the area, located within the Parguaza Granite formation.

Final groups E and F are the most cohesive. Out of 18 samples, 83% (n=15) pertain to the Granitic Family, 11% (n=2) belong to the Mixed Granitic, while only 5.5% (n=1) belong to the Mixed Fibre Family. These groups are characterised as having coarse and medium-grained poorly sorted angular mineral inclusions, most of which correspond to sub-angular quartz, microcline and microcline perthite, with a few biotites (***Fig.6.6-41***). A few rock inclusions still associated with these minerals are also reported. Such composition suggests a coarse-grained, acid igneous rock, presumably granite, found locally in the Parguaza formation.

The angularity and size of this poorly sorted inclusions can be associated with a local residual clay source, less weathered than its counterparts. Also, in contrast to the yellowish colour characteristic of highly fired samples from the other groups, samples from this last groups present a bright reddish colour in the paste, most likely due to its higher Fe concentrations, as seen in its X-ray fluorescence results.

Three exceptions must be clarified. One Granitic Family sample (PIC 060) was grouped with mostly sponge spicule samples in Group B while another one from the former family (PIC 043) was clustered within the Mixed Fibre dominated Group C (***Fig.6.6-40***). Both samples exhibited very low levels of Fe, K and Rb, which were confirmed petrographically by a more yellowish base clay colour and a reduced number of microclines. Regarding PIC 060, rather than a reduced number of microclines, the K feldspars present in the sample were particularly altered and weathered. Lastly, a Fibre, charcoal and sponge spicule fabric sample (PIC 059), which occurred among the Granitic fabric dominated E and F groups, was coarser and with a greater number of feldspars than its counterparts from the same fabric in Group B, which might explain its higher K and Rb values which explain it was located in Group F. Likewise, outlier samples from Group F which presented lower K values (PIC 042 and PIC 023) did have less microclines and microcline perthites, while the ones with higher Nb values (PIC 034 and PIC 029) did present few carbonized fibre inclusions, although it is not confirmed whether they are related to this last element.

Picure island is a granitic outcrop in the middle of the rapids, a remnant from the Middle Proterozoic Parguaza Granite formation. However, there are not extended sand or clay deposits on the shorelines of the island because of the high currents of the rapids, which do not allow for them to form. Based on our excavations, the sediments in the middle of the island are not too deep (<2m) and do not exhibit clay deposits. The nearest clay sources are located in the Orinoco river banks or close tributaries such as the Cataniapo or Mesetas rivers. The Orinoco banks are easily accessible from the island during the dry season, even by foot from other islands in the rapids such as Zamuro or Viboral.



*Fi**gure 6.6-41**. Micro photographs of Picure samples from groups B, C and F, in cross-polar (XP) (left) and plane polarizing light (PPL) (right). Image width: 3mm. Microphotographs taken by Natalia Lozada, 2017.*

Sedimentary clay deposits are available on these river banks and further inland areas along both riversides (***Fig.3-1***), which are more reachable during the dry season, when the water level is low. Alluvial clays, characterised as having silt sized minerals, mostly rounded and dominated by quartz- which are most resistant to weathering- are most likely located in the immediate area of the river banks, more exposed to the high currents and the erosion from the stream. Less weathered clays, with remaining feldspars and sub-rounded inclusions, seem to correspond to a more juvenile and less altered deposit, probably located somewhat further inland. Finally, residual clays, with poorly sorted angular minerals and rock fragments made up of agglomerates of minerals, suggest a deposit closer to the parent rock, with less transport and perhaps not so close to the river. Based on these analyses, ceramic sherds found at Picure site were manufactured using clays with three different stages of weathering and disaggregation of the parent material, all available on nearby locations along the river banks but not in the island. Residual clay is most likely to be located further away from the river banks, while sedimentary and alluvial clays are closer to the riverside.

Regarding their vertical distribution, sedimentary clay group B and residual clay group F were registered in the deepest levels of TU-04 and TU-01 (PIC 054, 059, 060, 063), with samples belonging to the Mixed Fibre and Granitic families, respectively. Potsherds from clay groups A (PIC 007, 050), B (PIC 009, 047) and D (PIC 049), are all associated with sedimentary clay sources and part of the Sponges, Mixed Sponges and Fibre families, which prevailed in the analysed sample from the intermediate levels of TU-01 (PIC 007, 009, 047, 049, 050). The remaining ceramic fragments from the upper levels of units TU-01, TU-02 and TU-04 exhibited all the clay groups identified in the sample: with Sponge Spicules and Mixed Fibre families are associated with sedimentary clay groups (A, B, D) and Granitic and Mixed Granitic families with residual clay groups (E, F). Although there is a sample bias in the analysed fragments, which were mostly from the upper levels of all units (due to better preservation and larger size), there seems to be a constant between the bottom and upper levels which always presents at least two different clay sources, one tempered sedimentary clay source and one non-tempered residual one.

6.6.5.3 Paste preparation and Processing:

Ceramic sherds obtained during the excavations in 2016 and 2017 at Picure archaeological site were divided and classified in seven macroscopic fabrics, based on their paste colour and type and grain size of inclusions. A sample of 61 sherds including all macroscopic groups was further analysed in thin section. This approach was used to provide independent and more detailed assessment of the raw materials and technology of the sherds, which can be used to assess the validity of their macroscopic paste classification and to determine which inclusions were naturally occurring and which were added. It also served to reconstruct other stages in the production sequence beyond the paste preparation, such as forming and firing techniques, which will be detailed further ahead in the corresponding sections.

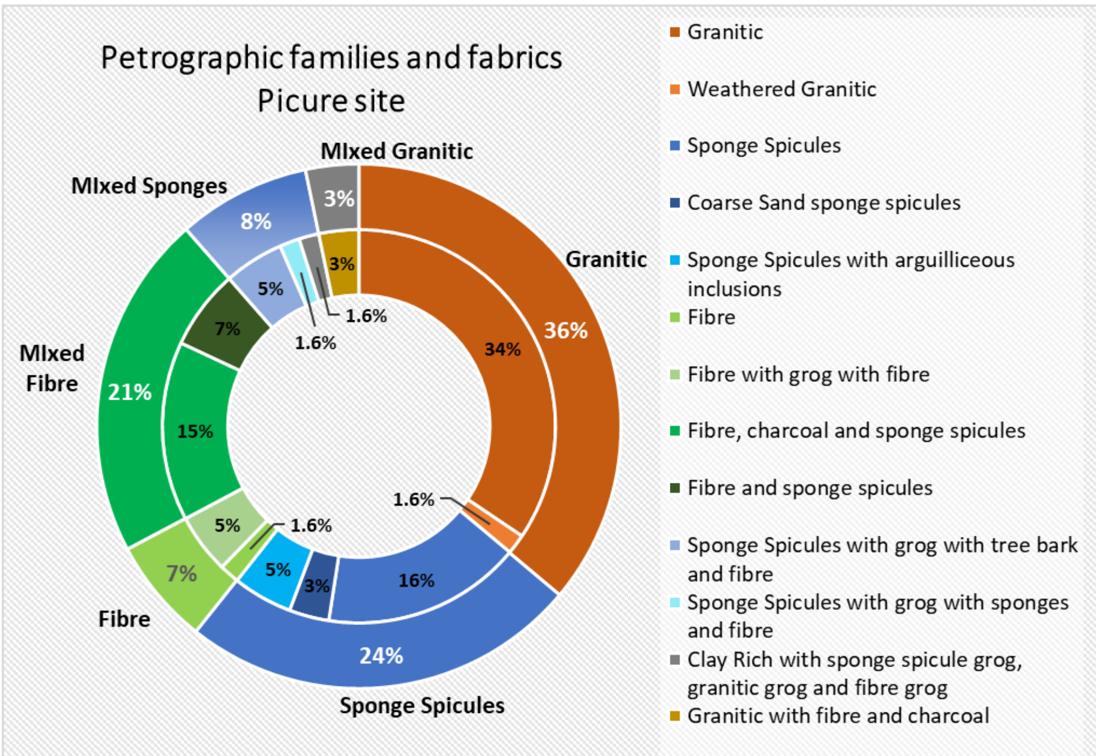


***Figure 6.6-42**. Petrographic fabrics and families recovered at Picure archaeological site (n=61).*

The analysed sample comprised five sherds from the surface collection, 18 from trench TU-01, four from TU-02, 22 potsherds from TU-04 and 12 from TU-05. Regarding the paste preparation recipes present in the sample, 13 different petrographic fabrics were detected at Picure site (see ***Fig. 6.6-42,*** inner ring), based on different raw materials and technology, which represent distinct, conscious choices. Some of the fabrics share broad similarities in terms of the use of specific types of clay sources or distinctive temper materials. These have been grouped in *fabric families* (as defined by Quinn, 201 p.77, 80) for the purpose of discussion, a higher category based on their main inclusions that is useful for understanding some technological similarities (see ***Fig. 6.6-42,*** outer ring).

The largest family is the Granitic Family (36%, n=22), defined by its main mineral inclusions, derived from a granitic parent rock. This family includes the Granitic Fabric, the largest in the analysed sample (34%) with a third of the total potsherds, and the Weathered Granitic Fabric (1.6%). They are followed by the Sponge Spicules Family (24%, n=15), with sponge spicules as its main component. Said family comprises the Sponge Spicules Fabric (16%), the Coarse Sand Sponge Spicule Fabric (3%) and the Sponge Spicules with Argillaceous Inclusions Fabric (5%). Next is the Mixed Fibre Family (21%), in which the samples (n=13) contain fibre, tree bark, charcoal and sponge spicules. Each fabric was denominated according to which inclusion was the most abundant and followed by the others in order of frequency. The main fabrics within this family are the Fibre, Charcoal and Sponge Spicule Fabric (15%), and the Fibre and Sponge Spicule Fabric (7%). Mixed Sponges Family (8%, n=5) was a minority group in which its samples, primarily tempered with sponge spicules, were accompanied by fibre and tree bark tempered grog inclusions. The fabrics belonging to this family were the Sponge Spicule with grog with tree bark and fibre Fabric (5%), the Sponge spicules with grog with sponges and fibre Fabric (1.6%) and the Clay rich with sponge spicules grog, granitic grog and fibre grog Fabric (1.6%). On the other hand, the Mixed Granitic Family (n=2) only comprised the Granitic with fibre and charcoal Fabric (3%). The remaining family, Fibre Family (7%, n=4), with only fibre inclusions, presented two fabrics: Fibre Fabric (1.6%) and the Fibre with grog with fibre Fabric (5%).

Ceramic sherds within the Granitic Family, which represent a third of the samples, have a mineral composition associated to a weathered medium-grained acid igneous rock, possibly a microgranite, congruent with the geology of the Parguaza Granite formation in which the island and its immediate surroundings are located.

One sample among the Granitic Family exhibits what appears to be a grog inclusion composed of a granitic fabric (***Fig.6.6-43***). Nevertheless, given that there is only one inclusion in the section, it could have been un-intentionally added during the paste preparation phase. As stated by some ethnoarchaeological studies, crushed ceramic sherds can be used during the paste kneading process and/or during the pre-forming stages to prevent the clay from adhering to the surface. These small ceramic bits could possibly stick to the paste and be misidentified as a consciously added crushed pottery inclusion.

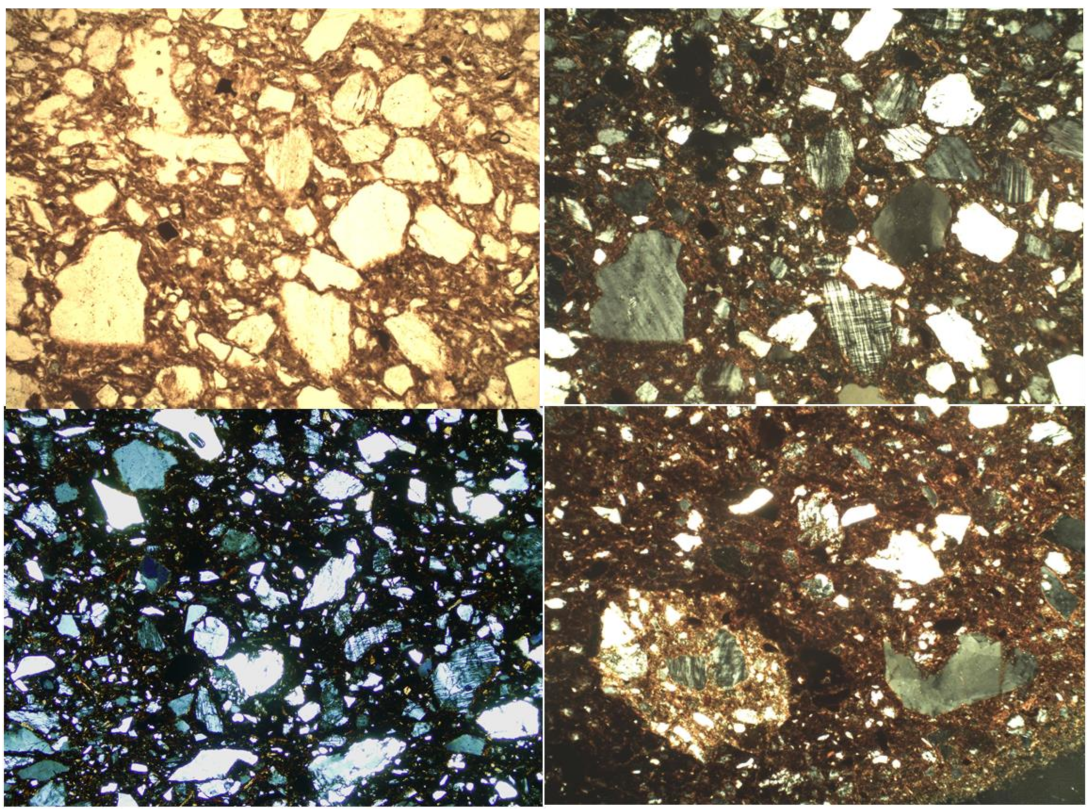


Figure 6.6-43. *Granitic Family microphotographs. Upper section: Granitic Fabric (PIC 040) under a plane polarized light (PPL) on the left and a cross-polar light (XP) on the right; Bottom left: XP Weathered granitic Fabric (PIC 060) and Bottom right: A possible granitic grog in XP sample PIC 002. Image width: 3mm.*

A family with very few mineral inclusions is the Sponge Spicule Family, with three different fabrics, all of which share the abundant presence of this elongated siliceous rich structures which constitute between 40-50% of the paste. Among the few minerals reported in this family there are mostly coarse silt-sized rounded and sub-rounded quartz, along with very rare microclines, muscovite and biotite.

This minerals angularity, size and rare frequencies are common in highly weathered clays.

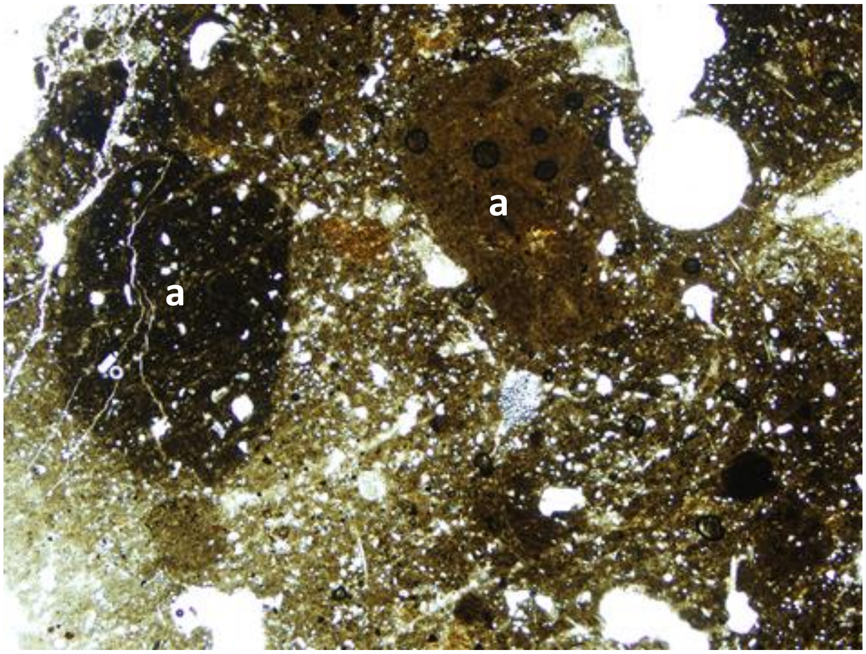


Figure 6.6-44. *Sponge Spicules tempered with Argillaceous Inclusions Fabric (PIC 007). In the microphotograph taken with PPL light, two clay pellets (a) can be observed in the upper left corner. Image width: 3mm.*

Sponge spicules, as mentioned before, are thought to have been used as tempering material. As expected from this tempering process, it was possible to document during the petrographic analysis of Picure samples, areas of possible base clay which did not receive sponges during blending (Quinn 2013, p. 175), evidence for incomplete mixing techniques. On the other hand, clay-rich plastic inclusions (Quinn, 2013 p.58), can be the result from poor hydration of a powdered base clay while preparing the paste. These last ones where present within the Sponge Spicules tempered with Argillaceous Inclusions fabric (***Fig.6.6-45***), where they constitute 5-10% of the total inclusions in the paste.

The ceramics classified within the Fibre-Tempered Family in Picure are divided between two different fabrics: Fibre Fabric and Fibre with grog with fibre Fabric. Their moderately sorted inclusions indicate some sort of grinding or cleaning to refine the clay and to crush the fibre inclusions before incorporation. It could also suggest the use of a finer clay source (***Fig. 6.6-45***).

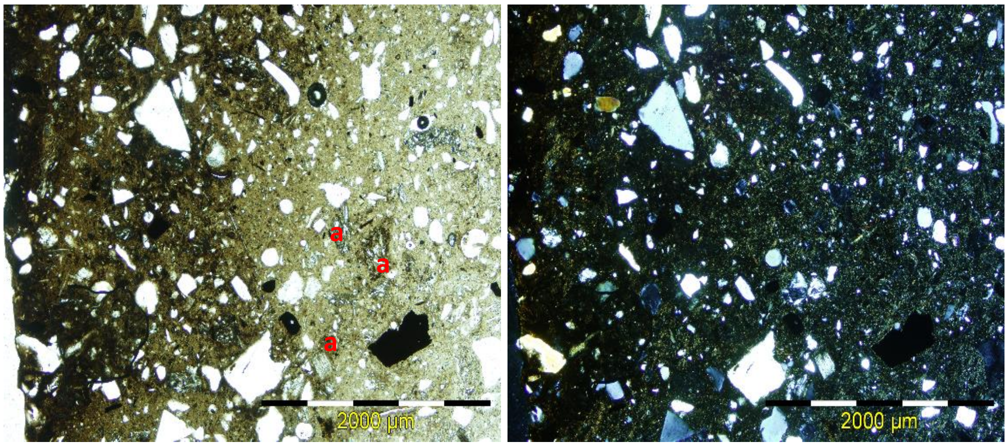


Figure 6.6-45*. Plane polarizing light (PPL) (left and bottom) and cross polar light (XP) (right) micro photographs of Picure sample PIC 046, which belong to the Fibre with Grog Fibre Fabric. Inclusions identified with letter (a) correspond to grog inclusions (bottom-close up).*

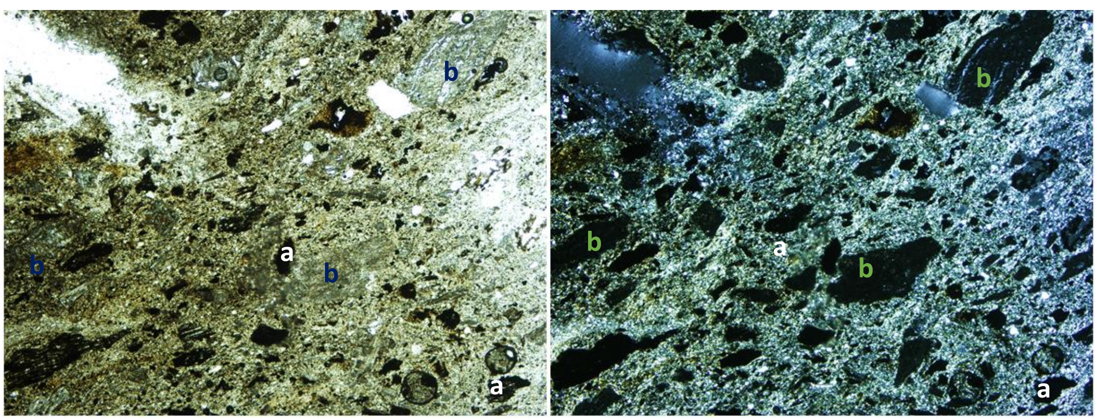


Figure 6.6-46. *Fibre, Charcoal and Sponge Spicule Fabric (PIC 063) under a plane polarized light (PPL) on the left and a cross-polar light (XP) on the right. Inclusions identified by letters: a) charcoal; b) non-charred tree bark. Image width: 3mm.*

Samples belonging to the Mixed Fibre Family in this sample have very different proportions of minerals, varying from 3% to 15% of abundance of medium and fine-grained sub-rounded quartz, microcline and muscovite inclusions (***Fig.6.6-46***). The most conspicuous components are siliceous-rich inclusions such as fibre, tree bark, charcoal and sponge spicules. Charcoal and charred tree bark inclusions have similar sizes (0.3-0.5mm in length) while non-charred tree bark inclusions are larger (1mm in length).

The Mixed Granitic Family fabric has a similar base clay than the Granitic Fabric, with fibre and charcoal inclusions, which are rare and were most likely not intentionally added. In contrast, Mixed Sponges Family samples exhibited fibre, tree bark and sponge spicules tempered grogs, and non-tempered granitic grogs. These inclusions are common (15-20%) and they can be found mixed together in one sample.

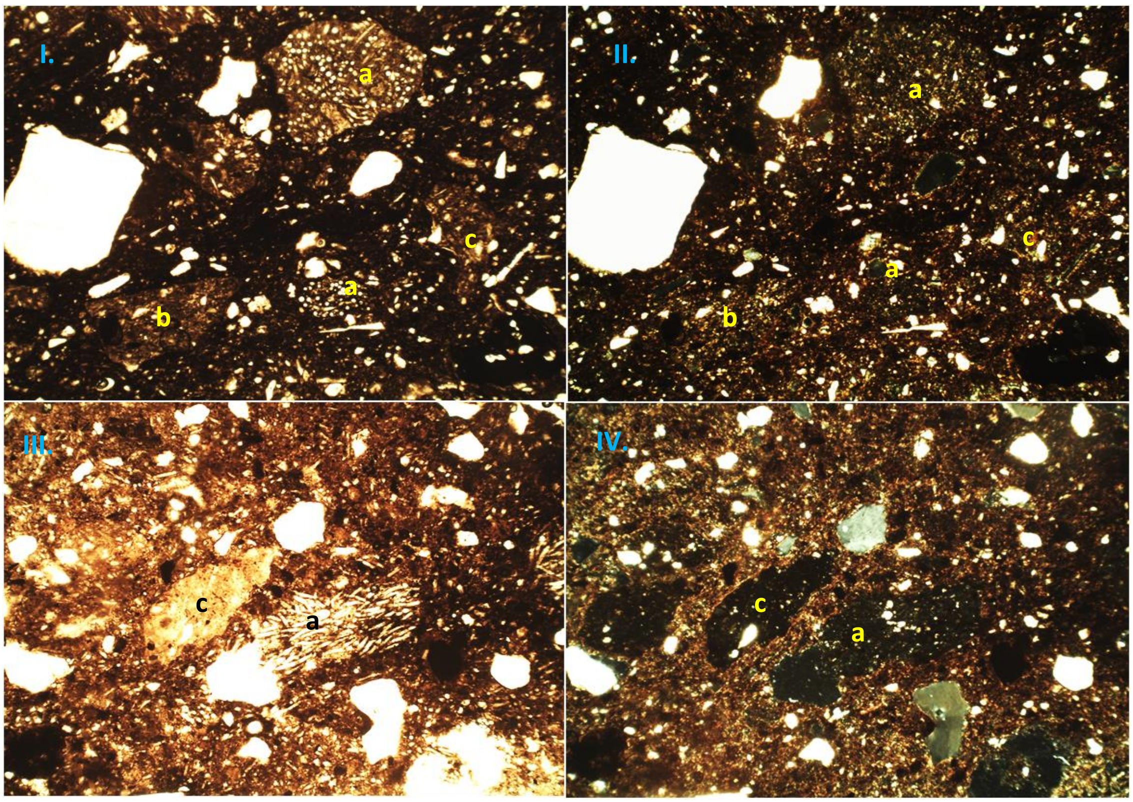


***Figure 6.6-47**. Mixed Family microphotographs. Upper section: I. Clay rich with sponge spicule grog, granitic grog and fibre grog Fabric (PIC 003) under a plane polarized light (PPL) and II. a cross-polar light (XP). Bottom section: III. Sponge Spicules with grog with sponges and grog with fibre (PIC 015) under PPL and IV. Under XP light. Inclusions identified by letters: (a) sponge spicule rich grog (b) granitic rich grog (c) fibre rich grog. Image width: 3mm. Microphotographs taken by Natalia Lozada, 2017.*

While the Granitic, Sponge Spicule and Mixed Fibre families appear in all excavation units and through every level, there are some variations within these fabrics through time and a more restricted presence of the remaining families. The

Mixed Fibre Family, in particular, presents conspicuous charred tree bark and rare spicules in samples from the deepest levels in TU-04 (PIC 059, 063), while the samples from later levels in the same unit and in TU-01 (PIC 001, 010-014, 020, 022, 031, 032) have more fibre and spicule inclusions and rare charred bark. On the other hand, Fibre (PIC 049) and Fibre with Grog with Fibre fabric samples (PIC 046, 047, 055) were only found in the upper levels of TU-01 and in the surface collection. Finally Sponges with Tree Bark and Fibre tempered grog fabrics (PIC 050, 051, 058) were only found in the intermediate levels of TU-01, TU-02 and TU-04, while the ceramics tempered with different kinds of grogs were present in the upper levels of TU-01 (PIC 003).

6.6.5.4 Fashioning

- ***6.6.5.4.1 Roughing Out***

As the initial phase of the fashioning stage, roughing out refers to the constitution of the hollow form, without the geometric characteristic of the final shape. This stage is often difficult to identify in macro-trace analysis given that posterior stages of the production chain often erase its associated features. However, the combined examination of profile, radial section, fracture and topography of the sherds allowed to recognise features associated to certain roughing out techniques. The observations regarding each of these elements were registered for each sherd and can be seen in detail in ***Appendix 11.*** Thin section petrography was also used as an independent proxy to reconstruct this stage, based on the orientation and distribution of the inclusions.

From a total of 77 ceramic sherds analysed from Picure site, this phase was identified in 57 of them (74%). From the latter, 84% (n=48) corresponded to coiling technique while the remaining 16% (n=9) corresponded to modelling. Only one small cylindrical vessel presented a mixed technique which combined coiling on its upper vessel segment and modelling on its base (***Fig 6.6-48***). The coiling technique was identified from the chaotic orientation of the inclusions on the radial section, the type of fracture and equidistant straight cracks and small ridges observed on the surface associated to discontinuities in the profile. On the other hand, modelling was recognised from a continuous profile with horizontally oriented inclusions, with no associated cracks or concavities.

Macro-trace analysis also allowed to classify the coiling technique by type of junction and placement of coils. Coiling by 'drawing' (i.e. *étirement*) was present in most of the sherds (n=23), followed by 'Pinching' (n=15), and the indeterminable (n=10). Despite the type of coiling, the junction most commonly used in both was the 'Bevelled' form, followed by the 'Straight' form. Placement type varied between coil types, with 'Outside to Inside' placement as the predominant technique among the coiling by pinching, and the 'Alternation' as the most common within the coiling by drawing. All coils were merged using direct finger pressure, evidenced in the discontinuous circular concavities seen in the exterior surface of several ceramic fragments. Discontinuous punctual finger-tip pressure was also noticed in the modelled base (FS 114705-07), made by pinching.

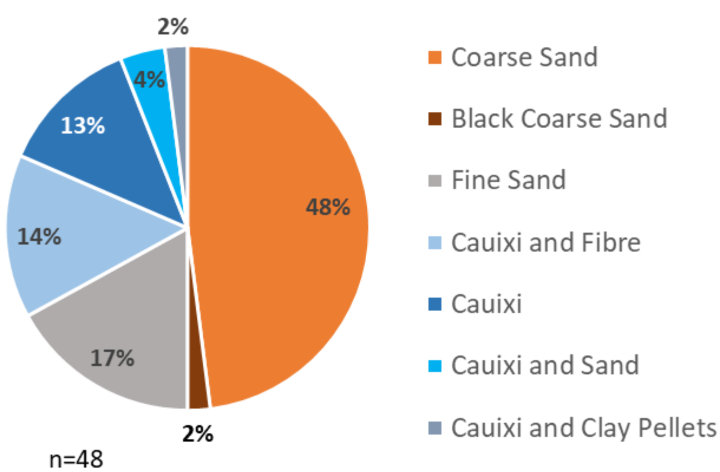


Figure 6.6-48*. Pie chart with the macroscopic fabrics of the analysed potsherds with coiling on Picure.*

All macroscopic fabric groups contain potsherds which were made with the coiling technique. Petrographic analysis, performed on half of these samples, confirmed the large range of fabrics associated to this technique, which correspond to all of the petrographic families reported on Picure, except for the Mixed Granitic (***Fig.6.6-49***).

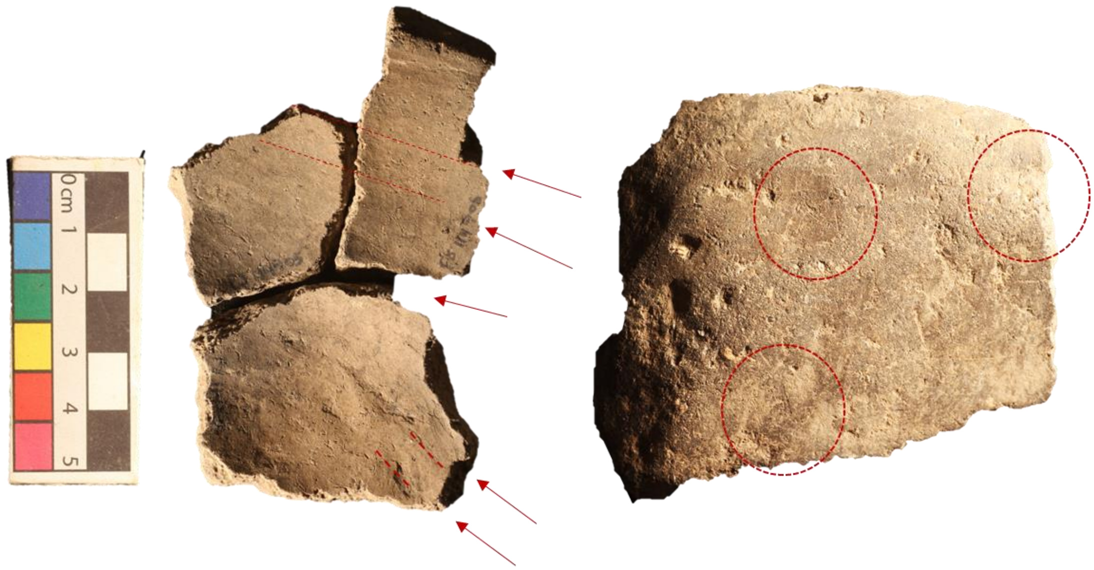


Figure 6.6-49. *Picure sample FS-114750-07, of the Granitic Family, presents both coiling and clay mass roughing-out techniques. Coiling is observed in the body and in the joint with the base (red arrows, left), while the base was made separately with a clay mass and shaped with finger-tip pressure (circular depressions on the right).*

Figure 6.6-50. *Fragments of roller stamps recovered at Picure site. Top fragments belong to the Sponge Spicule Family while bottom fragments pertain to the Fibre with Grog with Fibre Fabric. All roller stamps were made by modelling.*

Regarding distribution through the site, coiling technique was reported in sherds from trench units TU-01, TU-02, TU-04 and TU-05, in both the upper (Cx.101, 102, 401, 501) and lower contexts (Cx.202 and 402), as well as in the Feature-1 from TU-01 (Cx.106), occurring through the entire sequence of Picure site. It was associated to different vessel forms such as globular pots, griddles, *aripos*, deep and shallow bowls and cylindrical vessels.

Modelled sherds correspond to two zoomorphic figures and seven roller stamps. The latter were found mostly on the surface (n=5) and in TU-01 (Lv.4 and Lv.7-Cx.102) (***Fig.6.6-50***). The zoomorphic figures corresponded to TU-04 and TU-05 (Lv.6-Cx.401, Lv.1-Cx.501). Finally, the small cylindrical vessel with a modelled base was found on TU-04 in Lv.10-Cx.401. From its distribution at the site, on the surface and upper contexts in TU-01 and TU-04, this technique appeared as early as cal. AD1324-1436 -based on the associated date to one of the roller stamps from Lv.7-TU-01. It was more common in the late part of the occupation, with most of the roller stamps on the surface and the modelled base from Lv.10-TU-04, which dates somewhere between ca. AD1365-1400. However, the zoomorphic figure in TU-05 appears to belong to a different earlier complex, which most likely dates as early as ca. AD400, for which modelling can be traced earlier in the island.

On their associated paste recipes, the zoomorphic figure in TU-05 corresponded to the Granitic Family and the one from TU-04 to the Sponge Spicule Family. The latter was the predominant group among the roller stamps, with 72% (n=5), followed by the Mixed Fibre Family (28%, n=2). Thin section petrography of the stamps revealed 43% belonged to the Fibre Family, specifically to the Fibre with Grog with Fibre fabric, which is a recipe exclusive for these shapes in Picure site. Fibre and Sponge spicule tempered roller stamps are found on the surface and in TU-01 (Lv.4 and 7-Cx.102). From these results, modelling is more common among the Sponges and Fibre families, with the exception of the early zoomorphic from TU-05 which belongs to the Granitic Family.

The reconstruction of forming technique through petrographic analysis was only detected in six samples, three of which correspond to the Mixed Fibre Family, two to the Mixed Granitic Family and one to the Mixed Sponge Family. The analysed samples correspond to oriented cuts (***Fig.53***), using the rim as a point of reference. The concentric orientation of its inclusions serves as evidence for coiling technique.

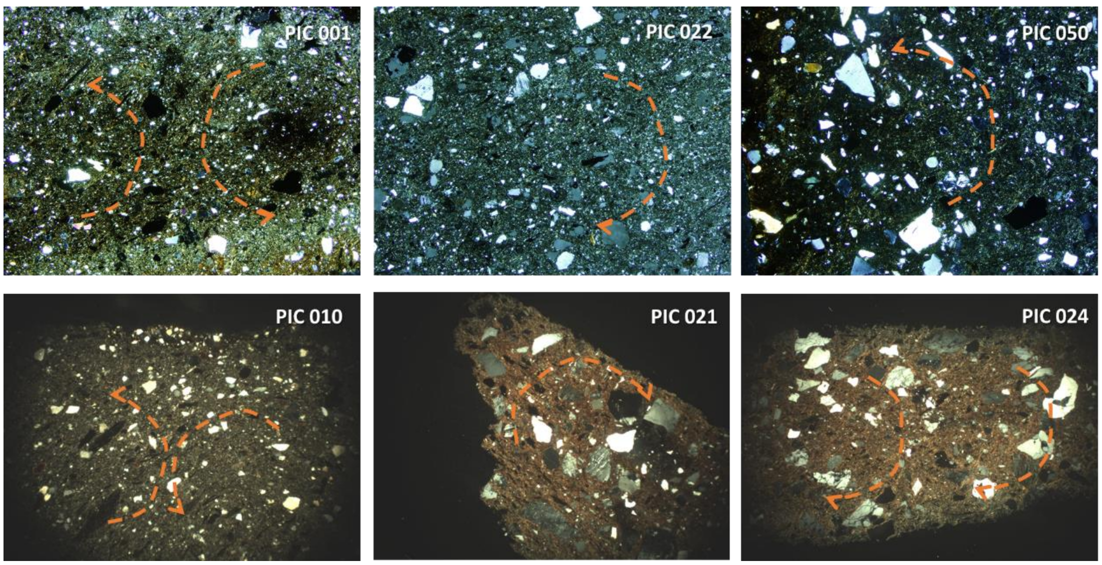


Figure 6.6-51. *Cross polar (XP) microphotographs of Picure thin sections showing circular oriented inclusions and central voids, associated with coiling. Top line images width: 3mm. Bottom line images width: 6mm. Microphotographs taken by Natalia Lozada, 2017.*

- ***6.6.5.4.2 Pre-forming***

The pre-forming technique refers to the second phase of the fashioning stage, in which the hollow form is given a definitive shape. This process can be performed with the help of tools. This phase could only be identified with macro-trace analysis by evaluating the microtopography of the sherds and the presence of striation and concavities associated to the use of certain percussion tools. From the 69 sherds analysed using this method, in 56 (81%) this phase was recognizable and survived later surface treatments.

The samples classified as having coils by pinching or drawing did not exhibit any difference between them in their pre-forming phase. In both cases, samples were shaped when either wet or with a leather hard clay. Two pre-forming techniques for wet clay are present: scraping -a discontinuous horizontal and vertical pressure on the surface of the vessel - and continuous finger pressure. Likewise, three techniques for leather hard clay were identified: '*repoussage*' -pressure with a tool from the inside to remove clay from the surface; shaving -pressure with a sharpen tool to remove an excess of clay; and beating -percussion with a tool.

Scraping was found in external and internal faces of various sherds. Individually scraped external surfaces were found on sherds from TU-04 (Lv.11) and TU-02 (Lv.6-7), with associated dates from cal. AD1220-1280 and AD1365-1553 (AMS and TL dates); while sherds with internal or both surfaces scraped were only found in the deepest levels of TU-04 (Lv.16) and in TU-05 (Lv.2), associated to the earliest dates of the site, ca. AD298-607 (TL average date). Few of the sherds which presented scraping were diagnostic for form; however, the ones which could be reconstructed are associated to deep hemispherical bowls (***Fig. 6.6-52***).

Continuous finger pressure was only reported in one globular pot and a griddle from TU-04 (Lv.9), which according to the radiocarbon and TL dates from the directly above and below levels, were deposited somewhere between ca.AD1365-1444. They were not found in any other trench unit in Picure and in any similar vessel form, making it a rather idiosyncratic and late technique (***Fig. 6.6-52***).

As for the pre-forming techniques applied in leather hard clay, shaving predominates in most of the samples. Sherds with both surfaces shaped with this technique were reported in trench units TU-01, 04 and 05 and are present throughout the entire sequence. Sherds with shaved internal surfaces were only reported in TU-04 (Lv.11), with an average associated date of ca.1459 (TL). Meanwhile, sherds with external shaved faces were found in higher levels in the same unit (Lv.6) and in TU-05 (Lv.2). From associated dates in TU-04, the latter can be traced to somewhere between cal. AD1444-1479. Among the vessel forms with shaving are griddles, globular pots and deep and shallow hemispherical vessels.

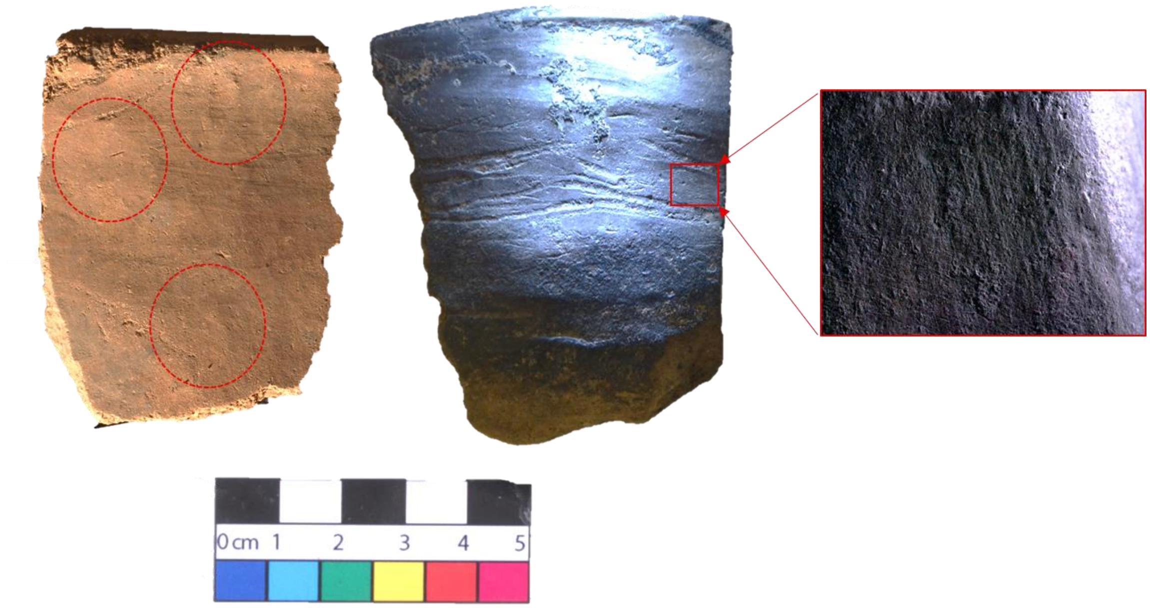


***Figure 6.6-52.**.Continuous fingers pressure (left, sherd FS-114601) and scraping (right, sherd FS-107901) were found associated to moderately deep and deep hemispherical bowls in Granitic and Mixed Sponges families.*

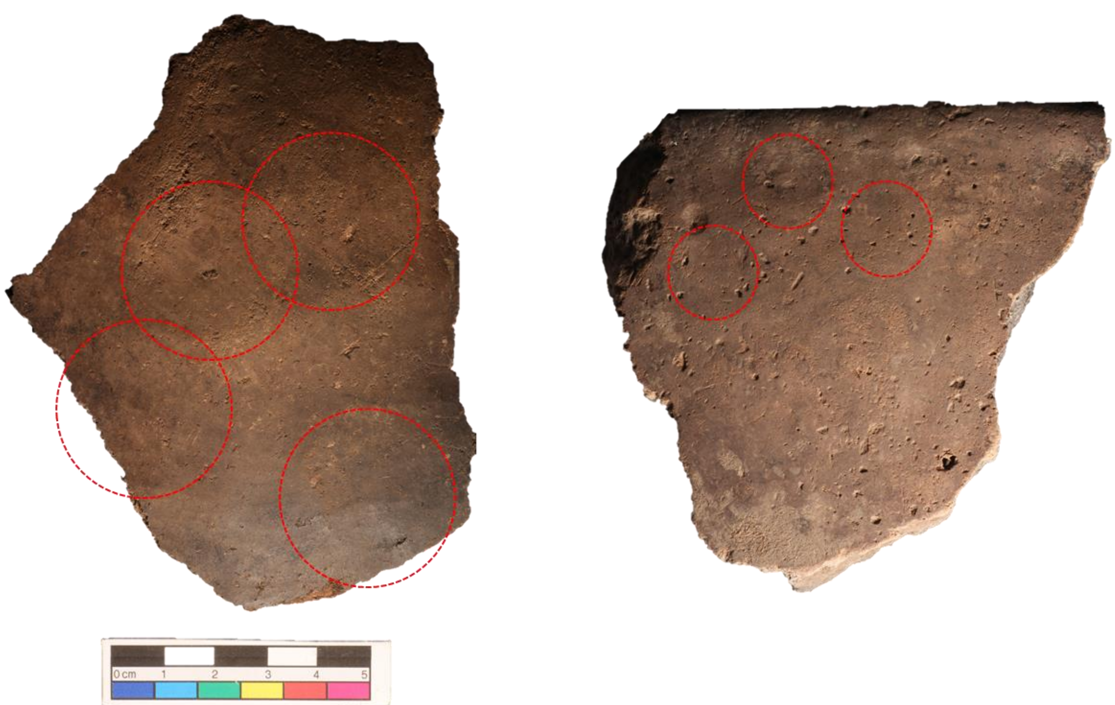


***Figure 6.6-53.** Globular pot potsherds belonging to the Granitic Family (left) (FS-112701) and a griddle rim sherd from the Mixed Fibre Family (right) (FS-110905). Both show shaving and beating techniques. Percussion marks (red circles-concavities in the surface) were made by a tool as part of the pre-forming.*

The ‘repoussage’ and beating techniques are less common. The former was observed in only one *aripo* sherd from TU-01 (Lv.2), while beating was found on the external surface of one griddle from TU-04 (Lv.6) and two globular pots from Feature-1 in TU-01 (***Fig. 6.6-53***). Associated radiocarbon dates placed both techniques between cal.AD1407-1445.

Regarding paste recipes associated to the previous techniques, both scraping and shaving were identified in potsherds from the Granitic, Sponges and Mixed Fibre petrographic families. The Mixed Fibre Family also exhibited continuous pressure and ‘repoussage’ techniques, making it the paste recipe family exhibiting more pre-forming techniques. On the other hand, recovered sherds from the Mixed Sponges Family only showed scraping, while the ones from the Granitic Family displayed shaving. Finally, the beating technique was reported in the ceramic fragments from the Granitic Family for which reason it is the only technique exclusively associated to a particular petrographic family.

Only four ceramic vessels, from TU-01 (Feature 1) and TU-04 (Lv. 6, 10, 11), showed mixed pre-forming techniques. Two of these vessels belong to the Granitic Family while the other two pertain to the Mixed Fibre Family. One of the granitic vessels corresponds to a deep hemispherical vessel (PIC 056, TU-04 Lv.11) with scraping on the external surface and shaving on the internal one, which means it was worked from the outside to the inside. The other granitic vessel is a globular pot (FS112703-4, TU-01 Feat-1) with shaving on both surfaces and beating on the outside, applied after the shaving operation was finished.

The remaining Mixed Fibre vessels correspond to griddles (***Fig.6.6-54***). One of the griddles (FS114703, TU-04 Lv.10) shows continuous pressure on the external surface and shaving on the internal one, while the other (FS110905, TU-04 Lv.6) has shaving on both surfaces and beating on the inside, performed after the shaving operation. The former was first shaped on the outside while the clay was still wet and without the use of tools other than the fingers, after which the internal surface was worked with a tool to even the surface and remove the excess clay when it was leather hard. The second griddle was shaped in both surfaces when it was leather hard, after which it was flattened with a circular tool through a beating operation. Both samples reveal two different shaping procedures for the same vessel form, dated to ca. AD1400-1479, which corresponds to the last part of the occupation.

In summary, scraping and shaving are not chronologically restricted or associated to a particular vessel form and/or paste recipe. While shaving seems to be the preferred pre-forming technique applied through the entire sequence and associated to all vessel forms, scraping in both surfaces is only associated to potsherds from the earliest occupation reported on site. In contrast, in the late part of the occupation, there are additional pre-forming techniques (i.e. continuous pressure, repoussage, beating) present in both the Granitic and the Mixed Fibre families and associated to food processing vessels such as globular pots, griddles and an *aripo*.

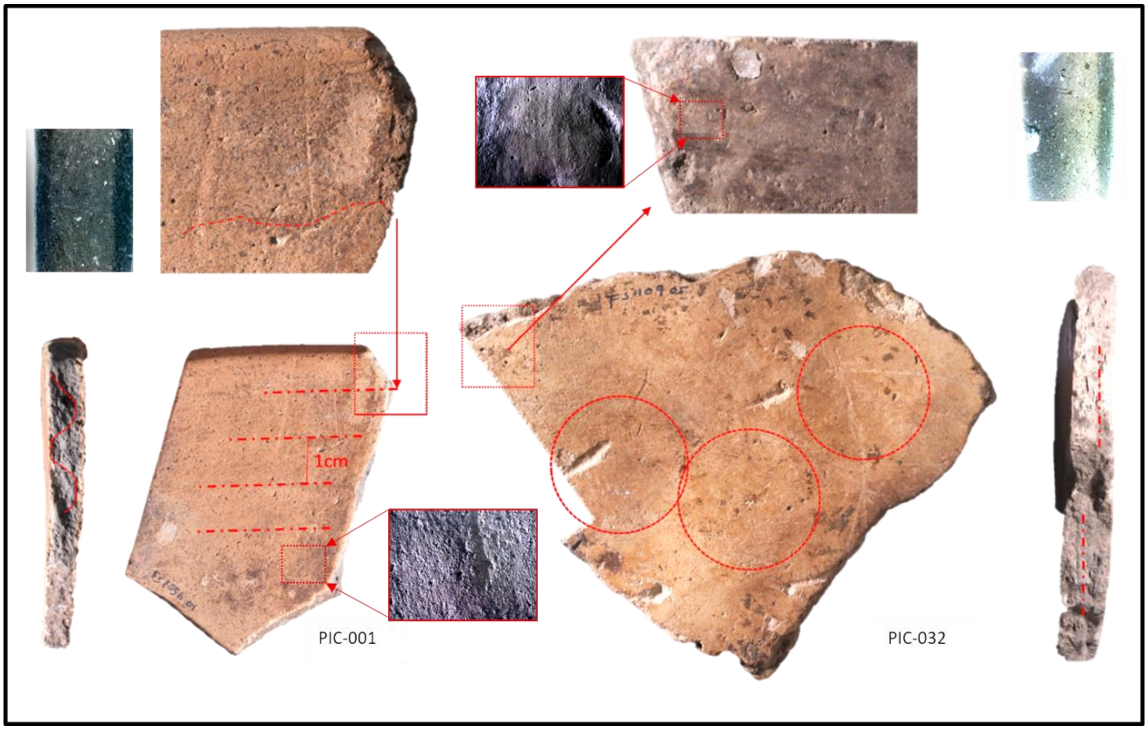


Figure 6.6-54. *An aripo (left) and a griddle (right), both from the Mixed Fibre Family. They were built using coiling shaped by continuous finger pressure, but the one on the right used shaving and beating. Radial section, mineral orientation, microtopography and fractures were used to identify coils and pre-forming operations. Taken by Natalia Lozada. 2018.*

6.6.5.5 Finishing

From a total of 69 analysed sherds, 55 (79%) had surviving evidence to reconstruct the surface treatment, whether it was smoothing, burnishing or polishing. Surface treatments present on the sample did not vary between sherds with different types of coiling and/or pre-forming techniques.

The most conspicuous treatment in the sample was burnishing, mostly on the external surface, present in trench units TU-01 (Lv.6, 8, Feature-1), TU-02 (Lv.6-7) and TU-04 (Lv.6, 10, 11) and throughout most of the sequence, between ca. AD1220-1479. This technique is associated to all petrographic families and all vessel forms. Polishing, on the other hand, is more restricted, found in fewer samples and only in trench units TU-02 (Lv.6) and TU-04 (Lv.6, 9, 10, 16). This technique is mostly found on the interior of cylindrical small vessels, globular pots and griddles, probably to ensure their endurance and for preventing food/beverages penetrating the walls. It is present throughout the entire sequence of occupation in Picure and associated to all petrographic families, except for the Mixed Sponges.

- ***6.6.5.5.1 Decorative techniques***
  - ***Surface***

Decorated samples recovered from the surface collection in Picure exhibited punctation and thin linear incisions (1-2mm), sometimes together in triangular compositions, mostly around the mouth of the vessels. There were also Thick-linear incisions (2-3mm) on lips and body sherds. Rims also presented small rounded flanges with punctation. Very few body sherds showed punctated strips and round applique nubbins on the external surface. Also, a poorly made anthropomorphic modelled-incised applique motif was present. Finally, roller stamps exhibited deep excisions and punctations.

TU-01

Only 29 sherds (0.8% of the total ceramics from this unit) presented decoration (***Fig.6.6-55***). Among the reported techniques in this trench, the most common is the linear incision, usually located on top or along the circumference of the mouth and in few body sherds. Thicker linear incisions (>2mm) are found on body sherds, all restricted to Lv.9 (35-40cmBS). Thin linear incised rims and punctated rims and body sherds are two decorative techniques found mostly on the upper levels (Lv.1-5, 0-23cmBS) with two exceptions on Lv.8 (30-35cmBS). Punctated strips are present on body sherds from Lv. 1 (0-5cmBS), 5 (20-23cmBS) and 7 (26-30cmBS). Round applique nubbins are also reported on levels 5 and 8 (30-35cmBS). Excision is associated to roller stamps found on Cx.102 (Lv.4 [15-20cmBS] and 7 [26-30cmBS]). Circular perforations were found in level 3 (10-15cmBS) and 9 (35-40cmBS), most likely associated to repairs.

Figure 6.6-55. *Thick linear incised body sherds found on the bottom levels of TU-1.*

<u>TU-02</u>

In this trench unit, 20 potsherds (1.6% of the total ceramics) exhibited some decorative trait (***Fig.6.6-56***). Punctated strips were found only on body sherds of levels 5-7 (25-45cmBS). An anthropomorphic modelled-incised applique was also reported attached to a body sherd recovered from level 4 (20-25cmBS). Round nubbins on rims and body sherds were scattered in different levels through the trench (Lv. 3 [10-20cmBS] and 7 [36-42cmBS]). Tripartite linear incised rims were reported in levels 4 and 5 (20-30cmBS), while thin linear incisions (1mm) were only associated to a rim found in level 6 (30-35cmBS). Likewise, in the bottom levels 4-6 (20-35cmBS), painted sherds were identified, along with perforated sherds, possibly from repairs.

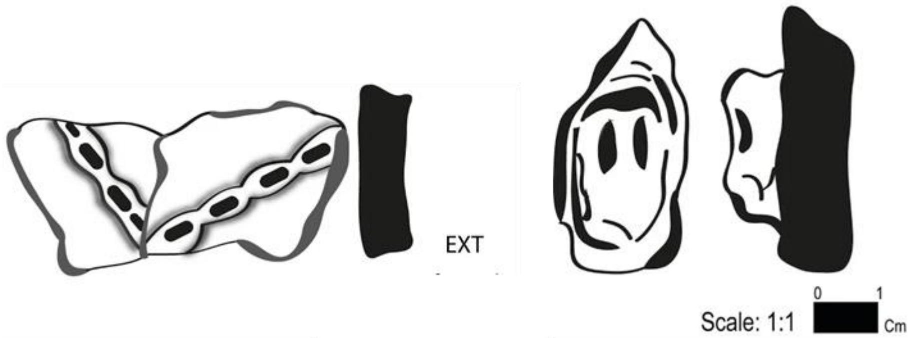


Figure 6.6-56. *Punctated applique strips and modelled-incised anthropomorphic appliques found on TU-2.*

TU-04

In this excavation unit, a total of 49 sherds (1%) presented decoration (***Fig.6.6-57***). Punctated strips were mostly found on body sherds scattered through various levels from the surface to Lv.11 (50-55cmBS), with only one sherd with this technique recovered from the surface cleaning. Punctation was present in rims and body sherds in most levels from surface to Lv.12 (55-65cmBS). Round modelled applique nubbins were identified in the upper levels (Lv.1 [0-5mBS] and 7 [30-35cmBS]), along with deep linear incision (2-3mm) accompanied by punctation (Lv.1-2 [0-10cmBS]). Thick incised lines were also observed by themselves in body sherds from level 16 (125-135cmBS). Triangular incisions around the rim were only found in Lv.10 (45-50cmBS) while '*mamelones*' (double modelled applique nubbins) were only present in levels 7 (30-35cmBS) and 11(50-55cmBS).

Among the techniques with a more restricted distribution was excision, only reported in one roller stamp found in level 12 (55-65cmBS), and painting, reported in levels 6-7 (25-35cmBS) and 11 (50-55cmBS). Painted motifs include parallel horizontal and zig-zag lines and concentric rhomboid motifs on body sherds. Thin linear incisions (1mm) in body and rim sherds was reported on levels 5 (20-25cmBS) and 8-9 (35-45cmBS) and was often accompanied by punctation or short consecutive lines. Anthropomorphic and zoomorphic modelled-incised appliques were scattered in the trench, found in Lv.1 (0-5cmBS), 6 (25-30cmBS) and 10 (45-50cmBS).

A restricted vessel from Lv.10 (45-50cmBS) deserves a special mention. It presents short linear incisions on an applique strip along with a circular punctated depression, surrounded by a circular linear incision, simulating an eye. Although the motif is not quite clear, it appears to be a zoomorphic design.

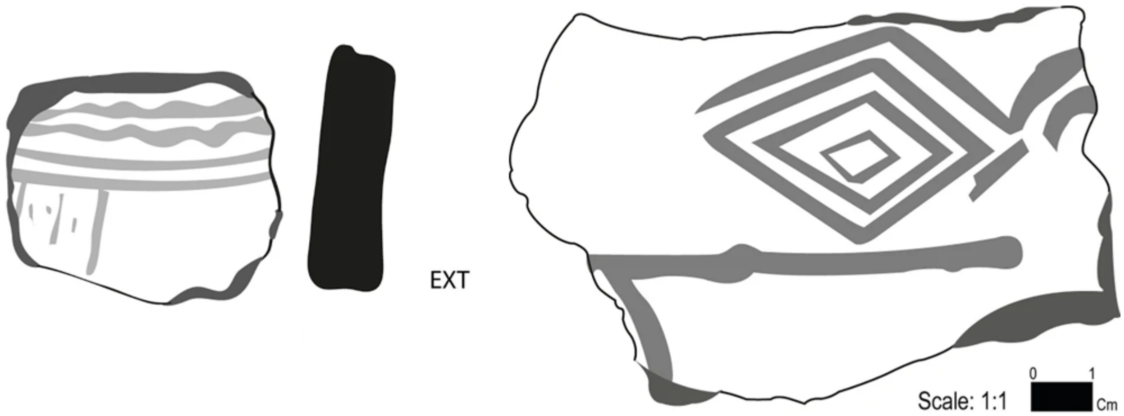


Figure 6.6-57. *Painted sherds (red colour where the grey appears in the drawings) found on TU-4.*

<u>TU-03 and TU-05</u>

No decorated sherds were recovered from TU-03. On the contrary, a significant part of the excavated sherds from TU-05 did present decoration. From 164 ceramic sherds, 10 (6%) exhibited some decorative technique, very much above the 1% average in other units. Thick linear incisions (2-3mm), red painting, punctated strips, perforation and a zoomorphic modelled-incised applique were reported in the surface of the unit. Likewise, Thin linear incisions (1mm) with punctations around the mouth and round appliques or '*mamelones'* were also identified.

- ***6.6.5.5.2 Decoration Summary***

A total of 108 (0.9%) potsherds in Picure were decorated using nine different decorative techniques. Regarding the distribution of certain techniques, it is important to establish if they are closely associated to a specific area and/or chronology. Thick linear incisions are only present in the deepest levels in TU-01 and TU-04, the latter in which they are associated to two TL dates with an average date range of AD298-607, which correspond to the earliest occupation of the site.

Painting, absent in TU-01, presents some differences between trenches. Red painting is only reported in TU-05 on a modelled-incised *adorno* with similar thick incisions as the ones reported on the deepest levels of TU-04, while pink painted recovered from lower levels of TU-02 and TU-04, have an associated later date range of ca.AD1220-1450.

Within this later date range, other techniques are found. Punctated strips are rare on the surface but scattered through all trench units. The earliest level with this technique is found in TU-02, with an associated date of cal.AD1220-1280, marking the appearance of this type of decoration at the site. Excision in roller stamps was identified on surface sherds and in sherds from TU-01-Cx.102 (15-35cmBS), dated between cal.AD1275-1396, and TU-04-Cx.401 (Lv.12 [55-65mcBS]). Finally, tripartite linear incised flanges were only described for potsherds from TU-02, with a relative date of ca. AD1300-1400, while triangular elongated incisions were only present in TU-04 associated to a similar relative chronology.

6.6.5.6 Firing

The macroscopic and petrographic analysis of the sampled sherds permitted to reconstruct the firing atmosphere and to suggest an approximate firing temperature. Hand-specimens from the Coarse Sand macroscopic fabric presented a uniform red colour on both surfaces and in its radial section, whereas, Black Coarse Sand macroscopic fabric sherds had an uneven black colour on both surfaces. In contrast, Cauixí and Cauixí and Sand pot-sherds were light grey coloured and presented a darker nucleus in the radial section. Based on the former, Coarse Sand sherds presented a complete firing in an oxidizing atmosphere, whereas Cauixí-tempered fabrics had an incomplete firing under the same conditions. Black Coarse Sand's darker surfaces were most likely the product of a reducing atmosphere, for which three different firing modes were recognised in the sample. Petrographic analysis also considered the presence of cores, as well as the clay matrix's optical activity and the transformation of micaceous minerals as indicative of firing conditions and temperature. Darker cores in the Black Coarse Sand and Cauixí-tempered sherds might be due to short firing or the significant presence of organic matter (Rice, 1987). All sherds had a birefringent clay matrix, which suggests that the firing temperature did not surpass <800-850°C (Quinn, 2013. p.191).

6.6.5.7 Vessel form

From 11,667 analysed sherds in Picure, only 703 (6%) were diagnostic for form. This sample was not as fragmented or eroded and included some larger potsherds (>10cm in length) that were recovered from the excavation units, allowing for a more complete discussion of form and function. Nonetheless, rim fragments continue to be the majority of the diagnostic potsherds and are discussed here as a separate dimension to explore their use, distribution and its potential chronological implications. A more detailed discussion of the lip and rim modes and their distribution in each trench are presented at length in ***Appendix 12***. In the following section, a summary of the modal analysis of Picure's diagnostic sherds will be presented per dimension and in combined pairs to explore binding relations between modes. The upper vessel segment, divided between restricted and unrestricted contours is more thoroughly described, given that base fragments were scarce. The identification of vessel contours will be key to identify its associated functions and, along with the defined modes for each dimension, it will allow to characterize the ceramic complexes present in Picure.

6.6.5.8 Vessel form Modal Analysis Summary in Picure

Based on the previous analysis of each dimension per trench, certain patterns for Picure site can be described. The following summary present results for the three main excavation trenches in Picure (TU-01, 02 and 04) separated by dimensions.

- ***6.6.5.8.1 Rim and Lip dimensions***

Four different rim angle modes were reported on Picure, three of which (i.e. Direct, Out-sloping and Horizontal) correspond to unrestricted open vessels and only one restricted form (i.e. In-sloping). In terms of lip treatments, nine different lip modes were recorded.

TU-01 presented all four different rim angles and eight different lip treatments. Since the Horizontal rim (i.e. *aripo*, griddle) was reported in Feature-1 (Cx.106) it was not considered part of the sequence but a rather intrusive and late event, associated to a radiocarbon date of cal.AD1407-1445. Two other unrestricted rims angles were present in all contexts, while two sherds belonging to In-sloping (i.e. restricted) vessels were only reported in latest context Cx.101. Among the unrestricted vessels, Out-sloping rim angles were more popular than Direct ones in Cx.101, while in the other two contexts they shared similar proportions.

Regarding lip treatments, top two contexts, Cx.101 and 102, reported seven lip modes, while bottom context Cx.103 only had five. Even though Flat and Round lips were present in almost all levels, Round lip is more popular from levels 5 to 9 (20-40cmBS) and Flat lip between levels 2 and 4 (5-20cmBS). Top levels where Flat lip was more common have an associated radiocarbon date of ca.AD1324-1436, while Round lip mode popularity is associated to three radiocarbon dates which yielded between ca.AD1270-1389. Bilaterally Flat lip mode was the lip mode with a more restricted distribution, present only in Lv.4-5 (15-23cmBS) in Cx.102, associated with a date somewhere between cal.AD1275-1389 and cal.AD1324-1436. Tapered and Internally Round lips were in the top two contexts (101 and 102), although much more common in Cx.102 (Lv.5-7 [20-30cmBS]).

TU-02 excavation unit reported three different rim angles and six different lip modes, making it the least diverse trench in Picure, excluding TU-03 and TU-05. Very rare In-sloping rims are only present in top context Cx.201, which has an associated date of cal.AD1411-1447. Both Direct and Out-sloping rims are present in all contexts, although Direct rims predominate in the beginning of context Cx.201 (Lv.3-5 [10-30cmBS]). On the other hand, Cx.201 and Cx.201+202 reported five different lip modes each, while bottom Cx.202 had four. Round and Flat lip treatments occur in every context and level, with a marked popularity of the Round lip in Cx.201 and Cx.201+202. Internally and Externally Flat lips were only identified in Cx.201, dated between ca.AD1280-1411, while Internally Round was only present in bottom contexts Cx.201+202 and Cx.202, associated with a radiocarbon date of cal.AD1228-1280. Tapered lips, also present within this last range, were more popular in Cx.201 and absent in Cx.202.

TU-04 exhibited all four different rim angles. Context Cx.400 had unrestricted rim angles (Direct and Out-sloping), while Cx.401 had all four kinds of rims and Cx.402 had one sherd of each except for the Out-sloping rim. Rare Horizontal and In-sloping rims are mostly present in Cx.401, with only one sherd in Cx.400 and Cx.402, respectively. Unrestricted Direct and Out-sloping rims predominate, appearing in almost the same proportions in Cx.400 and Cx.401. Horizontal rims are reported in only two parts of Cx.401: in the upper levels 1-2 (0-10cmBS) and in the lower levels Lv. 9-11 (40-55cmBS). Horizontal rims from the upper levels are definitely later than cal.AD1422-1479, while the bottom levels are somewhere between ca.AD1365-1400 (based on dates from Lv.8 and 11), leaving a gap of almost 100 years between the two. In-sloping vessels, found in rare proportions in most of Cx.401, are more common between Lv.5 and 6 (20-30cmBS), which coincides with an important peak of Direct over Out-sloping rims, dated to cal.AD1422-1479. They are also found in Lv.10 and 11 (45-55cmBS).

Concerning lip modes, Cx.401 has nine different lip modes, while Cx.400 has three and Cx.402 has only one. This last one is the Flat lip mode, present in all contexts, and only surpassed by the Round lip mode. Cx.400 has both Flat and Round lip modes, as well as the Internally Round lip, which is also present in Cx.401, along other rare modes such as the Tapered, Externally and Bilaterally Round and the Externally Flat. Round lips predominate in every level except between Lv.1-4 (0-20cmBS), where it is surpassed at length by the Flat lip. These same levels are also the only ones where the Bilaterally Round and Bilaterally Flat lip modes appear. These rare lips appear definitely later than the Lv.5 (20-25cmBS) date of cal.AD1422-1479, with the exception of a Lv.6 (25-30cmBS) Bilaterally Flat lip sherd, dated somewhere between ca.AD1400-1422. Tapered lips were scattered through Cx.401, while Internally Flat lip was only identified in Lv.10 (45-50cmBS), with a date between ca.AD1365-1444. Externally Flat was only identified in Lv.8 (35-40cmBS), associated to a date of cal.AD1400-1444.

In terms of rims angles, the one with a more circumscribed spatial distribution in Picure site is the Horizontal rim, associated to griddles, which was only reported in Feature-1 in TU-01 and in Cx.401 in TU-04. Based on the associated radiocarbon dates, this rim appears somewhere between ca.AD1400-1479. Likewise, the In-sloping rim appears late in the sequence, always on the top context of each trench. Date range for this rim angle varies between trenches, with an earlier one in Cx.101 in TU-01, between cal.AD1324-1436, and a later range in TU-02 (Cx.201) and TU-04 (Cx.401), about ca.AD1411-1479. Direct and Out-sloping rims do not have a limited distribution, appearing as common in different stages and in all units.

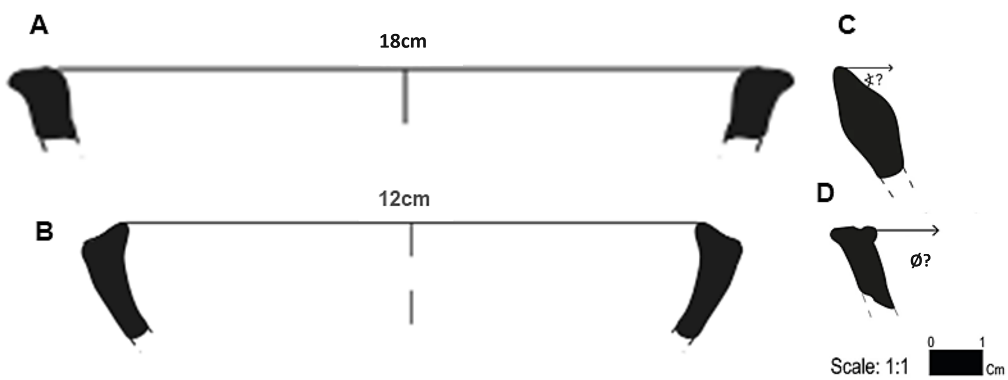


Figure 6.6-58. *Lip treatments from Picure, TU-04. A) Externally Flat lip, B) Internally Flat lip, C) Tapered lip, D) Bilaterally Flat lip.*

Lips such as the Tapered or the either Externally, Internally and Bilaterally Flat or Round thickened rims are intentionally shaped by adding pressure, extra coils and/or using flattening tools. These additional steps involved in their manufacture serve as evidence to suggest they are purposely made with qualitatively different techniques and morphologies, responding to distinct parameters. Their low frequencies indicate they are also rare, except for the Tapered lip, which appears as more common in Cx.102, 201 and 401. Based on their scarcity and particular shapes, their distribution can signal a period and/or event where new manufacturing practices were introduced or adopted, singling important shifts in the sequence.

When analysing lip treatment mode distribution, only three are potentially chronologically and spatially sensitive. The Bilaterally Round lip was only identified in the upper levels of TU-04 and scattered through Cx.102 in TU-01, associated with an earlier date of cal.AD1275-1396 in TU-01 and a later than cal.AD1422-1479 in TU-04. Meanwhile, the Internally Flat lip was recovered in TU-02 (Cx.201) and TU-04 (Cx.401) with an average date of ca.AD1365-1447. Lastly, the Bilaterally Flat lip, reported in TU-01 and TU-04, has an earlier appearance in TU-01, around cal.AD1275-1396, while in TU-04 it appears scattered in the upper levels, between ca.AD1400-1479. Associated dates suggest these lips were introduced somewhere at the begging of the 14th century and remained until at least half of the 15th. Likewise, in TU-02 there were no Bilaterally Round or Bilaterally Flat lips in any of the stratigraphic contexts. Given than this last unit was identified as a possible habitation site, these lips might not be related to a domestic context.

- ***6.6.5.8.2 Body dimension***

Most of the registered sherds did not exhibit carinations or inflexion points, therefore the predominant body shape corresponds to the Globular body mode, a rounded and soft angled curvature from top to bottom. However, a few Narrow-neck bodies were identified in the surface collection and in the upper 20cmBS in excavation units TU-01 and TU-04, suggesting a second body shape with smaller mouths and tall-necks, a 5-7cm height. This body mode is associated to two radiocarbon dates of cal.AD1324-1436 and cal.AD 1422-1479. Likewise, Necked-olla bodies, a third body silhouette with a shorter neck of 2-3cm in globular large ollas, were reported in TU-05 and scattered in the sequence of TU-04. The latter is associated to a date range of ca. AD1400-1479.

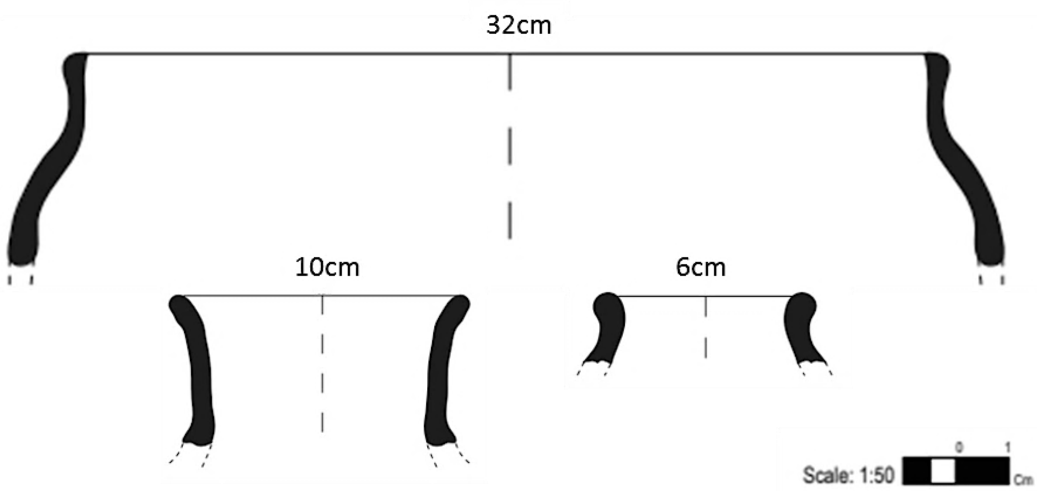


Figure 6.6-59. *Vessels with inflected contours. Bottom left: Fine Sand tall narrowed-neck from TU-01 (Lv.5 [20-23cmBS]). Top necked-olla: Cauixí sherd TU-04 (Lv. 5 [20-25cmBS] and bottom right: Granitic short-narrowed neck from Lv.3 [10-15cmBS]).*

- ***6.6.5.8.3 Handle dimension***

Handles were only reported in TU-04 at Lv. 11 (50-55cmBS), where two irregular strips handles were found. Based on the aperture of the attached strips, they do not seem functional but rather added as a decorative trait. A TL date from this level gave a range of ca.AD1365-1553.

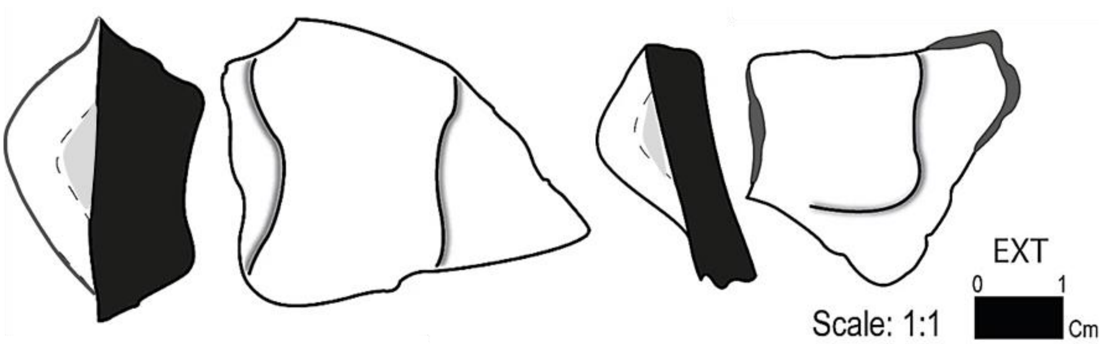


Figure 6.6-60*. Handle strips from TU-04 (Lv.11 [50-55cmBS]).*

- ***6.6.5.8.4 Base dimension***

Base potsherds were difficult to identify considering the high fragmentation of the sample. The former suggest they were easily mistaken with body sherds, for which most bases were direct flat or rounded. Legs to hold vessels in place, were only found in TU-04. A Thick-short round leg was identified in Lv.9 (40-45cmBS) while Thin-long round legs were reported in Lv.2 and 3 (5-15cmBS). Thick-short legs appear somewhat earlier than cal.AD1400-1444 while Thin-tall legs are later than cal.AD1422-1479. Finally, Horizontal flat bases, associated with griddles and *aripos*, were obtained in Feature-1 in TU-01 and scattered through TU-04, with an associated date range of ca.AD1400-1479.

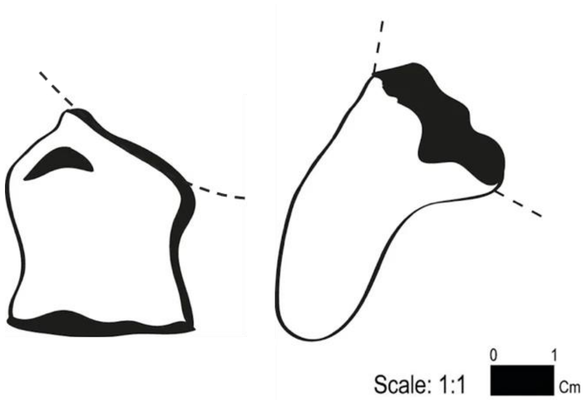


Figure 6.6-61. *Legs recovered from TU-04: Left: Granitic leg from Lv.9 (40-45cmBS); Right: Sponge Spicule leg from Lv.3 (10-15cmBS)*

- ***6.6.5.8.5 Modes combination:***

Careful examination of each dimension and how they combine with each other per trench, in every level and context, was performed to evaluate biding relationships between them.

-Rim and lips: While Direct and Out-sloping rims appear associated to seven and eight different lip treatments, respectively, In-sloping rims show five and Horizontal rims only two. All rims are associated with Round and Flat lips, which predominate in the entire sequence. They are followed by the Externally Round lip which is the third most popular combination in all but the Horizontal rim. However, some particular lips are more tightly associated to certain rims. This is the case of the Bilaterally Flat and Bilaterally Round lips, which appear only in unrestricted Direct and Out-sloping rim vessels. Also, Externally Flat lips are associated to both unrestricted Out-sloping vessels and restricted In-sloping vessels. Lastly, Tapered and Internally Round lips are more common among the Out-sloping rim vessels, although they also appear in Direct and In-sloping rims, respectively.

Rare lip combinations first occurred in TU-01 in Direct rim vessels in Cx.102, associated with a date rage of ca.AD1275-1396, even though they soon became more common among the Out-sloping rim vessels. In TU-02, they are first reported in both Direct and Out-sloping rim vessels from the first levels of Cx.201 (Lv.4-5 [20-30cmBS] and transition context Cx.201+202 (30-35cmBS), with an associated date range of ca.AD1220-1411. Finally, most rare lip combination in TU-04 occurred within the upper levels (Lv.2-7 [5-35cmBS]), with a date of cal.AD1422-1479, and in almost equal proportions between Direct and Out-sloping rim vessels (see ***Appendix 12***).

-Rim/lips and paste: Granitic Family sherds in Picure, comprising Coarse Sand and Black Coarse Sand macroscopic fabric groups, exhibited most of the rim and lip combinations, making them the most diverse paste group in site. In TU-01 they presented 13 combinations, while in TU-02 and in TU-04 the had 12 and 14, respectively. Most of the combinations in TU-01 and TU-02 trenches occurred within the Out-sloping vessels, while in TU-04 they happened mostly within the Direct rim vessels, in which both Flat and Round lip were always the most frequent choice. They also present some rare In-sloping rim vessels scattered in all trenches. Some Direct and Out-sloping rim combinations happened exclusively in each trench; however, the only exclusive combination of the Granitic Family in all of Picure site is the In-sloping rim with Internally Round lip, which only occurs in TU-04 ca.1400-1422 (Cx.401, Lv.4 [15-20cmBS]. Rim and Lip combination diversity within this group was expanded in all trenches during a period range of ca.AD1220-1396 (Cx.102 [Lv.8, 30-35cmBS], Cx.201+202 [Lv.6, 30-35cmBS] and Cx.401 [Lv.12+13, 55-75cmBS]), reaching its largest number of co-occurring combinations in the beginning of the 15th century.

The Sponge Spicule Family, which includes the Cauixí, Cauixí and Sand and Fine Sand macroscopic fabric groups, have slightly fewer rim and lip combinations, with a total of 10 in TU-01, 8 in TU-02 and 13 in TU-04. Most of the previous occurred within unrestricted vessels, with very rare In-sloping rim vessels in TU-02 and TU-04. Direct and Out-sloping rim vessels share rim and lip combination with the other paste recipes families, except for two the Out-sloping with Internally Flat lip combination and the Horizontal rim with Round lip, both exclusive of this family. This former is reported in TU-02 (Lv.3, [10-20cmBS]) and TU-04 (Lv.7 [30-35cmBS] and 10 [45-50cmBS]), associate with a date range of ca.AD1400-1447. The latter was identified in TU-04 at Lv.10 (45-50cmBS), somewhere in the transition between the 14th and 15th century. Sponge spicule-tempered sherd appear very early on in the sequence however, their rim and lip diversity are only expanded slightly later, ca.AD1220-1396, around the same time the Granitic Family reports the introduction of rare lip combinations such as the Tapered, Bilaterally Flat, Bilaterally Round and Internally Round lips. This same time period exhibits the first In-sloping rim with Flat lip Cauixí vessels in TU-02.

Lastly, Mixed Fibre Family fabrics (Cauixí and Fibre macro-fabrics) present both unrestricted and restricted vessels. In TU-01, this group presents Out-sloping rims with Round and Externally Round lips, while in TU-02 they appear as an In-sloping rim with an Externally Flat lip vessel. This last combination is tightly bounded of this group for all of Picure site and appears in Cx.201 (Lv.4 [20-25cmBS]), somewhere between ca.AD1280-1411. They are also associated to Direct rim vessels and to Horizontal rim forms in TU-04, where this last one first appears in Lv.11 (50-55cmBS), with a TL date of AD1365-1553.

-Narrow necks and paste: On the surface and in both TU-01 and TU-04 units they were mostly associated to Sponge Spicules Family sherds, although one fragment belonging to the Granitic Family was also present in TU-04 (Lv.3 [10-15cmBS]), dated somewhere after cal.AD1422-1479. First sponge spicule-tempered narrow neck was reported in TU-01 (Lv.5 [20-23cmBS]), with a date later than cal.AD1275-1396.

-Necked-ollas and paste: Present in both the Sponge Spicule and the Granitic Family potsherds. Cauixí Family fragments with this body silhouette are found in the upper 25cmBS of TU-04 -with an associated radiocarbon date of cal.AD1422-1479, while Granitic sherds were reported in the bottom levels (25-45cmBS) of the same trench, dated slightly earlier to cal.AD1400-1444.

-Handles and paste: Strip handles from TU-04 belonged only to the Granitic Family.

-Bases and paste: While direct and rounded bases are hypothetically present in all petrographic families, Thin-long legs only pertain to the Sponge Spicules Family while Thick-short legs were exclusive of the Granitic Family. The former legs were found on the upper levels of TU-04, while the latter were found in one of the bottom levels in the same unit. Thick-short legs appear somewhat earlier than cal.AD1400-1444 while Thin-tall legs are later than cal.AD1422-1479. As for the Horizontal rim, belonging to griddles and *aripos*, it is only associated to the Sponges and Mixed Fibre families.

-Paste and decoration: The Granitic Family potsherds presented various decoration techniques among of which there were thick linear incisions (2-3mm) in rim and body sherds, thin linear incision (1mm) below the mouth and in body sherds, tripartite linear incisions on the lips, excision, punctated strips, punctation, triangular incisions in the external surface below the mouth, modelled-incised applique motifs, single round nubbins and ‘mamelones’ (i.e. double applique round nubbins). Sponge spicule Family sherds share most of the previously mentioned techniques, with the exception of thick linear incisions on the lips, triangular incisions and mamelones, found only on Granitic sherds. Additionally, cauixí tempered sherds exhibited excision as an exclusive technique. Mixed Fibre Family ceramic fragments did not have any decoration.

In regards to their distribution, excised cauixí-tempered sherds were identified in TU-01 (Lv.4 [15-20cmBS] and Lv.7 [26-30cmBS]) and TU-04 (Lv.12 [55-65cmBS]). While in TU-01 these stamps appear somewhat later than ca.AD1287-1396, in TU-04 they come somewhere between ca.AD1155-1365, according to a radiocarbon date form Lv.14 (75-115cmBS) and a TL date from Lv.11 (50-55cmBS). On the other hand, triangular incisions and mamelones, two of the exclusive techniques associated to the Granitic Family pot-sherds, were recovered in TU-04. Both techniques are rare, with triangular incisions identified in Lv.10 (50-55cmBS) in two different In-sloping vessels and the mamelones in loose body sherds from the upper levels Lv.1 (0-5cmBS) and Lv.7 (30-35cmBS). Thick-linear incisions where found on body sherds and lips of Out-sloping rims belonging to the Granitic Family on the deepest levels of TU-01 (Lv.9, 35-40cmBS) in TU-01 and in bottom level Lv.16 (125-135cmBS) of TU-04, associated to two TL dates with an average date range of ca. AD 298-607, which correspond to the earliest occupation of the site. Similar sherds with thick-line incisions and zonal red painting were found on the surface of TU-05 unit.

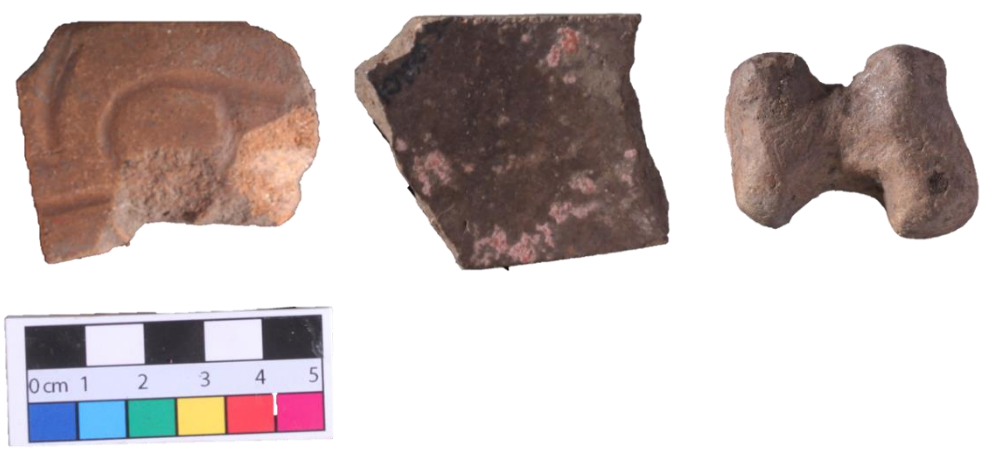


Figure 6.6-62. *Granitic Family sherd with thick linear incisions (left), Mixed Sponge Spicule Family sherd (center) with pink/mauve painting and Sponge Spicules modelled-incised zoomorphic figure/applique (right).*

In contrast, painted Sponge Spicule-tempered sherds were reported in the bottom levels of TU-02 (Lv.4-6 [20-35cmBS]) -dated to cal.AD1220-1280- and also scattered between Lv.6-7 (25-35cmBS) and Lv.11 (50-55cmBS) of TU-04, with a date range of ca.1365-1444. Painted sherds from TU-02 did not appear to show any design pattern, suggesting the use of painting as a cover to decorate large parts of the vessel. Meanwhile, painted ceramic fragments found on TU-04 all displayed linear and geometric motifs, with concentric rhomboids and zig-zag lines. Regarding some shared decorative techniques, Granitic pot-sherds with punctated strips were scattered through most of TU-01 (Cx.1010 and 102) and TU-04 (Cx.400 and 401), but only present in the bottom levels of TU-02 (Cx.201+202 and Cx.202), which support the argument of a different activity performed on TU-02 in the late part of the sequence. Sponge spicule-tempered sherds with this decorative technique only appear on the surface and in Lv.2 (5-10cmBS) in TU-04, which is definitely later than cal.AD1422-1479 and seems to suggest a rather late application of this decorative technique in cauixí-tempered pot-sherds.

Modelled-applique single nubbins are present in both Granitic and Sponge Spicules petrographic families in the bottom levels of Cx.102 (Lv.5-8 (20-35cmBS) in TU-01 and upper levels of TU-04 (Cx.400 and 401, Lv.1-2 [0-10cmBS] and Lv.7 [30-35cmBS]), associated with two radiocarbon dates of cal.AD1275-1396 and cal.AD1422-1479. The same single nubbins appear in TU-02 only in Granitic Family sherds in all contexts while mamelones or double-nubbins are recovered in TU-04, in the bottom levels Lv.7 (30-35cmBS) and Lv.11 (50-55cmBS). Modelled-incised applique *adornos* were also identified in TU-02 (Lv.4 [20-25cmBS]), TU-04 (Lv.1 [0-5cmBS], Lv.6 [25-30cmBS] and Lv.10 [45-50cmBS]) and on the surface of TU-05. A Granitic Family *adorno* from TU-02 was an anthropomorphic figure while Sponge Spicule modelled-appliques displayed both anthropomorphic and zoomorphic motifs. Lastly, TU-05 zoomorphic *adorno* also had red painting.Tripartite Linear incised flanges on rims were only reported in pot-sherds from both petrographic families found in TU-02 Cx.201 (Lv.4-5 [20-30cmBS]), with a date range of ca.AD1280-1411. Finally, thin lines of 1mm predominate in the Sponge Spicules group, often associated to punctation as part of triangular designs around the mouth. These last ones are more common in TU-04 in the upper levels Lv.1-2 (0-10cmBS), later than cal.AD1422-1479.

6.6.5.9 Picure Ceramic complexes

6.6.5.9.1 Early Picure Complex Component AD310-620

Picure was occupied ca.1170 years, between AD315 (TL date) to AD1422-1479. The stratigraphic, technological and modal analyses suggest there are two main occupation episodes, the last of which can be subdivided in three succeeding periods. The first period can be identified from the presence of a component of the Early Picure complex component on site, which yielded TL median dates between AD315-621. A larger and richer component of this complex is present in Rabo de Cochino site, which will be discussed in the next chapter.

Early Picure Complex (i.e. EP hereafter) was based on 40 potsherds found on the deepest levels of TU-01 (Cx.103), TU-04 (Lv.16 [125-135cmBS]) and on the surface of TU-05. The description of this complex is limited by the small size of the sample, particularly of diagnostic sherds for form. Only unrestricted upper vessel forms were reconstructed from pot-sherds recovered below the 'Sacred Rock' on the surface of TU-05, given that the ones from the trench units were highly fragmented. Two different wares are part of this complex.

EP-Coarse Sand ware is composed by Coarse Sand macro-fabric sherds, which belong to the Granitic fabric. Samples from this fabric were manufactured using a residual clay derived from a granitic parent rock, based on its composition of poorly sorted coarse-grained angular and sub-angular quartz, microcline feldspars and biotite. Granitic igneous rocks are found in the Parguaza Granite formation, located on the east bank of the Orinoco and with outcrops in the river and the west bank across the Llanos. Picure site is a granitic outcrop itself, part of this geological formation. However, the island does not contain any clay sources at the present day and most likely did not in the past, for which clay might have been brought from the bank or from further inland to the east. Coiling technique was identified in rims from this ware, assembled in alternation and jointed by drawing. The scraping technique was used during the shaping of the vessels on both surfaces, while smoothing and polishing were noticed in the internal surfaces, this last one done after the application of thick-line incisions (2-3mm) on rims and body sherds. A modelled-applique *adorno* with red painting and thick incised lines was also found in the surface of TU-05, underneath the 'Sacred Rock'. Finally, all sherds from this ware presented a strong red colour in the surface and radial section, for which it could be said they were fired in an oxidizing atmosphere. Associated vessel forms have unrestricted upper vessel segments, with Direct and Out-sloping rim angles, the former with Round lips and the latter with Internally Round and Bilaterally Flat rims.

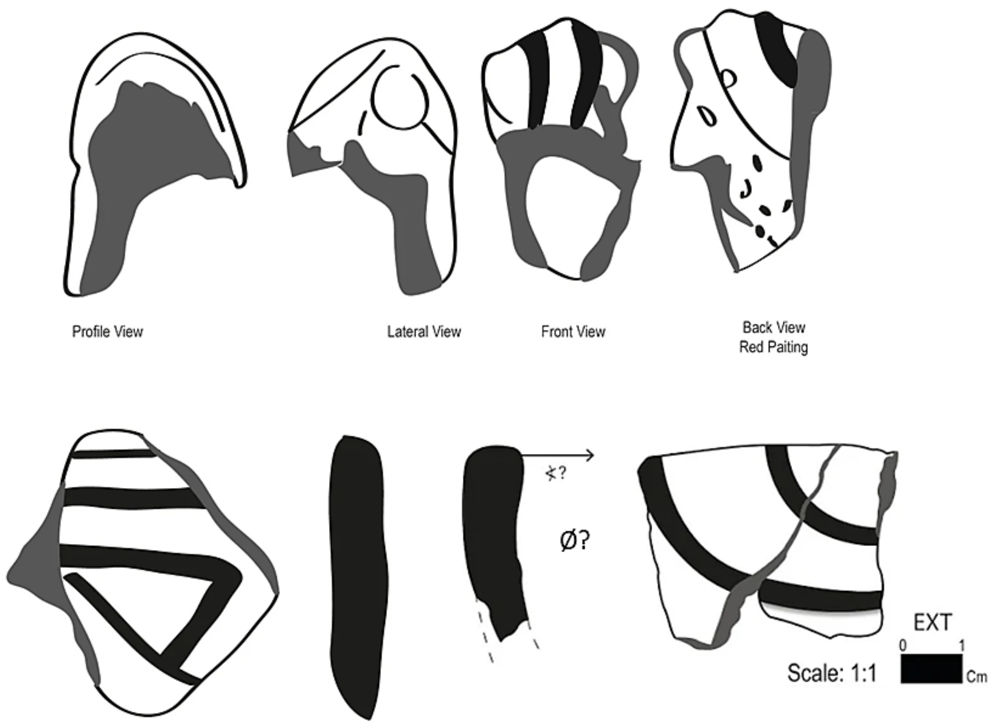


Figure 6.6-63*. Decorated modelled-applique zoomorphic motif and incised body shreds and rim from TU-05 and Lv.16 (125-135cmBS) from TU-04 (bottom right).*

EP-Cauixí and Fibre ware comprised only five sherds found on TU-04, Cx.103 (Lv.16 [125-135cmBS]) associated to the EP-Coarse Sand ware. This ware was made with a weathered sedimentary clay source derived from a medium-grained igneous rock, most likely microgranite, commonly found in the Parguaza Granite formation area. This clay was enriched with siliceous rich inclusions such as fibre (i.e. plant vases), tree bark and sponge spicule. The latter are found in rare proportions (≤10%) for which its intentional addition as temper is not confirmed.

Tree bark is found both charred and un-charred and with a unimodal elongated size, suggesting sieving and partial burning before their incorporation to the paste. Dark radial sections in some of the sherds suggest an incomplete firing, while similar grey and cream colour in the surface and inside the sherd suggest an oxidizing atmosphere. Coils were identified in some of the sherds, but poor conservation prevented the complete reconstruction of fashioning and finishing stages. Sherds from this ware corresponded to body sherds and were heavily fragmented, for which no vessel forms are known for this ware in the Early Picure's component at this site. No decoration was noted.

Only one vessel form reconstructed as part of the Earle Picure complex, belonging to the EP-Coarse Sand ware (***Appendix 17***). Form 1 -identified as a moderately deep bowl with a simple contour- has a circular horizontal cross section and one Out-sloping vertical cross section with two variations (a and b) (see ***Appendix 14*** for the description of each form).

Provided that the Early Picure complex sample was small and seriously fragmented, this component seems to correspond to a rather ephemeral occupation characterised by its conspicuous incised flanged rims and modelled-applique decoration.

6.6.5.9.2 Late Picure Complex AD1030-1480

The Late Picure Complex (i.e. LP hereafter) is divided in three subsequent stages based on the distribution of total materials and certain modes which are progressively added through time. This behaviour can be defined as an elaborating tradition, consisting of addition of attributes into a single line of development, determined by a rather slow introduction of traits without abandoning the initial modes (Haury et al. 1955:44). This complex comprised 11,870 ceramic fragments recovered from the surface collection, TU-01 (Cx.100-102, Cx.106), TU-02 (Cx.200-202) and TU-04 (Cx.400-401).

- ***6.6.5.9.2.1 Picure I AD1030-1220***

LP-Picure I is the earliest stage of this occupation documented on the island on TU-01 (Cx.103, Lv.9-10 [35-50cmBS]), TU-02 (Lv.7 [35-45cmBS]) and TU-04 (Lv.14-15 [75-125cmBS]). Early levels from all three trenches displayed low frequencies of ceramic materials, where Granitic fabrics constituted between 60-68% of the samples, followed by the Sponge Spicule fabrics sherds with 26-30% and Mixed Fibre fabrics with 5%. The associated dates are based on a TL date from TU-04 (Lv.11 [50-55cmBS]) with a range of AD1027-1155 (16% error) and a radiocarbon date form TU-02 (Lv.6 [30-35cmBS]) from the directly upper level, which yielded cal.AD1220-1280. This first stage is based on a total of 692 ceramic fragments recovered from the lowest levels of these excavation units and will be next described according to each one of its three main wares.

LP-Coarse Sand I ware, comprises the Coarse Sand and Black Coarse Sand macroscopic fabric groups, which belong to the Granitic petrographic Family. Fabrics from this group used poorly sorted and coarse-grained residual clays derived from a granitic parent rock, available in the Parguaza Granite formation. Picure island, a granitic outcrop from this geological formation, did not present any available clay sources and so they are most likely located on the river banks and/or further inland, based on the angularity of its inclusions and the presence of merged-rocks which suggest limited transportation. Clays could have been superficially cleaned by removing large rocks and quartz inclusions. Fashioning techniques included coiling and shaving of the internal surfaces, sometimes covered by smoothing and burnishing. Firing was made in both an oxidizing and reducing atmosphere, proven by the significant presence of red and black paste sherds (the latter part of the Black Coarse Sand macroscopic fabric), and which might indicate this stage was not properly controlled. Decoration was rare, with only two decorated fragments from TU-02 (Lv.6 [30-35cmBS]) with a punctated strip and a round applique nubbin. Associated vessels forms have unrestricted upper vessel segments with Direct and Out-sloping rim angles. The former appears associated with Round, Flat, Externally Round and Bilaterally Round lips, while the latter has Round, Externally Flat and Internally Round lips.

LP-Cauixí I ware includes ceramic potsherds from the Cauixí, Cauixí and Sand and Fine Sand macroscopic fabrics, which belong to the Sponges and Mixed Fibre families. Both families used a highly weathered sedimentary silty clay source, possibly alluvial, derived from an acid igenous rock, most likely granite. Alluvial deposits are located on the banks of the Orinoco river, formed by flooding sediments and weathering of the granitic geological formation. Silica-rich inclusions as sponge spicules and fibre were added to the paste based on its high frequency and spread distribution. Mineral inclusions are scarce and mostly comprise coarse-silt sized quartz, for which it could be suggested that the clay was also previously cleaned before adding the temper. Coiling and shaving were used as fashioning techniques, followed with shaving and smoothing. Dark nucleus in radial sections of sherds prove suggest incomplete firing, while light cream and/or grey colour of the sherds indicates it was conducted under oxidizing conditions. No decoration was present in any of the fragments of this ware. Circular perforations were reported, possibly associated with repairs. Associated vessels have unrestricted upper vessel segments with Direct and Out-sloping rim angles. Direct and Out-sloping rims have mostly Round lips, but the latter also presents rare Externally Round lips.

LP-Cauixí and Fibre I ware consists of ceramic potsherds from the Cauixí and Fibre macroscopic fabric, part of the Mixed Fibre petrographic families. Pot-sherds from this ware were manufactured using a weathered sedimentary clay source deriving from a medium-grained igneous rock of acidic composition, possible microgranite. The clay was tempered with tree bark, fibre and sponge spicule inclusions. Charred and un-charred equant elongated tree bark inclusions of similar sizes suggest that some of them were burned and sieved before adding them to the paste. Light grey sherds with a dark middle indicate incomplete firing in an oxidizing atmosphere. Coiling was identified in some of the sherds, however, poor surface conservation did not allow to identify pre-forming and finishing techniques. Decoration was absent. Diagnostic sherds of this ware corresponded to Out-sloping rim angled vessels with Round and Externally Round lips.

Vessel forms identified on the Late Picure I complex all have a circular horizontal cross section and correspond to unrestricted upper vessel segments. LP-Coarse Sand I ware had Form 2 (b) and Form 3 (b), corresponding to straight wall deep bowls and neck-ollas with simple and inflected contours, both with large mouths with 22-23cm diameter. On the other hand, LP-Cauixí I ware exhibited Form 1 (b), Form 4 and Form 5, which stand for moderately deep bowls with simple contours and varying mouth diameters, between 6-12cm and 22-24cm, and a moderately deep necked-bowl with an inflected contour and a mouth diameter between 17-18cm. Finally, LP-Cauixí and Fibre I was only associated to Form 6, an out-sloping deep bowl with a simple contour and a 20-22cm mouth diameter. All forms are open vessels, mostly with straight walls and a simple contour, and share a similar mouth size of 20cm diameter in average. Smaller open bowls are reported only within the EP-Cauixí ware, with 6-12cm mouth diameter. While larger bowls, present in all wares, are usually associated to food processing and cooking, smaller bowls are thought to have been used for service and food consumption.

- ***6.6.5.9.2.2 Picure II AD1220-1400***

LP-Picure II is the second stage of the Late occupation on Picure island, reported in TU-01 (Cx.102, Lv.4-8 [15-35cmBS]), TU-02 (Cx.201+202, Lv.6 [30-35cmBS]) and TU-04 (Cx.401, Lv.12, 12+13 [55-75cmBS]). Associated radiocarbon dates from TU-01 (Lv.6-7 [23-30cmBS]) have a date range of ca.AD1275-1396, while one radiocarbon date from TU-02 (Lv.6 [30-35cmBS]) yielded a slightly earlier date of cal.AD1220-1280 and alleged levels of TU-04 are located somewhere between AD1155-1365, based on the immediately above (Lv.11 [50-55cmBS], TL date AD1365-1553) and below (Lv.14 [75-115cmBS], radiocarbon cal.AD1027-1155) levels. Despite the decreasing frequency of artefacts recorded in TU-01 during this stage, the overall tendency in the other units is a significant rise in ceramic counts of up to 40% with relation to the previous period, which could be due to a population increase. Granitic and Sponge Spicule families are represented in the same proportions as in Late Picure I; however, Mixed Fibre Family sherds are notably absent. A total of 1,399 ceramic fragments were found in this stage and were classified in two main wares.

LP-Coarse Sand II ware comprises Coarse Sand macroscopic fabric sherds, belonging to the Granitic Family. Manufacture characteristics, including raw materials, fashioning, finishing and firing stages are similar to the ones described for its equivalent ware in the LP-Picure I stage with some minor differences in terms of decoration and larger number of lip modes. Regarding decoration techniques, Punctated strips, with only one rare fragment in the previous stage, are more common in LP-Picure II body sherds. Regarding rim and lip related modes, Direct rims still have Bilaterally Round and Internally Round lips and an additional Tapered lip mode, while Out-sloping rims have supplementary lips such as the Externally Round and Bilaterally Round.

LP-Cauixí II ware includes the Fine Sand, Cauixí and Cauixí and Sand macroscopic fabrics, belonging to the Sponge Spicule petrographic Family. Unlike its equivalent in LP-Picure I, the sedimentary clay used for this family was mostly tempered with sponge spicules (>30-40%), with very few to no fibre (i.e. plant vases, phytoliths) and tree bark inclusions and three documented cases of sponge spicule-tempered grog and fibre-tempered grog in TU-02 (Lv.6 [30-35cmBS]) and TU-01 (Lv.8 [30-35cmBS]). Light grey colour pot-sherds from this ware suggest firing under an oxidizing atmosphere, althought rare darken nucleous also suggest incomplete firing. Fashioning techniques are still coiling and shaving, although modelling is present in roller stamps belonging to this ware and recovered from TU-01 (Lv.4 [15-20cmBS] and 7 [26-30cmBS]) and TU-04 (Lv.12 [55-65cmBS]). These last ones showed new decoration techniques, such as excision and punctation. Burnishing of both surfaces was the most generalized surface treatment, while polishing in the inside of large fragments found on TU-02 and TU-04 was rare.

Few body sherds presented other decoration techniques in their external surfaces such as thin line incisions, pink paint, round applique nubbins and a very rare punctated strip and thick incision. Additionally, a rim also display punctation on its flat lip, following the circumference. Lastly, circular perforations were present, possibly associated with repairs. Firing of this ware was complete and performed under oxidizing conditions, much more controlled than in its precursor ware. Unrestricted upper vessels are still the dominant ones for this ware, with mostly Direct and Out-sloping rim angled vessels, nevertheless, a rare In-sloping rim vessel with a Flat lip was present in TU-02 (Lv.6 [30-35cmBS]), introducing restricted upper vessel segments to the sequence. Aside from the already mentioned Round and Externally Round lips, in this stage Direct rim and Out-sloping angled sherds from this ware are also associated to Flat and Bilaterally Flat lips. Out-sloping rims also have Tapered, Bilaterally Round and Internally Round lips and the In-sloping rim only has a Flat lip.

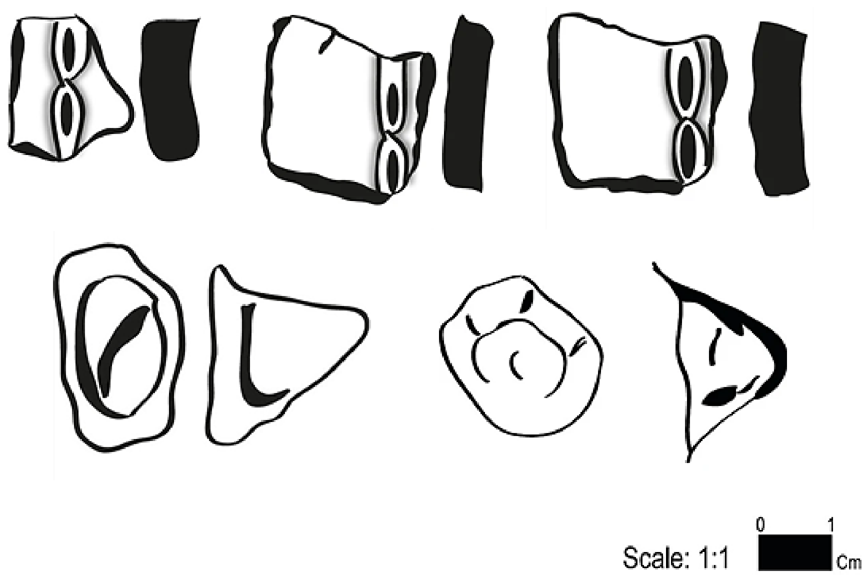


Figure 6.6-64*. Decorated sherds from LP-Coarse Sand II ware (top) and LP-Cauixí II ware (bottom). Punctated strips and round applique nubbins are more common in this stage.*

Vessel forms reconstructed on the Late Picure II complex all have a circular horizontal cross section and correspond mostly to unrestricted upper vessel segments (see ***Appendix 17***). LP-Coarse Sand II ware displayed Form 1 (b), Form 4 (b) and Form 7 (a and b), accompanied by a rare Form 5. The former Forms 1, 5 and 7 correspond to Out-sloping and Direct angled bowls with simple contours. Forms 1 and 5 are moderately deep bowls with large mouth diameters between 17-25cm, while Form 7 are shallow bowls with small (9-16cm) and wide (20-24cm) mouth diameters. The rare Form 4 corresponds to a tall-necked bowl with a 15cm mouth diameter. LP-Cauixí II ware is mostly comprised of Form 1 (a) vessels, which correspond to moderately deep bowls with simple contours and 16-21cm mouth diameter. Rare Forms 3 (b) and 4 (b), with inflected contours, were also present in this ware. Form 3 was a moderately deep-necked olla with a short neck size (2cm) and Form 4 was a moderately deep-neckedolla with a 10cm mouth diameter.

Open large and moderately deep bowls, with simple contours and an average mouth diameter of 17-25cm, are common in both wares. Rare inflected contoured necked-bowls with a narrowed neck between 10-15cm were also reported in both. Exclusive vessel forms were found in LP- Cauixí II ware, such as a moderately deep necked-bowl with a short neck and shallow small open bowls (9-16cm mouth diameter). Only one wide mouth shallow bowl was reported in LP-Coarse Sand II ware. Larger deep and moderately deep open bowls and short necked-bowls are associated to cooking, while tall necked-bowls with a narrowed mouth are most likely related to pouring liquids. Shallow open bowls, exclusive of the LP-Cauixí II ware, were most likely used for food service and consumption.

- ***6.6.5.9.2.3 Picure III AD1400-1480***

LP-Picure III is the more recent stage in the Late Occupation period. It is found in TU-01 (Cx.100-101, Lv.0-3 [0-15cmBS]), TU-02 (Cx.200-201, Lv.0-5 [0-30cmBS]) and TU-04 (Cx.400-401, Lv.0-11 [0-55cmBS]). Radiocarbon date from this stage in TU-01 (Lv.3 [10-15cmBS]) yielded cal.AD1324-1436, followed by a later TU-02 ^{14}C date (Lv. 3 [10-20cmBS]) of cal.AD1411-1447. The remaining two radiocarbons dates from TU-04 (Lv.5 [20-25cmBS] and 8 [35-40cmBS]) had a date range of ca.AD1400-1479. Overall, the upper levels of all trenches show subsequent rising and decreasing tendencies of ceramic materials counts in this period, with at least two main frequency peaks, one of which is always located in the top level, below the surface. The latter seem to suggest various seasonal or temporary settlements in the island during this stage closely associated to minced pottery (<1cm^2) fragment distribution. Ceramic materials recovered in this later period are divided into three main petrographic families, with Granitic Family representing between 58-60% of the total, followed by Sponge Spicule Family with 22-26% and Mixed Fibre Family with 1-3%. A total of 8,809 artefacts were identified on the surface and the top levels of the three main trenches and divided into three main wares.

LP-Coarse Sand III ware, which includes the Coarse Sand and Black Coarse Sand macroscopic fabrics from the Granitic petrographic Family, shares similar clay and paste preparation procedures than its equivalent wares in the previous stages. Although coiling remains as the preferred roughing-out technique, modelling was also reported in a fragmented base, recovered from TU-04 (Lv.10 [45-50cmBS]), and which was part of a coil-made upper body small vessel. Other bases did show coiling technique, for which the former is thought as a rare and idiosyncratic technique in the analysed sample. Pre-forming techniques are more varied. Most of the sherds were shaped in a leather hard clay state by using shaving technique in both surfaces, however, one globular pot from TU-04 (Lv.9 [45-50cmBS]) showed continuous finger pressure shaping traces, associated to a wet clay state. On the other hand, two large body sherds from Feature-1 (Cx.106) in TU-01 (cal.AD1407-1445) also exhibited beatings with a circular tool on the external surface. Finally, one sherd from TU-04 (Lv.11 [50-55cmBS]) showed scraping traces on the external surface and shaving on the inside, which means it was shaped when still wet on the outside and finished on the inside. The former sherds with unique and mixed techniques are all associated to the early levels of this stage, with a TL date of AD1365-1553 (16% error) and a radiocarbon date of cal.AD1407-1445. Attachments such as a couple of strip C-handles, as well as a thick and short leg were reported in early levels of this stage in TU-04 (Lv.9-11 [40-55cmBS]), with a relative date of ca.AD1365-1400. Several darker sherds form this ware (grouped in the Black Coarse Sand macroscopic fabric), along with a complete oxidised majority, suggest that the firing stage was made in both reducing and oxidizing atmospheres, indicating that this stage was not as regulated. Base pot-sherds found on TU-02 (Lv.3 [20-25cmBS]) and TU-04 (Lv.9-11 [40-55cmBS]) corresponded to direct bases, one of which had a 12cm diameter, and exhibited coils in spiral.

Decoration techniques on body sherds included previously seen punctated strips and round applique nubbins, present in all levels and excavation units, with additional techniques such as modelled applique anthropomorphic motifs and tripartite linear incisions on semi-circular flanges on the rim, both recovered only in TU-02 (Lv.4 [20-25cmBS]), and punctation on flat rims in TU-04 (Lv.11 [50-55cmBS]). Exclusive techniques such as double-round applique nubbins or ‘mamelones’ and triangular incisions were also present in this ware in the early levels of this stage in TU-04 (Lv.7 [30-35cmBS], Lv.10-Lv.11 [45-55cmBS]). Perforation close to the rims in TU-01 (Lv.3 [10-15cmBS]) and in various levels in TU-04 seems to be associated with vessel repairs.

Regarding rim and lip modes, unrestricted vessels are still the majority in this ware, with Direct and Out-sloping rim angled vessels. Direct rims present the same lip modes from the previous stage (Late Picure II), with an additional Bilaterally Flat lip mode, while the Out-sloping rims have new lip modes (Externally Flat and Internally Round). Restricted vessels (i.e. In-sloping rim angled) from this ware are more common in this stage, with Flat, Round, Externally Flat and Internally Round lip modes.

LP-Cauixí III ware comprises the Cauixí, Cauixí and Sand and Cauixí and Clay Pellets macroscopic fabrics belonging to the Sponge Spicule and Mixed Fibre petrographic Family. This ware has a similar composition to the one described for the LP-Cauixí I ware, with a highly weathered sedimentary silty clay and abundant sillica-rich inclusions as sponge spicules and fibre (i.e. plant vases and phytoliths), added as temper to the paste. Although there is an important amount of sponge spicules (>30%) in all sherds from this ware, fibre inclusions are more frequent than in the previous stage, representing 15-10% of the inclusions, and sometimes overcoming the spicules. Also, there was a rare use of granitic grog, and grog tempered with tree bark and fibre on sponge spicule tempered sherds. Coiling remains the preferred roughing-out technique for all vessel forms except for roller stamps and modelled anthropomorphic and zoomorphic figures, which were made by modelling. Shaving was used as a preforming technique and few sherds presented burnishing on both surfaces. Rare attachments such as thin-long legs were reported for this ware in upper levels of TU-04 (Lv.3 [10-15cmBS]). The absence of darker nucleus in radial sections and light cream to grey coloured paste suggest complete firing under an oxidizing atmosphere.

The decoration techniques in this ware are mostly thin linear incisions and punctation below the mouth in composite triangular motifs and modelled-incised zoomorphic and anthropomorphic applique. The rare techniques are the tripartite linear incision on semi-circular flanges on the rim, pink painting and punctated strips. Perforations are uncommon, only reported in TU-02 (Lv.4 [20-25cmBS]).

Associated rim and lip modes include unrestricted and restricted vessels. Direct and Out-sloping rims present the same lips as in the previous stage, although the former appear associated with additional lip modes such as Tapered and Internally Round, while the latter also reports the Internally Flat. An additional unrestricted vessel form, the Horizontal rim, is introduced in this stage, related to Flat and Round lip modes. Lastly, In-sloping vessels, more common in this stage in this ware, have only Flat and Round lips.

LP-Cauixí and Fibre III ware reappears in this last stage and preserves the same raw materials and clay preparation described for LP-Picure I. Roller stamps belonging to this ware and recovered from the surface and from TU-01 (Lv.4 [15-20cmBS]), showed an exclusive paste recipe with fibre and fibre-tempered grog inclusions, with rare sponge spicules (<3%). They were also the only form built using modelling within this ware. Coiling was identified as the preferred roughing-out technique, often followed by shaving in the shaping operation. However, some sherds exhibited other pre-forming techniques such as continuous finger pressure and scraping, conducted while the clay is still wet, and ‘repoussage’ and beating for leather hard clay.

All of the previously described new pre-forming techniques were associated to Horizontal rim vessels, which correspond to griddles and *aripos*. The external surface of an *aripo,* with scraping traces was found in the deepest level of TU-04 (Lv.11 [50-55cmBS]), along with a griddle’s external surface with continuous finger pressure in the above level (Lv.10 [45-50cmBS]). Both of these vessel forms were worked from the outside to the inside while the clay was still wet. Another griddle with beating in the internal surface from the same unit (TU-04, Lv.6 [25-30cmBS] and a final *aripo* with ‘repoussage’ on the external surface form TU-01 (Lv. 2 [5-10cmBS]) prove that these forms were also worked during leather hard clay state in a latter occupation of the site, based on the stratigraphic location of these samples. Burnishing and polishing was often found in the internal surfaces of Horizontal rims, while external surfaces were often left without a surface treatment. Light grey sherds colour of the sherds with a dark core suggests incomplete firing in an oxidizing atmosphere. The darker colour of the external surface is not associated to its fringin but rather to constant exposure to heat and fire. No decoration was found in any of the pot-sherds from this ware.

Aside from Horizontal rim with Flat lip, other unrestricted and restricted vessels are also related to this ware. Direct and Out-sloping rims only presented Round and Flat lip modes, respectively, while In-sloping rim vessel were related to Externally Round Lips.

The reconstructed vessel forms for LP-Picure III complex have circular horizontal cross sections and varying vertical sections. Most of the vessels correspond to unrestricted upper vessel segments, although all wares in this stage also report restricted vessels (see ***Appendix 17***). LP-Coarse Sand III ware vessel forms mostly correspond to Form 1 (a, b, c), Form 3 (a, b, c, d), Form 4 (a and b), Form

7 (a and b) and Form 8 (a and b), accompanied by rare Form 2 (a and b), Form 5 (a and b) and Form 9 (a and b). Forms 1, 3, 4 and 7 correspond to Direct and Out-sloping vessels with different depths and mouth diameters, while Form 8 belongs to a restricted In-sloping vessel form. This last one, as well as Forms 3 and 4, all have inflected contours, while the remaining forms have simple contours. Form 1, a moderately deep bowl with a simple contour and 20cm average mouth diameter, was the most popular form for this ware. This is followed by inflected necked-ollas (Form 3) and necked-bowls (Form 4), the former with an average mouth diameter of 22-24cm, while the latter presented 12cm average mouth diameters with 3-4cm necks. Direct and simple shallow bowls (Form 7) with an average 19cm mouth diameter were commonly found in this stage, as well as In-sloping moderately deep bowls with inflected contours (Form 8) and a 13cm average mouth diameter. Scarce Forms 2, 5 and 9 belong to unrestricted simple contour forms with varying depths (deep, moderately deep and shallow, respectively) and mouth diameters between 10cm (Form 2) and 20-24cm (Form 5 and 9). Largest vessels -which belong to Form 3, a deep olla with a short-neck were found in this ware in TU-04 (Lv.9 [40-45cmBS]), with up to 30-56cm in diameter.

LP-Cauixí III ware had the same forms reported for LP-Coarse Sand in different proportions, with Forms 1 (a and b), 4 (a and b), 5 (a and b) and 7 (a and b) as the most popular, followed by less frequent Forms 2 (a), 3 (a and d), 8 (a) and 9 (a), and an additional rare Form 11. While Forms 1 and 8 presented the same average mouth diameters as in the LP-Coarse Sand III ware, inflected vessel's Forms 3 and 4 showed slightly larger mouths, with 24 and 36cm diameters in a few vessels from TU-04 (Lv.5 [20-2cmBS] and 11 [50-55cmBS]). The preference of vessel Form 5, a direct and moderately deep bowl with a simple contour and an average mouth diameter of 13cm, agrees with the unrestricted small-mouth simple bowls reported in the previous stages of the Late Period for this ware. The other vessel which is slightly more common within the sponge spicule-tempered sherds is Form 9, an out-sloping shallow bowl with a 10-12cm mouth diameter. Two rare Form 10 samples, a Horizontal rim flat form most likely associated to an *aripo*, was also observed for this ware in TU-04 (Lv. 1 [0-5cmBS] and 3 [10-15cmBS]).

LP-Cauixí and Fibre III ware only comprised vessel Forms 8 and 10. Form 8, an inflected contour, in-sloping vessel with a 12cm mouth diameter, was only recovered from TU-04 (Lv.5 [20-25cmBS]). On the other hand, three Form 11 sherds, which correspond to a Horizontal rim flat form with 42-54cm diameter, were found in the deepest levels of this stage in TU-04 (Lv.9-11 [40-55cmBS]). The widest fragment from Form 10 -with 54cm diameter- had a slightly upturned thickened lip, for which it was recognized as a griddle. The two remaining rim sherds belonging to this form had flat and rounded rims and 42cm in diameter, the reason why they were classified as *aripos*.

The open and moderately deep bowls with simple contours and a 20cm mouth diameter are common in both LP-Coarse Sand III and LP-Cauixí III wares. Moderately deep-necked bowls with a short neck are present in both wares, although they have larger mouths in LP-Cauixí III ware. Deep-necked ollas were more common in LP-Coarse Sand III, while small open bowls between 10-14cm mouth diameter, both shallow and moderately deep, were more frequent in LP-Cauixí III ware. Horizontal flat forms belonging to *aripos* and griddles were only associated to both sponge-spicule tempered wares, particularly LP-Cauixí and Fibre III ware. Open moderately deep bowls with larger mouths and deep necked-ollas are most likely associated to food processing and cooking, while moderately deep bowls with smaller mouths and shallow bowls are associated to food service and consumption. Both LP-Coarse Sand III and Cauixí III have forms associated to both functions, although the latter have generally a smaller mouth and shallower bowls, for which it seems more closely associated to food consumption. Horizontal flat forms on LP-Cauixí III and LP-Cauixí and Fibre III wares are all related to cooking and often have combustion clouds on their external surfaces.

6.7 RABO COCHINO (AM-3)

6.7.1 Geographic Context

Down the Orinoco River, 16km away from Puerto Ayacucho, a small island of ca.1.2km² known as Rabo de Cochino is located next to the eastern bank. The locals gave it this name because it is said to have a semi-colon shape, similar to a pig's tail (*Rabo de Cochino* in Spanish), although the island itself is more similar to a semi-circle (see ***Fig. 6.7-1***). Surrounded by a cut-off channel to the east and the main channel of the Orinoco river on the west, is thought to be a rather recent formation, originally part of the river bank.

Figure 6.7-1. *Rabo the Cochino Island on the Orinoco River, with a red dot indicating the excavation area of the archaeological site. Satellite image taken from Google Earth ®.*

In this portion of the river, the Orinoco channel becomes wider, with a diminished current flow and a larger flooding area, due to the absence of elevated rocky formations along the river banks. Vegetation in the surrounding planes varies from bush-like savannah trees to gallery forest along the main channel (Vila, 1960 p.262-35; Weibezhan, 1990 pp.154–155).

Similar to other islands in this area, Rabo de Cochino is characterized as a sandy island with a stable vegetation coverage, mostly of bushes and small trees. Sandy islands were formed by alluvial and sedimentary deposits along the river banks. However, small gallery forest type of trees are located on the eastern portion of the island, suggest it was originally part of the mainland where similar trees are reported.

Precipitation in the area during the rainy season (April-November) varies between 180-200mm/month (Hamilton and Lewis, 1990 p.492; Schot et al., 2001 p.11). During these months, water level can rise up to 15 m, which means a large part of the above-mentioned islands is flooded during the wet months. On the other hand, during the dry season (December-March), large sand banks around the islands are exposed, allowing in some cases to walk form one to the other.

Figure 6.7-2*. In situ and Satellite picture of Rabo de Cochino Island west bank (facing the Orinoco River) during the dry season on January 2016. Photo by Jose R. Oliver and satellite image taken from Google Earth ®.*

The sandy beaches on the west bank of Rabo de Cochino add up to 0.3km² to the original area of the island during the dry season (***Fig. 6.7-2***). River erosion on the west river's bluff of the island exposed archaeological materials, mostly ceramic potsherds, along the beach and some still buried on the river's bluff under 1.5m of culturally sterile sediments. As seen in ***Fig.6.7-3***, the amount of materials visible on the surface is significant, reflecting a *long durée* erosive process which had destroyed a large portion of the original bluff where these materials were deposited.

The occurrence of redeposited ceramic potsherds on the sandy beaches of this island and the islands on the surrounding area was previously described by Morey and Marwitt (1974) and Barse (1989), who visited this site more than 30 years ago. Barse described the western bank of the island as a rapidly eroding river's bluff, while also quoting a local fisherman who reported that 20 to 30 m of the bluff were lost in the past 25 years (Barse 1989:289).

Figure 6.7-3. *Ceramic pot-sherds exposed along the beach of Rabo de Cochino island. Photos courtesy of Jose R. Oliver, January 2016.*

Although it is difficult to estimate the extent of the original area, the large number of sherds on the surface of the sandy beach described in the past are still present today (***Fig.6.7-3***) and suggest that a larger archaeological site was in place, part of which still remains despite years of flooding and erosion. The concentration of materials in the western area is undeniable. Although the visibility was limited on the surface of the rest of the island, the conspicuous presence of archaeological ceramics on the western beach, as well as the previous excavation performed by Barse (1989) on this area where a Barrancoid component was reported but not dated, served to justify the location of the trenches in the readily exposed bluff containing archaeological materials.

6.7.2 Site Description and Analysed Data

Site AM-3 is on the west bank of Rabo Cochino Island. During the 2016 excavation season, the island was briefly visited, and an opportunistic surface collection on the beach was undertaken to evaluate its potential. In the following year, during the 2017 excavation fieldwork, three 2x1m test units (TU-A, TU-B and TU-C) were excavated and a second surface collection was undertaken along the beach area.

Figure 6.7-4*. Location of Trench units and small family huts (Ranchos) on Rabo de Cochino Island. Picture taken with a Phantom II Drone in January 2017 by Phil Riris.*

Figure 6.7-4 shows the location of the excavation trenches along the river's bluff. It also shows the location of small homesteads (or *Ranchos* in Spanish) denominated after their owner's last name. Although today the island is mostly unoccupied, three small huts with their corresponding crop areas, located on the north-west and west portion of the island, were registered during our visit on January 2017. Most of the island was not cultivated, presenting high pastures which prevented a thorough surface collection on the interior of the island and the identification of other archaeological sites besides the ones visible on the bluff.

Surface collection was not systematic, considering the ceramic materials had been washed away by different flooding episodes, distributed along the beach and once buried under at least 100cm of sterile alluvial sediments in some points. An opportunistic collection was performed, favouring decorated and large sherds, suitable for form reconstruction. A total of 554 ceramic sherds were recovered from this area, while no lithics or bones materials were collected.

Trench units were situated on two different areas of the river's bluff where a significant concentration of materials was visible on the profile. The area around the bluff's façade was cleaned and the profile was straightened to serve as a fourth wall. TU-A and TU-C were excavated directly into the bluff while TU-B was located perpendicular to TU-A and at the bottom of the bluff, to evaluate the stratigraphy of the flood zone between the base of the bluff and the river.

Units excavated into the bluff were 14m apart. The 2x1m trenches were excavated in 10cm spits. Materials were sifted through a fine wire mesh of ⅛ inch and artefacts were bagged and labelled (FS-#). TU-A, which reached 215cm below surface (i.e. BS), yielded a total of 3,618 artefacts (3,410 ceramics and 208 lithics), followed by TU-C with 1,505 artefacts (1,432 ceramics and 73 lithics) found on a 230cmBS deep trench. TU-B yielded only 112 artefacts (106 ceramics and 6 lithics) on a 100x70cm trench (reaching 290cmBS). In all, 5,235 artefacts were excavated in this site.

6.7.3 Rabo Cochino Site Excavations

Rabo de Cochino sequence reconstruction demands a thorough stratigraphic and chronological discussion, closely tied to the techno-stylistic characterization of the recovered ceramic materials. The stratigraphic contexts and their associated radiocarbon and thermoluminescence dates (TL) will be considered individually for each trench unit and then compared for pattern identification. Description of contexts and their chronology will be focused on excavation units TU-A and TU-C, where most of the artefacts and associated dates were obtained. TU-B will not be discussed individually in terms of stratigraphic contexts given that it only exhibits one single cultural stratum, which correspond to the earliest one (Cx.103) described for Trench A, and so it will be addressed in that section.

6.7.3.1 Stratigraphy and chronology at Rabo de Cochino Site

Twelve new radiocarbon dates (AMS) and six TL dates were obtained from Rabo de Cochino site. ^{14}C dates were obtained from organic charcoals -wood and charred seeds- found on trench units TU-A, B and C, reported here with a 2σ calibration (***Table 6.7-1***). An additional six ceramic fragments from TU-A and TU-B were subjected to TL dating (***Table 6.7-2***). Given that both methods work on different error calculations, these dates will be discussed separately, but compared using an approximate date range.

OxA#	TU	Cx.	Lv.	cmBS	Date	Error	δ13C	2σ (IntCal13)
36196	A	101	3	45-55	530	26	-28.3	AD 1323-1348
36211	A	102	4	64	676	26	-28.7	AD 1273-1389
36212	A	103	11	135-155	921	25	-25.8	AD 1030-1166
36213	A	106	HF	174	885	25	-27.4	AD 1045-1218
36133	C1	101	2	57	206	27	-23.6	AD1648/modem
36215	C1	102	3	126	519	24	-27.0	AD 1330-1441
36214	C1	102	3	126	548	23	-26.8	AD 1318-1430
36216	C1	102	5	158	588	26	-27.5	AD 1301-1413
36217	C1	102	8	180	593	25	-30.8	AD1300-1410
36134	C1	102	9	209	731	26	-27.5	AD 1288-1295
36135	C1	103	10	218	899	30	-30.5	AD 1039-1211
36218	C2	102	8	180-185	551	24	-28.0	AD 1316-1430

Table 6.7-1. *Radiocarbon dates for Rabo de Cochino site.*

The dates obtained reflect human occupations on Rabo de Cochino island through ca.1,520 years, by locating the deposited ceramic materials between ca.80BC-AD1440. During this period, at least three different and discontinuous occupations took place. Although the earliest occupation is only supported by TL dates, control samples from upper levels and from Picure site allow to address their reliability. To explain their distribution and association with stratigraphic contexts, the obtained results will be presented per trench and then compared in a final summary section.

FS#	**TU#**	**Cx.**	**Lv.**	**cmBS**	**Date *y.a***	**Error (%)**	**TL Date**	**+/-**	**Date range**
5051.02	A	101	3	45-55	1051	14.85%	AD 968	156	AD 812-1124
5147.06	A	103	13	165-185	1671	13.45%	AD 348	224	AD 124-572
5147.05	A	103	13	165-185	1561	13.61%	AD 458	212	AD 246-670
5157.03	A	103	14	185-195	5151	12.61%	3132BC	649	3781-2483 BC
5027.05	B1	103	Pfile	205-220	1851	13.31%	AD 168	246	78BC-AD414
5027.06	B1	103	Pfile	205-220	1901	13.26%	AD 118	252	134BC-AD370

Table 6.7-2. *TL dates for Rabo de Cochino site. Each date is given in y.a (years ago from 2019), a calendar date and a range according to the individual error of each sample.*

- ***6.7.3.1.1 TRENCH UNIT A (TU-A)***

Excavation unit TU-0A yielded four stratigraphic contexts in 215cm below surface (cmBS), from which a total of 3,410 ceramic sherds were recovered (***Fig.6.7-5***). The elevation datum (bubble line level) was placed 10cm above the surface of the NW corner of the unit. The GPS-based coordinate on the NW corner in decimal degrees were: N 06.55398 – W 06.40831, 50mASL. Arbitrary levels of 10 and 20cm were excavated, using shovels and trowels as appropriate.

Cx.100 (0-35cmBS) is described as a layer of light grey silt (10 YR 7/2) with few inclusions and medium rooting. Very few ceramic sherds were found at the bottom of this context, close to the interface with Cx.101 (35-55cmBS). This last, although still a light grey silt soil, was densely compacted and exhibited reddish brown mottles, few thin roots and angular pebble inclusions. Charcoal specks and artefacts were found through the whole context which yielded a radiocarbon date of AD1323-1348 2σ (530 ± 26 BP, OxA-36196), obtained from Lv.3 (45-55cmBS). An additional TL date from a ceramic potsherd (FS-5051.02) recovered at Lv.2 (35-45cmBS) yielded a median date of AD968 (14.8% error), within a range of AD812-1124 (***Table 6.7-2***). This last method suggests a significantly earlier date, with a difference of 200 years in relation to the ^{14}C date obtained from the level below. Given that the margin of error is considerably smaller in radiocarbon dates, and that the remaining ^{14}C dates from lower levels support a later occupation, the AD1323-1348 will be used for this context.

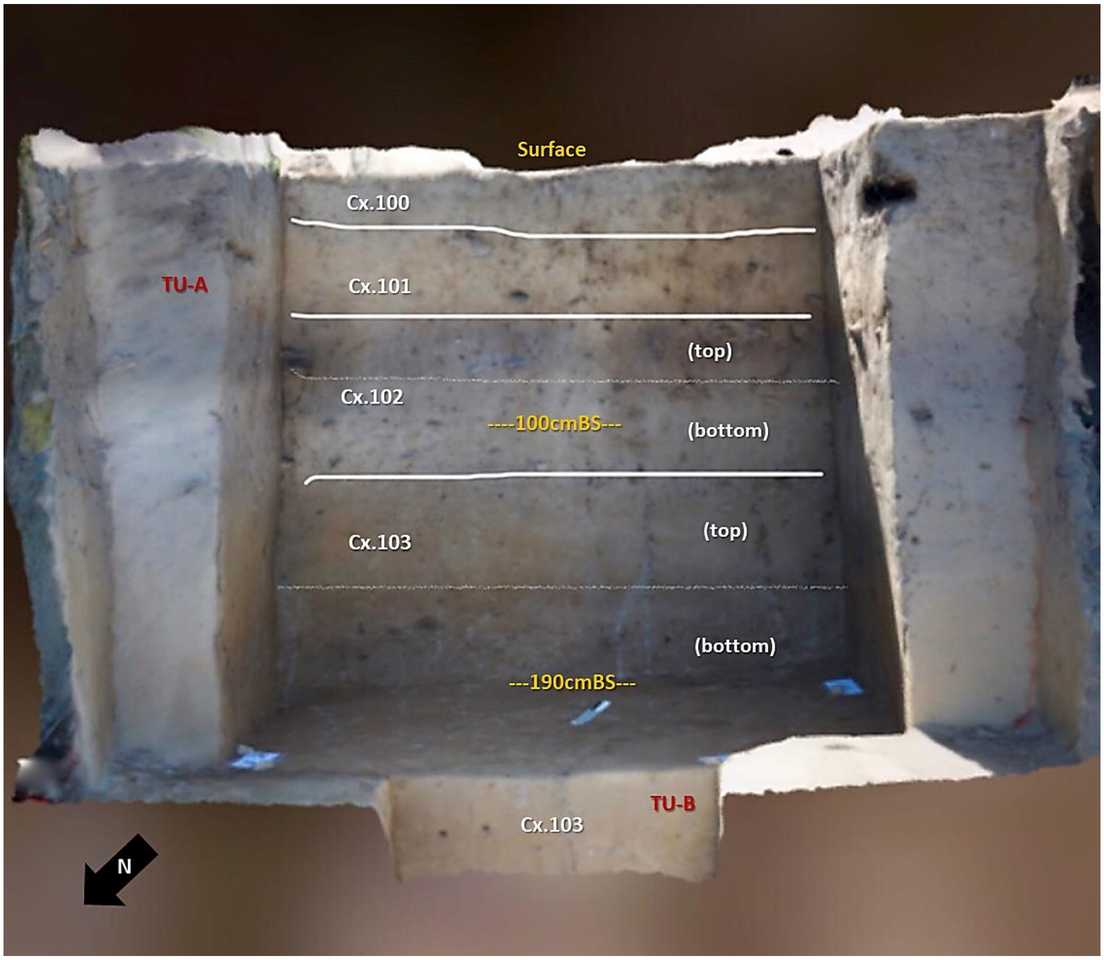


Figure 6.7-5. *Trench A excavation unit east wall profile before the excavation of the window. In the upper SW corner, a bird's burrow in the wall is visible. 3D model from Agisoft Photoscan made by Phil Riris, 2017.*

The texture and colour of Cx.102 (55-125cmBS) changed to a dark greyish brown (10 YR 4/2) medium compacted sandy silt soil. It also presented less rooting and a larger number of charcoal flecks. This context encompasses six 10cm thick arbitrary levels, except for Lv.7 (85-105cmBS), which is a 20cm thick level. The upper levels 4 to 6 (55-85cmBS) concentrated most of the artefacts found in this context, including ceramics, lithics, bone and charcoal. The bottom levels 7 to 9 (85-125cmBS) presented a significant reduction in terms of artefacts, bone and charcoal inclusions. The artefact count drop, first registered in Lv.6 (75-85cmBS), is the reason why Lv. 7 was excavated as a 20cm level. In the SW corner, an ant burrow, first detected in Lv. 6 and present until the bottom of the context, contributed to the progressive loosening of the soil. Finally, only one radiocarbon date from this context was obtained from the bottom of Lv.4, at 64cmBS, and which yielded a date of AD1273-1389 2σ (676 ± 26 BP, OxA-36211), which statistically overlaps with the date from Cx.101.

Cx.103 (125-215cmBS) is a loosely compacted light yellowish brown (10 YR 5/4) sandy silt soil with no roots and very few inclusions. Its most conspicuous trait is the presence of cracks in the form of roots infilled with light grey (10 YR 7/1) silt. The upper levels on this context, between Lv.10-12 (125-165cmBS), exhibited very few artefacts, which is why it was excavated as one 20cm thick arbitrary level (Lv.11 [135-155cmBS]). in the bottom levels of this context, between Lv.12-16 (155-215cmBS), the soil matrix displayed concentrations of charcoal specks and bitumen (jet or *azabache*) associated to a greater number of artefacts. Level 13 is the only level among the bottom ones in TU-A which is 20cm thick. The last two levels (Lv.15 and 16 [195-215cmBS]) were excavated in a 1x1m window due to the lack of time. A culturally sterile level was not reached.

Charcoal and bitumen inclusions did not continue below, as it can be seen from the TU-B east wall profile (***Fig.6.7-6***), perpendicular to the excavation window in TU-A. This trench presented the same sandy yellowish soil with the grey silt veins from above but with fewer ceramic potsherds. Artefacts were only found on the eastern half of TU-B, facing the western wall of TU-A, which meant the deposit did not extend towards the beach.

Regarding dates available for this context, one radiocarbon date and five TL dates were obtained from this stratum. The charcoal sample from the upper levels of Cx.103 (Lv.11 [135-155cmBS]) yielded a date of AD1030-1166 2σ (921 ± 25 BP, OxA-36212) while the TL dates available were all from the bottom levels and suggest an earlier long occupation between 80BC-AD570. Ceramic fragments (FS5147.05 and 06) from Lv.13 (165-185cmBS) had two median TL dates of

AD348 (13.45% error) and AD458 (13.61% error) (***Table 6.7-2***), both ranges overlapping between AD240-570. A TL date (FS5157.03) from Lv.14 (185-195cmBS) produced a median date of 3132 BC (12.61% error). This last date was ruled out by the Oxford lab due to contamination, most likely from the burned bark and charcoal temper inside the ceramic fragment used for this test. Finally, two TL dates (FS5027.05 and .06) from TU-B Cx.103 layer, immediately below TU-A Lv.16 (205-215cmBS), yielded two median dates of AD168 (13.31% error) and AD118 (13.26% error), with an overlapping date range of 80BC-AD370.

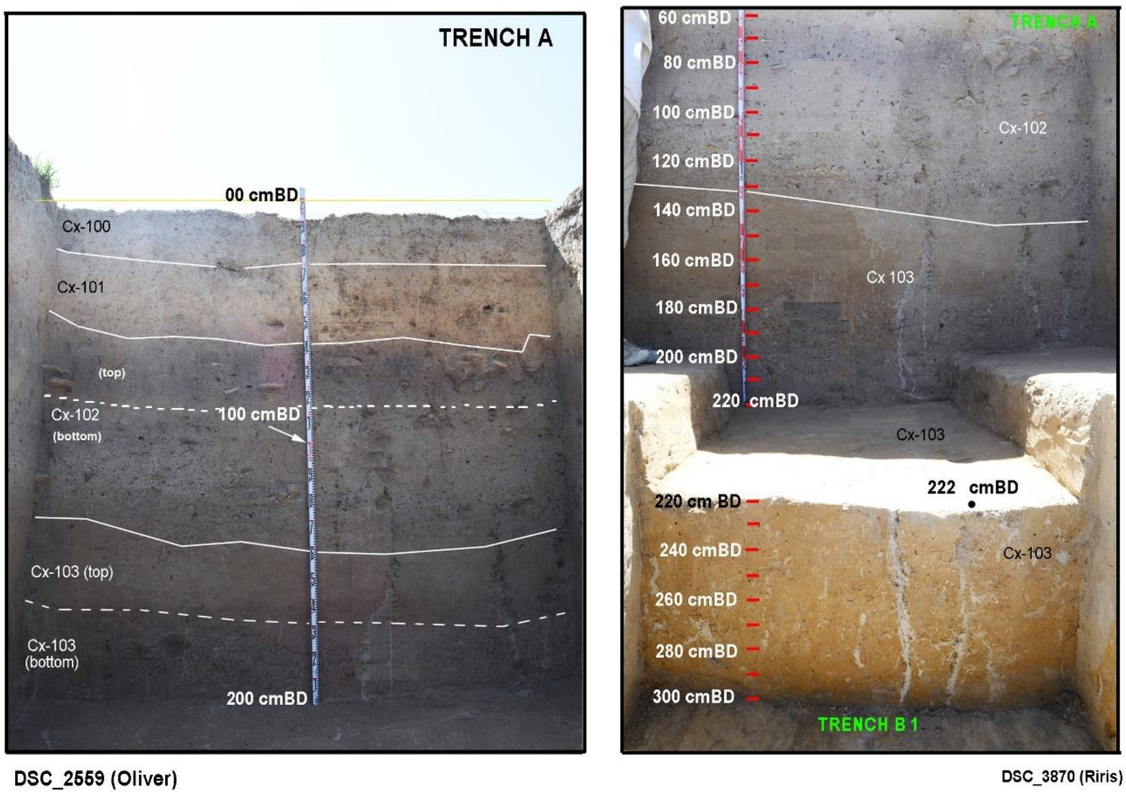


Figure 6.7-6*. Trench A east wall profile. Left picture shows the profile before the opening of the window in Lv. 15 (195-205cmBS), while the right picture shows the wall after the opening of the 20cm deep window from TU-A and the east wall profile of TU-B1. Photos courtesy of José R. Oliver and Phil Riris, 2017.*

Despite having a greater error margin and a broad period range, TL dates obtained from Cx.103 were in the right order according to their depth. Radiocarbon date from the top end of Cx.103 suggest the materials recovered from the top of this stratum were deposited sometime ca.AD1100, while the TL dates from the bottom levels of this context in TU-A and the upper ones in TU-B suggest an earlier occupation between 80BC-AD570. This difference in dates coincide with the already described soil matrix change within Cx.103 and it will be further discussed in relation to the techno-stylistic and formal analysis of the ceramic materials.

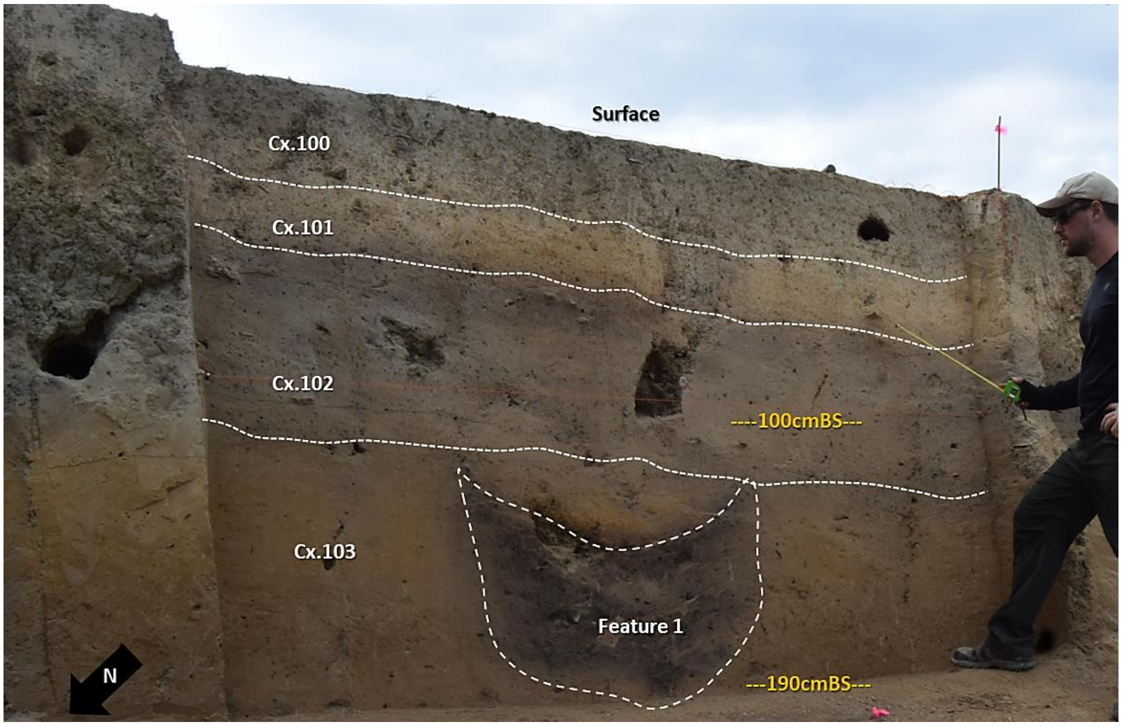


Figure 6.7-7. *West wall of TU-A before the excavation started. When the river's bluff was cleaned and straightened to start excavating, a roughly basin-shaped dark stain became evident in the profile. It corresponded to a charcoal concentration which will later be referred to as Feature 1. Holes on the wall correspond to Amazonian King Fisher bird nest burrows. Courtesy of José R. Oliver, 2017.*

Finally, in the transition between Cx.102 and Cx.103, at 126cmBS, a large charcoal concentration with a heterogeneous fill and an irregular form was detected in TU-A. As seen in ***Fig.6.7-7,*** this element, denominated as Feature 1, was detected while doing the wall cleaning. The cut and fill of the feature were denominated as Cx.105 and Cx.106, respectively. Cx.106 was a fine grey silt (10YR 6/1) loosely compacted soil with some charcoal specks, light rooting and very few eroded artefacts and hardened clay lumps (i.e. *topia*). It extended from 126cmBS to 194cmBS. Inside the feature one post-hole was recorded. The cut and fill of the latter were denominated Cx.108 and Cx.109, respectively. It presented a conical shape which extended from 126-162cmBS in which there was a dark grey (10YR 4/1) silt soil with no associated artefacts or inclusions. A radiocarbon date obtained within Feature 1 at 174cmBS dated AD1045-1218 2σ (885 ± 25 BP, OxA-36213), statistically equivalent to the date obtained from Lv.11 (135-155cmBS) of AD1030-1166.

- ***6.7.3.1.2 TRENCH UNIT C (TU-C)***

Excavation TU-C presented four stratigraphic contexts in 270cm below surface (cmBS), from which 1,432 ceramics sherds were recovered. The elevation datum was placed at 10cm above the surface on the SE corner of the unit (GPS: N 06.5434 – E 064.0851, 52±5mASL). Arbitrary levels of 10cm and 20cm were excavated, using shovels and trowels as appropriate.

Cx.100 (0-50cmBS) is characterized as a light grey (10 YR 7/2) silt soil with no inclusions and medium rooting. No artefacts were found on this layer. Cx.101 (50-124cmBS), slightly more compacted light grey silt soil, also lacked artefacts (***Fig.6.7-8***). At the beginning of this context, a large burned wood log was found at 57cmBS from which a radiocarbon date was obtained (OxA-36133). The log dated to AD1648-modern era and was not associated to any artefact. In the 10cm before the transition to Cx.102, a few ceramic sherds and lithics were found and recorded as pertaining to this context.

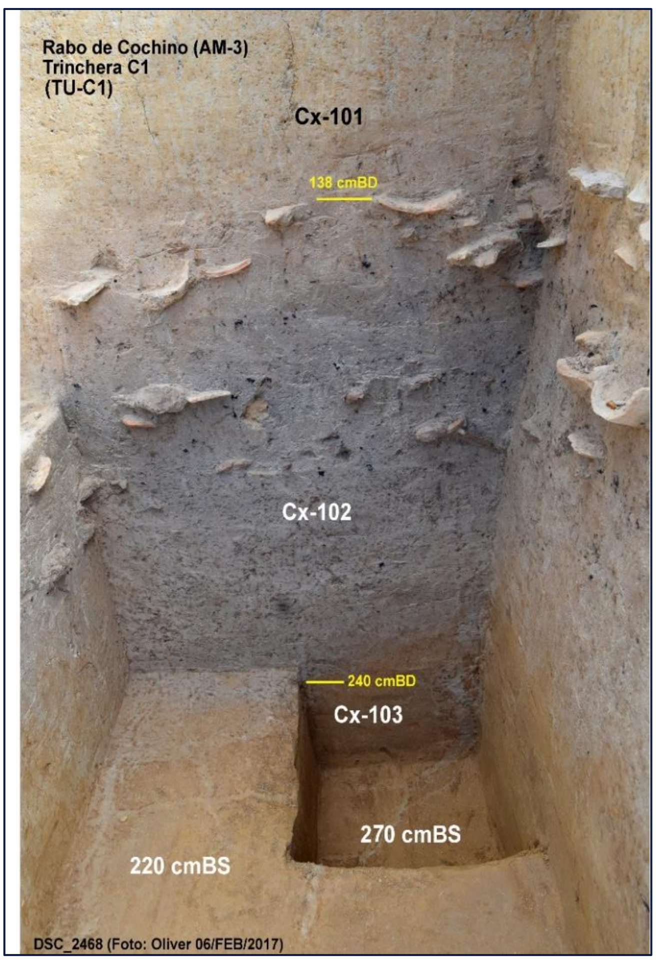


Figure 6.7-8. *Stratigraphic contexts on the eastern wall of TU-C. Cx.100 (0-50cmBS) is not seen on the picture. Cx-102 (124-210cmBS), the only context with artefacts, is a grey sandy silt soil with charcoal, ashes and large ceramic and lithic artefacts, still visible on the profile. Courtesy of José R. Oliver, 2017.*

Cx.102 (124-230cmBS) was described as a very fine yellowish brown (10 YR 5/4) sandy silt soil with dark yellowish brown (10YR 4/4) mottles. This was the context with most artefacts on the trench unit. Around the recovered materials some charcoal and ash flecks were found, turning the colour of the soil to grey. This context was excavated in 10cm arbitrary levels except for 20cm bottom Lv.9 (190-210cmBS). From Lv.3 to 5 (124-160cmBS), the excavations was conducted in a 2x1m unit. These three levels contained large *in situ* ceramic artefacts and rocks, placed horizontally on top of what appears to be an ancient food processing area. The removal of these larger pieces was performed by excavating the deposition context rather than by following an arbitrary measure, which explain the 16cm thick Lv.3 (124-140cmBS). Lv.4 to 5 (140-160cmBS) also presented *in situ* large potsherds of globular pots and griddles on top of carefully places rocks and significant amounts of burned wood and ashes around them, apparently part of a lower floor surface, as seen on ***Fig.6.7-9***.

Figure 6.7-9. *Picture of the in-situ ceramics and lithics found at Cx.102, 150cmBS. Lithics (yellow L) and large ceramic sherds (red C) are identified with letters on the image. The ceramic fragments on top of the rocks were joined together and identified as part of a thin griddle or aripo. Courtesy of José R. Oliver, 20017*

Two radiocarbon dates from Lv.3 (124-140cmBS) were obtained from charred *cucurito* palm seeds (*Attalea maripa*). Both samples (OxA-36214 and 36215) are statistically equivalent, with a median date range of AD1325-1435. A charcoal sample (OxA-36216) from the bottom of Lv.5 (158cmBS) dated AD1301-1413 2σ (588 ± 26 BP), which significantly overlaps with the dates from the upper levels.

Cx.102 continues until 220cmBS; however, the excavation of the unit changed from Lv.6 (160-170cmBS) downwards. Given that the artefacts found were progressively concentrated on the west wall of the trench, it was decided to re-orient the trench perpendicular to the river's bluff. Levels 6 and 7 (160-180cmBS) were excavated as a 1x1m unit on the south half of the original trench, while Lv.8 and 9 (180-210cmBS) were part of the new 2x1 unit, in which the original south-half of TU-C became the eastern half of TU-C1. ***Figure 6.7-10*** shows the new trench perpendicular to the bluff, in which the western half was denominated as TU-C2. Artefacts obtained from these two bottom levels were labelled as coming from C1+C2. Finally, slumping material was recovered from TU-C2, and although it is part of this same context, it was clearly mixed and was recorded separately as TU-C2.

From bottom levels 8 (180-190cmBS) and 9 (190-210cmBS), three charcoal samples were obtained for dating. Lv.8 sample OxA-36217 was recovered from 180cmBS on TU-C1 while sample OxA-36218 came from 180-185cmBS from TU-C2 side. The former yielded a date of cal. AD1300-1410 2σ (593 ± 25 BP) while the latter dated between cal.AD1316-1430 2σ (551 ± 24 BP), both statistically equivalent. Lv.9 sample (OxA-36134) from 209cmBS, at the base of Cx.102, yielded a date of cal.AD1288-1295 2σ (731 ± 26 BP). Dates from Lv.8 overlap with the ones obtained in upper levels 3 and 5, while Lv.9 is slightly earlier. Based on the former, Cx.102 occupation period range extends from ca. AD1288-1430.

At 210cmBS, due a noticeable reduction of artefacts, a 50x50cm excavation window on the SE corner of TU-C1 was opened in an attempt to reach the culturally sterile layer. Cx.103 (210-270cmBS) a strong brown (7/5 YR 5/8) sandy silt soil with light grey (10 YR 7/1) silt-filled cracks and yellowish brown (10YR 6/4) mottles was detected within this window. A date was obtained from Lv.10 (210-270cmBS), at 218cmBS, which yielded cal. AD1039-1211 2σ (899 ± 30 BP). However, no artefacts were recorded in this context and this date could not be directly associated to any human occupation in this trench.

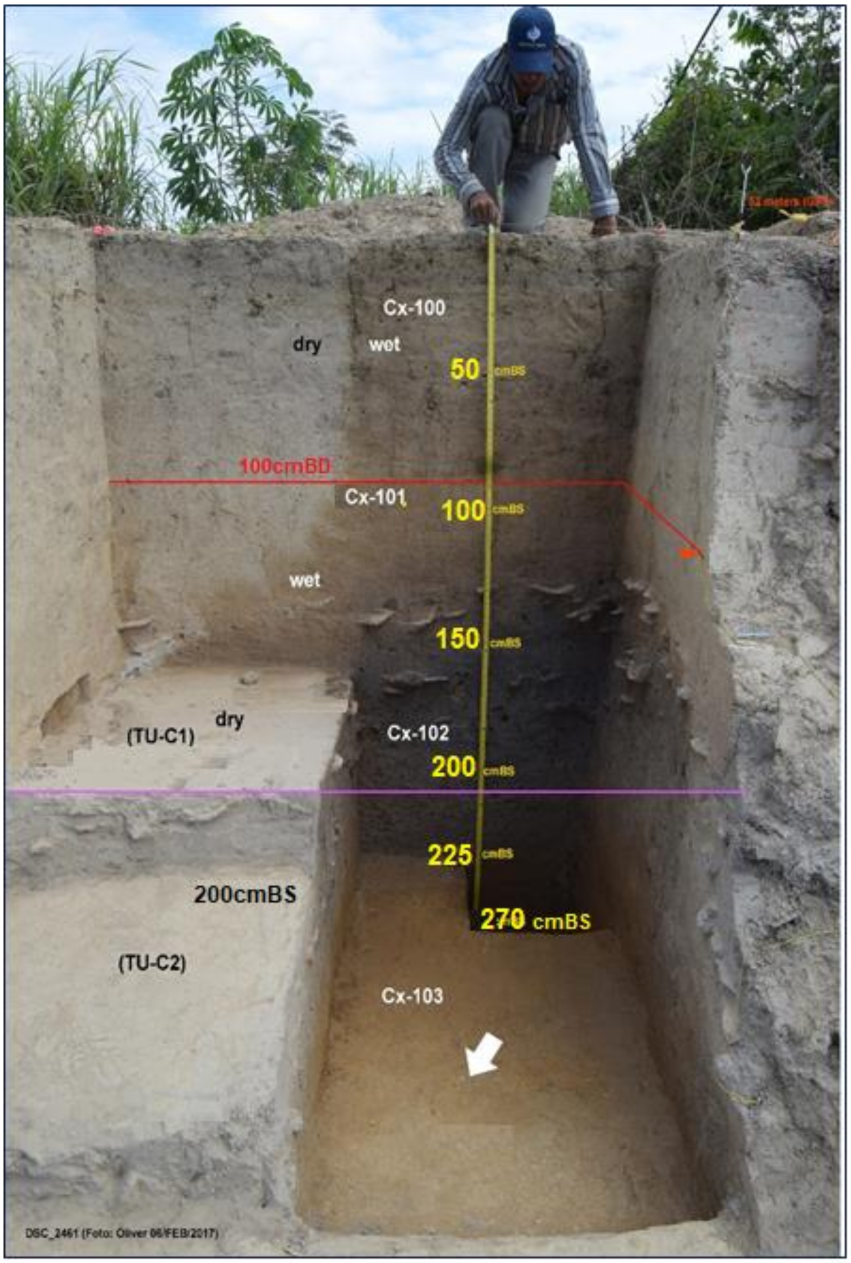


Figure 6.7-10. *Trench C after completion. Four stratigraphic contexts are visible in the wet portion of the wall. The material accumulation from Cx.102 is still visible on the profile and can be seen to extend towards the western half of TU-C2 unit on the wall profile at the right-hand side of the picture. Courtesy of José R. Oliver, 2017.*

6.7.3.2 Contrasting deposition regimes

Both trenches at Rabo de Cochino site share similar strata and equivalent chronologies associated to each one of them. Differences in terms of depth are due to a higher elevation of TU-C within the bluff, 2m above TU-A (according to GPS elevation datum ±5m). In general, three different occupation periods can be identified within three stratigraphic contexts.

None to very rare artefacts were found to be associated to Cx.100, the top soil matrix in both trenches, described as a light grey silt with few inclusions and medium rooting. Cx.101, also similar in both excavation units, characterized as a more densely compacted soil with reddish brown mottles and few pebble inclusions, did contained archaeological artefacts in TU-A, while it remained mostly sterile in TU-C. An associated radiocarbon date from this context from TU-A yielded a date of AD1323-1348.

As for Cx.102, it is described in TU-A as a dark greyish brown medium compacted sandy silt soil with charcoal flecks, while in TU-C it has a finer texture, as a very fine yellowish-brown sandy silt soil with dark yellowish-brown mottles and ashes and charcoal inclusions. Despite the lightness in colour and a finer texture difference of Cx.102 in TU-C, they both share a spike in artefact count and similar radiocarbon dates which placed them between ca.AD1280-1430, overlapping with Cx.101 radiocarbon date. This period in both trenches corresponds to the most intense occupation of the site based on the artefact count. It also suggests a semi-permanent to permanent settlement based on the finding in TU-C of a food production area with large ceramic vessels and carefully placed rocks surrounded by ashes and burned wood, possibly associated to a hearth.

The bottom Cx.103 is described in both trenches as a loosely compacted brown to light yellowish-brown sandy silt soil with light grey silt filled cracks and very few inclusions. The upper levels of this context in TU-A and Lv.10 in TU-C had very few to no artefacts associated. A radiocarbon date from TU-A and another one from TU-C from this part of the context yielded similar dates between ca.AD1030-

1210. The former can be interpreted as a period where people visited or passed through the island but did not have a permanent settlement.

The lower levels of Cx.103 in TU-A showed a noticeable change in the soil matrix with a significant amount of charcoal and bitumen inclusions. This soil change was accompanied by a second spike on artefact count, although not as numerous as the one reported in Cx.102. Dating of this portion of the context was only possible through TL since charcoal samples for radiocarbon dating turned out to be insufficient for AMS. TL dates from TU-A and TU-B eastern wall profile -which corresponds with this part of the context- yielded a median date between ca. 80BC-AD570. A culturally sterile layer was not found on TU-A, so this period could start earlier than what it was documented in our fieldwork. Although there is a considerable number of ceramic artefacts associated to these early levels, there is not enough evidence to establish the permanent character of this occupation.

6.7.4 Materials Distribution Patterns

6.7.4.1 Trench A (TU-A)

Trench excavation unit TU-A reached a depth of 215cm below surface where a total of 3,410 ceramics and 208 lithics were recovered. Arbitrary levels of 10cm were excavated in a 2x1m trench, except for levels Lv.7 (85-105cmBS) and Lv.11 (135-155cmBS), which were 20cm thick. The last two levels Lv.15-16 (195-215cmBS) were 10cm arbitrary levels excavated in a 1x1m window. Artefacts recovered from Feature 1 (Cx.106 [126-194cmBS], n=77) were bagged and registered apart, for which they do not appear in the following figures with the artefact distribution per level. Material refuse at TU-A presents three main peaks of materials, with an initial increasing tendency between levels 16 and 13 (165-215cmBS), a second peak between levels 10 and 8 (105-135cmBS) and a final brief one between levels 5 and 4 (55-75cmBS). Said tendencies were calculated by considering differences in volume between arbitrary levels.

The distribution of total artefacts and of ceramic materials through the trench follows a similar trend (***Fig.6.7-11, A and B***). After an initial increasing tendency of 35% average per level within levels Lv.16 to 14 (185-215cmBS), an average decline of 41% follows in the next three levels (Lv.13-11 [135-185cmBS]), considering a recalculation of total artefacts and ceramics in Lv.13 and 11 as 10cm thick levels. From level Lv.10 to 8 (105-135cmBS) an increasing tendency of 67% in average per level coincides with the transition between Cx.103 (125-215cmBS) to Cx.102 (55-125cmBS), followed by a brief but sharp decline of 65% in average per level between Lv.7 to 6 (75-105cmBS), (converting Lv.7 total count as a 10cm level). A final rise of 89% was registered towards the top levels of Cx.102, between Lv.5 to 4 (55-75cmBS). This spike is followed by an abrupt decline of 67% in average per level between levels Lv.3 and 2 (35-55cmBS), which coincides with the transition from Cx.102 to Cx.101 (35-55cmBS). Finally, a 98% reduction in the top level of the trench marks the transition to the almost sterile Cx.100 (0-35cmBS).

Lithic artefacts are a minority through TU-A. Their distribution trend mostly coincides with the one described for the total artefact and ceramics count, with some minor differences. As seen in ***Fig.6.7-12A***, lithic materials in the bottom levels are very rare, with less than 10 artefacts per level. However, the initial increasing tendency registered for ceramic artefacts between Lv.16-14 (185-215cmBS) is also mirrored by the lithics in a shorter span between Lv.15-14 (185-205cmBS). On the other hand, considering the thickness of Lv.13 (165-185cmBS), from a total of 8 lithics, only 4 lithics were found within a 10cm arbitrary level, for which there is a decrease of 30% towards this level, followed by a 60% increase in Lv.12 (155-165cmBS) and a subsequent 90% decline in Lv.11 (135-155cmBS), also a 20cm level.

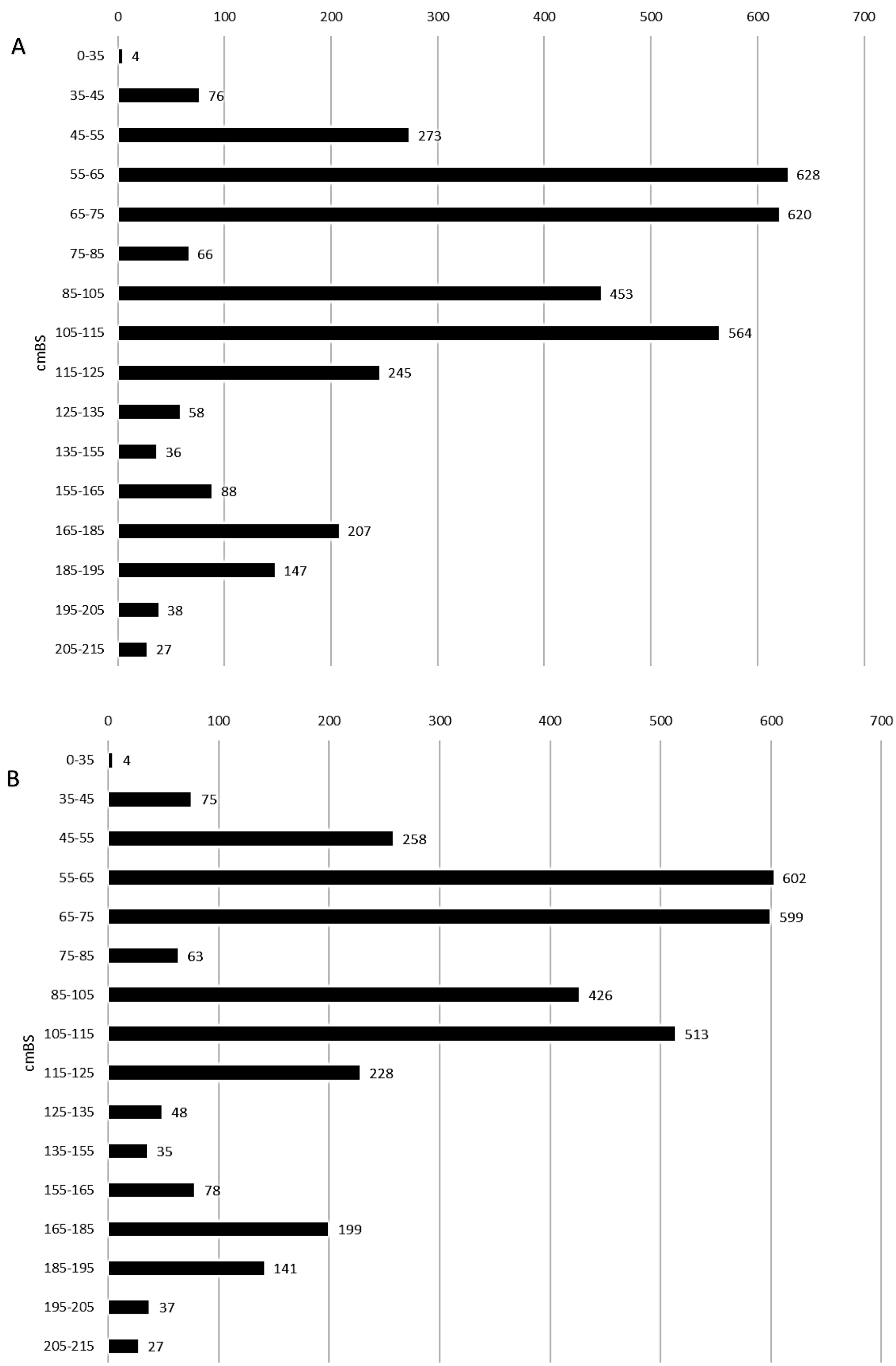


Figure 6.7-11. *Materials recovered at TU-A, registered per arbitrary level (cm below surface -BS-). A) Total artefacts recovered per level, B) Total ceramic sherds recovered per level.*

This erratic behaviour between Lv.13 to 11 (135-165cmBS) is not noted within total ceramics and total artefact trend. Following an increase of 90% in Lv.10 (125-135cmBS), it coincides with the stratigraphic context transition between Cx.103 and 102, which also exhibited a 67% average increase among ceramic materials. The increasing tendency continues in the upper two levels (Lv.9 -8 [105-125cmBS]), with a 53% average rise, followed by an 83% average reduction between levels Lv.7-6 (75-105cmBS), also registered for pot sherds and re-calculated by considering Lv.7 20cm thickness. A final rise between Lv.5 and 4 (55-75cmBS) of 95% matches the 89% rise registered for the ceramic materials and is followed by a continuous decline in the counts until the top end of the trench.

Minced pottery sherds (<1cm^2) follow a slightly different trend (***Fig.6.7-12B***), starting with an initial decline of 57% in average between levels Lv.14-11 (135-195cmBS), considering Lv.14 and 11 thickness to re-calculate the total count of minor sherds reported. This is followed by a 67% average increase between levels Lv.10-8 (105-135cmBS), which coincides with the transition from Cx.103 to Cx.102 and the rise of both ceramic and lithic materials in general. Decline of 64% average of minced pottery between Lv.7 and 6 (75-105cmBS) also matches the ones reported for all artefacts in the trench, while the immediate increase in Lv.5 (65-75cmBS) of 91% parallels the previously high reported rise counts for both ceramics and lithics just before the transition from Cx.102 to Cx.101. Top levels also report a reduction tendency of 78% in average.

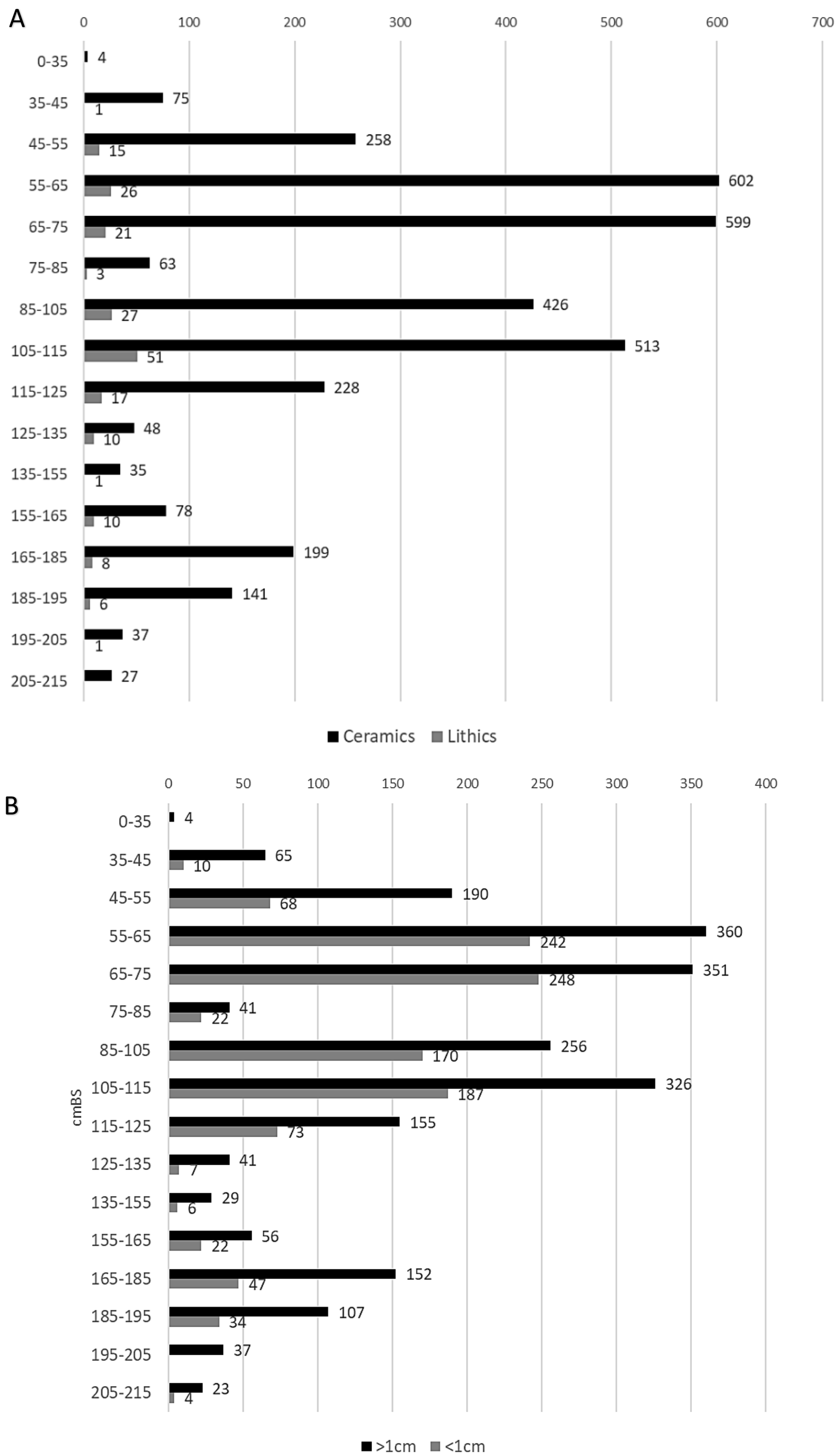


Figure 6.7-12. *Materials recovered at TU-A, per arbitrary level (cm below surface -BS-). A) Total artefacts discriminated by type of material (ceramics and lithics), B) Total ceramic sherds per level discriminated by size (grey=<1cm² and black=>1cm²)*

The stratigraphic differences through the trench are noticeable, with most of the artefacts concentrated in Cx.102. Cx.100 (0-35cmBS), a light grey silt soil with few inclusions and medium rooting, only yielded 4 ceramic pot-sherds, which constituted 0.11% of the trench total materials recovered. Cx.101 (35-55cmBS), a densely compacted soil with reddish brown mottles and few pebble inclusions, did show significant number of artefacts, with a total of 349 artefacts (333 ceramics and 16 lithics), equivalent to 9.8% of the trench's total. However, is Cx.102 (55-125cmBS), a dark greyish brown medium compacted sandy silt soil with charcoal flecks, which exhibits the biggest concentration of archaeological materials, with 2,576 artefacts (2,431 ceramics and 145 lithics), 73% of the total from TU-A. Finally, Cx.103 (125-215cmBS) is the second stratum with more materials recovered, with a total of 601 artefacts (565 ceramics and 36 lithics), 17% of the total artefacts from the unit.

Regarding the smallest ceramic sherds or minced pottery (<1cm²), there is a strong difference between contexts. Cx.101 (35-55cmBS) has 7% of the total of minced pottery from the trench, while Cx.102 (55-125cmBS) has 82% and Cx.103 (125-215cmBS) only has 10.5%. The greater fragmentation rate observed in Cx.102 suggests more activity and trampling in the area during this period, which was significantly and rapidly reduced towards the end of the occupation.

Considering the differences in volume between stratigraphic contexts, it is not surprising that Cx.102 has a substantial number of artefacts. While the latter has 1.4m³ in volume, Cx.101 only has a volume of 0.4m³. The largest context is Cx.103, with a volume of 1.6m³ that, nonetheless, yielded the second largest number of artefacts in the trench. To be able to accurately compare them, the amount of ceramic materials found in each context was recalculated using a common volume unit of 'x' artifacts per 1m³. In these terms, Cx.101 has only half (n=832/m³) of the sherds projected for Cx.102 (n=1736/m³), while Cx.103 has 80% less (n=353/m³). In sum, Cx.103 would be the context with less deposited materials in the trench rather than Cx.101. In terms of ceramic materials concentrated in arbitrary levels, level 4 and 5 (55-75cmBS) exhibits the largest number of sherds per $0.1m^3$ in this trench, with 602 and 599 ceramic fragments, respectively. Both account for 43% of all the minced pottery sherds reported in the trench. They are found in the top end levels of Cx.102, before the transition to Cx.101, and where most of the ceramic materials from this context were deposited. This suggests a rather intense activity and fast deposition period towards the end of this stratum.

The distribution of lithic materials confirms this trend, with 73.6% (n=145) of lithics recovered from Cx.102, followed by Cx.103 with 18% (n=36) and Cx.101 with 8% (n=16). However, when applying the $1m^3$ projection, Cx.102 predominance over the other contexts is reduced, with 63% of the lithic materials in the trench ($n=103/m^3$), while Cx.101 has 24% ($n=40/m^3$) and Cx.103 only 13% ($n=22/m^3$). This is also observed within the minced pottery shreds ($<1cm^2$) when projected into $1m^3$, with 71% ($n=673/m^3$) of the heavily fragmented pot-sherds in Cx.102, followed by Cx.101 with 20% ($n=195/m^3$) and Cx.103 with 8% ($n=75/m^3$).

Based on this comparison, the concentrations of both ceramics and lithic materials within Cx.102 (55-125cmBS), and specifically between Lv.4 and 5 (55-75cmBS) and Lv.8 (105-115cmBS), suggest that this stratum is the product of a different and more intense occupation, with deposition peaks closely located at both ends. Likewise, the highest frequency of minced pottery's throughout the trench is found in Cx.102, with an average of 35% of the ceramic materials in every level. This percentage also supports the claim of a greater trampling activity on site during this period, although it might also be the product of stronger erosive episodes, such as flooding.

Contrary to what was initially thought, and after considering the volume differences, Cx.101 is the second context with more artefacts on the trench, with half of the materials found on Cx.102, while Cx.103 has the least overall number of artefacts, with less than one-tenth of the total for Cx.102. Likewise, the top end levels of Cx.103 (Lv. 10 and 11 [125-155cmBS]) are also the ones with fewer minced pottery sherds, with an average of 15% per level, indicative of less activity during the early occupation stages of this site. This percentage is slightly surpassed in the bottom levels of Cx.103 (Lv.12 to 14 [155-195cmBS]), where both the total number of ceramic materials and minced pottery sherds are higher, with an average of 106 pot-sherds and 25% of heavily fragmented sherds per level.

The difference in material distribution supports the existence of at least three main occupations on Rabo de Cochino. Two distinct early occupations registered in Cx.103 (125-215cmBS) coincide with the previously described soil matrix change within this context. An early less intense occupation between Lv.12-16 (155-215cmBS) is associated to a noteworthy amount of ceramic materials associated with a TL date, ranging between ca. 80BC-AD570. The top levels of Cx.103 (Lv.10-11 [125-155cmBS] show a sharp drop in artefact count, possibly associated with a partial abandonment of this locus somewhere between ca.AD1030-1166. This low activity period is followed by the most intense occupation, registered in Cx.102 (55-125cmBS), associated to a radiocarbon date of AD1273-1389 from Lv.4 (55-65cmBS), the one with the highest number of artefacts and minced pottery sherds in the trench. Finally, a short but intense occupation towards the end of the site is registered on Cx.101 (35-55cmBS), which yielded a radiocarbon date of AD1321-1348. This date overlaps with the one available for the previous context and suggest the two last occupation occur in quick succession, although more dates are needed to clarify this time range. Additional evidence based on ceramic wares, production sequences and vessels forms, discussed in the next sections, will help to distinguish the occupations.

- ***6.7.4.1.1 Macro-fabrics distribution***

The macroscopic fabrics, defined according to paste attributes, represent the broadest unit of analysis to classify the ceramics according to their paste recipe. The distribution of macro-fabrics was registered per context and arbitrary level. Minced pottery sherds (<1cm²) are registered as ‘Other’ (i.e. undetermined). The sherds analysed from Feature 1 (Cx.106) are treated separately.

From a total of 3,333 ceramic sherds from TU-A, 17% of the ceramic materials were recovered from Cx.103, where five of seven macro-fabrics are represented. The Coarse Sand (CS) fabric, of the Granitic Family, represent 50% of the sample from this context. Remaining fabrics (30%) are all form the Sponge Spicule and Mixed Fibre Family (i.e. Cauixí [C], Cauixí and Sand [C+S], Cauixí and Fibre [[C+F] and Cauixí and Red Clay Pellets [C+CP] and Cauixí and White Clay Pellets [C+WCP]). The Fine Sand fabric is absent in this context while the 'Other' represent the remaining 20% (***Table 6.7-3***). The upper Cx.102 contains 73% of all the ceramic materials in the trench, classified between seven different macro-fabrics. While the Coarse Sand fabric remains the single most popular macro-fabric with 23% of the sample, Cauixí-tempered fabrics together add up to 37% while minority Fine Sand fabric is only 0.9%. The sharp reduction of sand-based fabric is accounted for by the growing percentage of the sponge spicule sherds and the rise of the undetermined sherds with 39%.

Cx.	cmBS	Total	FS	C	CS	C+S	C+F	C+CP	C+WCP	Other
100	0-35	4	0	0	1	3	0	0	0	0
101	35-55	333	0	34	119	53	10	39	0	78
102	55-125	2431	23	162	573	537	80	108	6	942
103	125-215	565	0	9	277	25	129	5	0	120
106	126-184	76	0	4	13	22	3	0	0	34

Cx.	cmBS	Total	FS	C	CS	C+S	C+F	C+CP	C+WCP	Other
100	0-35	100	0	0	25	75	0	0	0	0
101	35-55	100	0	10.2	35.7	15.9	3	11.7	0	23.4
102	55-125	100	0.9	6.7	23.6	22.1	3.3	4.4	0.25	38.7
103	125-215	100	0	1.6	49.0	4.4	22.8	0.9	0	21.2
106	126-184	100	0	5.3	17.1	28.9	3.9	0	0	44.7

Table 6.7-3. *TU-A Macro-fabrics distribution per stratigraphic context, by number of sherds (top) and percentages (bottom). Rabo de Cochino site.*

On the other hand, Cx.101 has 10% of the total ceramic sherds on TU-A, 36% of which correspond to the Granitic Family (CS). The growing representation of sand-based fabrics in this context in relation to the previous one is not the result of the reduction of sponge-tempered fabrics, which rose to a 41% in the upper context, but rather of the fall of the minced pottery sherds ('Other'), which account for only 23% of the total. The minority macro-fabric Fine Sand is absent in the top context. Finally, Cx.100 only has four sherds, one belonging to the Coarse Sand macro-fabric and the remaining three to the Cauixí and Sand.

Regarding the sponge spicule tempered fabrics, Cauixí and Sand predominates in every context except for Cx.103, where the Cauixí and Fibre group is five times more popular. The latter group turns into one of the minority groups in the top two contexts, while the Cauixí and Clay Pellets fabric grows exponentially closer to the top end of the trench. Lastly, the Cauixí and White Clay pellet fabric is only reported on Cx.102.

In feature-1 (Cx.106), ceramic sherds are predominantly sponge-tempered, with 38% of the sample, followed by the Coarse Sand macro-fabric with only 17% of the sherds. The undetermined (i.e. 'Other') fragments are the most popular in this context with 45% of the sample, the highest fragmentation rate throughout the trench.

Cx.	cmBS	Total	FS	C	CS	C+S	C+F	C+CP	C+WCP	Other
101	35-45	79	0	11	33	20	5	0	0	10
	45-55	258	0	23	87	36	5	39	0	68
102	55-65	602	0	61	175	84	13	27	0	242
	65-75	599	0	19	160	113	18	41	0	248
	75-85	63	5	12	12	0	12	0	0	22
	85-105	426	18	19	67	101	15	35	1	170
	105-115	513	0	37	98	160	21	5	5	187
	115-125	228	0	14	61	79	1	0	0	73
103	125-135	48	0	5	22	14	0	0	0	7
	135-155	35	0	0	18	4	5	2	0	6
	155-165	78	0	4	38	7	7	0	0	22
	165-185	200	0	0	114	0	39	0	0	47
	185-195	141	0	0	49	0	58	0	0	34
	195-205	37	0	0	24	0	10	3	0	0
	205-215	27	0	0	13	0	10	0	0	4
106	126-184	76	0	4	13	22	3	0	0	34

Table 6.7-4. *Macro-fabrics frequencies per level in TU-A. Legend: FS=Fine Sand, C=Cauixí, CS=Coarse Sand, C+S= Cauixí and Sand, C+F=Cauixí and Fibre, C+CP=Cauixí and Clay Pellets, C+WCP=Cauixí and White Clay Pellets.*

When assessed by arbitrary level (***Table 6.7-4, Fig.6.7-13***), there are some significant changes that occur within a shorter time frame within mentioned stratigraphic contexts. In Cx.103 (125-215cmBS), one important change occurs in Lv.12 (155-165cmBS) with the introduction of Cauixí and Cauixí and Sand macro-fabrics. While in the bottom levels of this context sponge tempered ceramic had been reported, these sherds also contained fibre inclusions (i.e. burned bark and wood) as part of the Cauixí and Fibre macro-fabrics. They also constituted 20% in average of the samples per level. However, from Lv.12 upwards, Cauixí and Fibre sherds correspond to less than 10% of the samples per level, except for Lv.6 (75-85cmBS), where they reached a 19%. Instead, Cauixí and Cauixí and Sand samples (both lacking fibre inclusions), are more frequent in the top levels.

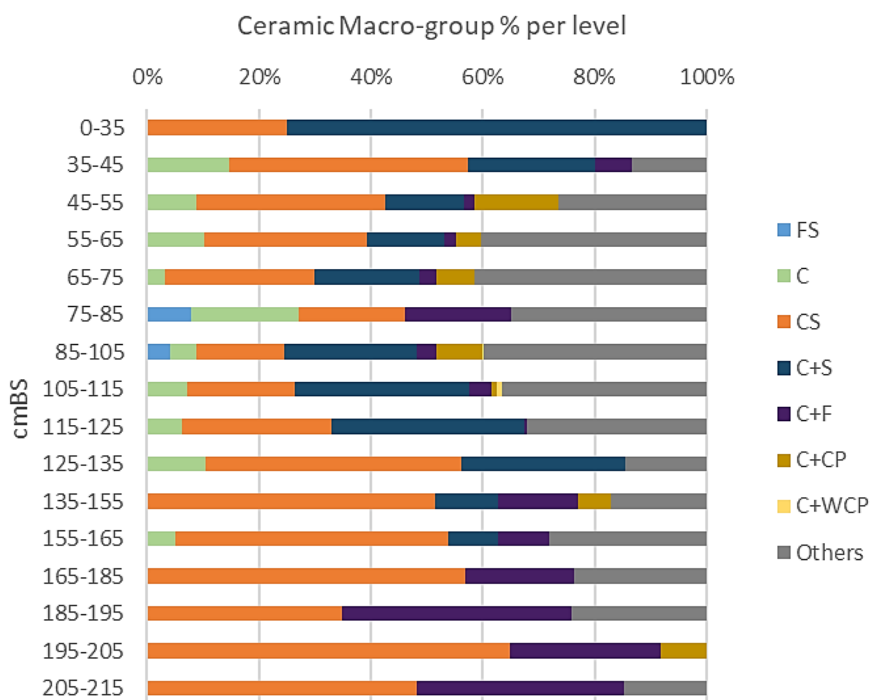


Figure 6.7-13*. Macro-fabrics percentages per arbitrary level in TU-A. Legend: FS=Fine Sand, C=Cauixí, CS=Coarse Sand, C+S= Cauixí and Sand, C+F=Cauixí and Fibre, C+CP=Cauixí and Clay Pellets, C+WCP=Cauixí and White Clay Pellets.*

Within Cx.102 (55-125cmBS), in particular from Lv.10 to Lv.7 (85-135cmBS), there is a noticeable rise of Cauixí and Sand macro-fabric sherds which derives in the lessening of the Coarse Sand fabric and is also correlated to an increasing number of heavily fragmented pot-sherds (i.e. Other) which suggest greater activity and trampling. Likewise, even though the Cauixí and Clay Pellets macro-fabric sherds are scattered through the trench, they are most common between Lv.8 and 3 (45-115cmBS), specially Lv.3 (45-55cmBS) where they represent almost 15% of the sample and which takes place just before the transition between Cx.102 and Cx.101.

6.7.4.2 Trench B (TU-B)

The artefacts from TU-B were recovered from the profile of the eastern wall, perpendicular to TU-A, and just below Lv.16 (205-215cmBS). Some sherds were also registered on the eastern half of the unit, where slumping material from the river´s bluff had landed. The excavation of this trench did not follow arbitrary levels, leaving a total balance by type of artefacts. Ceramic artefacts predominate in this unit, with a total of 106 pot-sherds and just 6 lithics. While 32% (n=34) of the ceramic materials were found on the profile wall, 68% were recovered from the south-half and bagged as overburden material. As for lithic artefacts, 66% (n=4) came from the profile and the remaining 33% (n=2) were mixed with the ceramic in the slump area.

- ***6.7.4.2.1 Macro-fabrics distribution***

Five different macro-fabrics were registered at TU-B, bagged separately according to their provenance within this trench. Samples from the profile wall corresponded to Coarse Sand (CS) and Cauixí and Fibre (C+F) macro-fabrics, from the Granitic and Mixed Fibre families, while the slumping material also included Cauixí (C), Cauixí and Sand (C+S) and Cauixí and Red Clay Pellets (C+CP) from the Sponge Spicule Family (***Table 6.7-5***). Sand based samples predominate among the profile pot-sherds and Cauixí and Sand are the most frequent in the slump re-deposited material.

TU-B	Total	FS	C	CS	C+S	C+F	C+CP	C+WCP	Other
Profile	34	0	0	22	0	11	0	0	1
Overburden	72	0	8	27	15	9	12	0	1

TU-B	Total	FS	C	CS	C+S	C+F	C+CP	C+WCP	Other
Profile	100	0	0	64.7	0	32.4	0	0	2.9
Overburden	100	0	11.1	37.5	20.8	12.5	16.7	0	1.4

Table 6.7-8*. Macro-fabrics frequencies in TU-B. Legend: FS=Fine Sand, C=Cauixí, CS=Coarse Sand, C+S= Cauixí and Sand, C+F=Cauixí and Fibre, C+CP=Cauixí and Clay Pellets, C+WCP=Cauixí and White Clay Pellets*

6.7.4.3 Trench C (TU-C)

Trench excavation unit TU-C yielded the best-preserved artefacts in Rabo de Cochino site. A total of 1,432 ceramics and 73 lithics, along with a few bones, were recovered from this unit. Artefacts were recorded per arbitrary level, context and section of the trench. The original 2x1m unit cut into the river´s bluff was denominated section TU-C1 and, starting at 180cmBS, the western half of the perpendicular 2x1m unit was named TU-C2. The bottom levels 8 and 11 (180-230cmBS) were excavated in the perpendicular trench unit, encompassing the south half of C1 and C2, for which reason it was labelled TU-C1+C2. Materials from the western half of TU-C2 were bagged as pertaining to C2 only, given that they did not intersect the original C1 trench and a great portion of them corresponded to slumping material, which was kept separate. The distribution of materials analysis of TU-C will not follow the arbitrary levels since most of the artefacts were concentrated on Cx.102 (124-230cmBS), at times excavated by following the disposition of the *in-situ* materials rather than the arbitrary level measure.

Cx.100 (0-50cmBS) was a sterile stratum, whereas Cx.101 (124-130cmBS) yielded a few artefacts just before the transition to Cx.102. As seen in ***Fig.6.7-14A,*** 33 artefacts were found on this context, which represents just 2% of the total artefacts from the trench. Meanwhile, Cx.102 (124-230cmBS) can be divided into three excavation sections: 1) the TU-C1 unit from levels Lv.3 to 7 (124-180cmBS), 2) the TU-C1+C2 unit between levels Lv.8-11 (180-230cmBS) and 3) TU-C2 between levels 8-11 (180-230cmBS). Most of the artefacts were found in the upper levels of Cx. 102 of TU-C1, with 61% (n=917) of the total artefacts. Lower excavation section TU-C1+C2 contained 7% (n=105) while the western portion TU-C2 yielded 30% (n=449) of the total. In this last section, 61% (n=275) were artefacts thought to be originally deposited in this context, while the remaining 39% (n=174) were most likely from redeposited, slumped material. Finally, only one sherd was recovered from Cx.103 (230-270cmBS) excavation window.

In terms of type of materials, most of the recorded evidence were potsherds (***Fig.6.7-14B***). However, in Cx.101, most of the artefacts are lithics (64%), while ceramics were the minority (36%). This tendency is overturned in both the top and bottom levels of Cx.102, where ceramics are in average 96% of the sample. Lastly, Cx.102 at TU-C2 maintains this tendency, with 97% ceramic materials and 3% lithics. However rare, rocks from TU-C1 in this context are flat, large and elongated rocks which occupied most of the context surface and on top of which most of the ceramic fragments were found.

Regarding minced pottery sherds (<1cm^2), most of the heavily fragmented ceramic sherds were found in TU-C1's upper levels (124-180cmBS), where they represented only 15% of the total ceramics (***Fig.6.7-15***). In the bottom levels of the context at TU-C1+C2 (180-230cmBS), minced pottery barely reached 4% of the sample, while in TU-C2 they yielded an 8%. Low fragmentation rates are in accordance with the character of the trench.

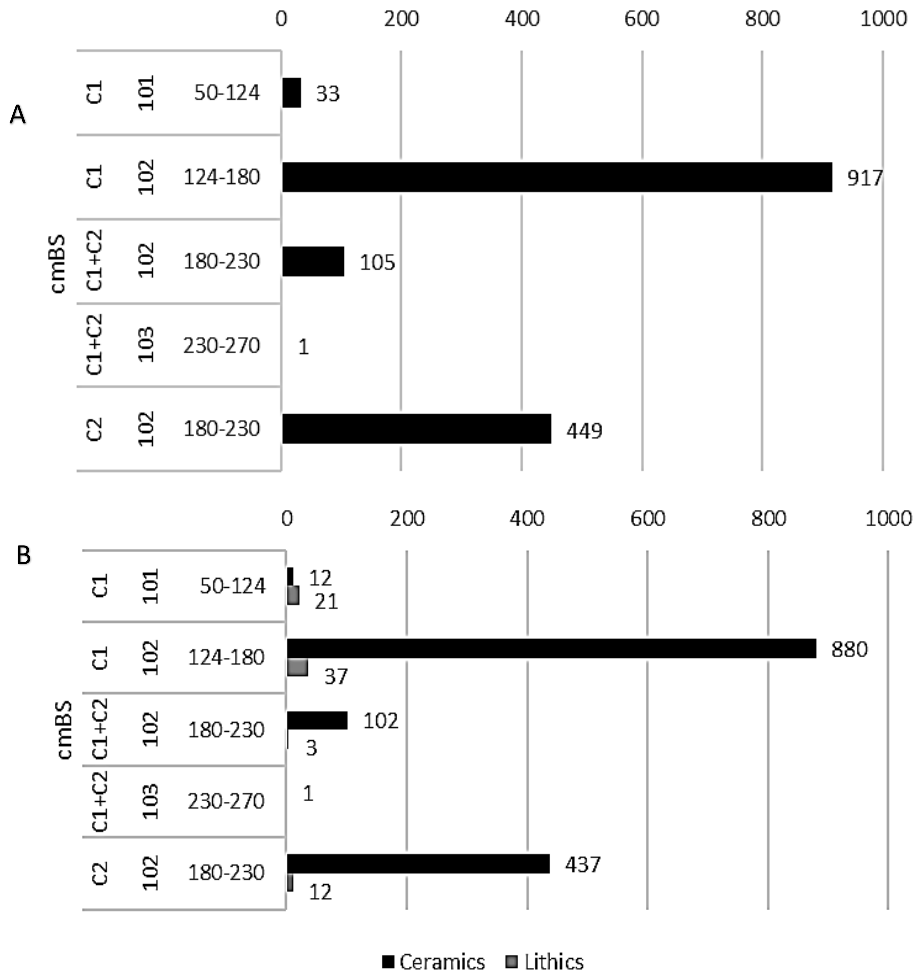


Figure 6.7-14*. Materials recovered at TU-A, registered per context (cm below surface -BS-). A) Total artefacts recovered per context, B) Total artefacts discriminated by type of material (ceramics and lithics).*

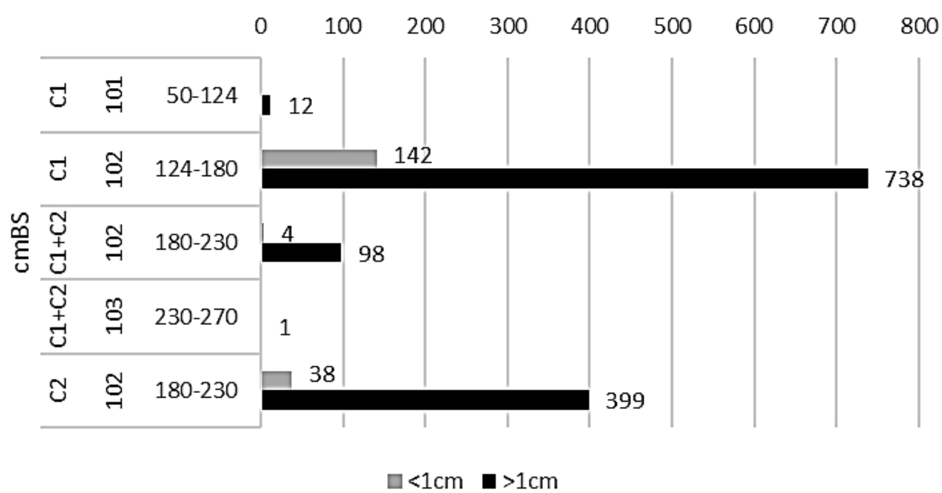


Figure 6.7-15*. Materials recovered at TU-A, registered per context (cm below surface -BS-). Total ceramic sherds per context discriminated by size (grey=<1cm² and black=>1cm²).*

Although Cx.101 and Cx.103 have very few artefacts, possibly from minor vertical movement within the trench towards both ends of Cx.102, the distribution within Cx.102 needs to be further addressed given the volume difference between the excavation sections. TU-C1, excavated between 124-180cmBS, has a volume of 0.92m^3, considering the 1x1m dimensions of Lv.6 and 7 (160-180cmBS). On the other hand, TU-C1+C2, a 2x1 unit excavated between 180-230cmBS, sampled a larger volume of 1.2m^3. Using the measure of artefacts per 1m^3, the comparison between the top and bottom of Cx.102 can be obtained using the total artefacts per 1m^3 as a standard volume.

Using the 1m^3 volume standardization, TU-C1 has eleven times more artefacts (n=996/m^3) than the bottom levels excavated in TU-C1+C2 (n=87/m^3). This same proportion difference between the two is visible in terms each type of material, with 956 and 40 projected ceramic and lithic artefacts for TU-C1 and just 85 sherds and 2 lithics for TU-C1+C2. Finally, minced pottery in each section of the trench produced a ratio of 154 sherds/m^3 for TU-C1 and 3 for TU-C1+C2. This last difference is striking, indicative of a greater fragmentation rate within the top end levels of Cx.102 (Lv.3-7), while also suggesting a lot less activity and trampling in the bottom levels of the context.

The associated radiocarbon dates to both sections of the excavation are statistically equivalent and overlap between ca.AD1300-1435. However, a date obtained from the bottom soil of Lv.9 (190-210cmBS) locates the beginning of Cx.102 between ca.AD1288-1295. The latter could suggest an earlier and minor occupation within Cx.102, with few artefacts and very rare lithics and minced pottery, which indicates a brief occupation which did not imply lot of trampling and/or transit through the area. Shortly after, a very intense occupation is inferred based on the number of artefacts and minced pottery found on TU-C1. The latter are indicative of a longer and more active period on site. Likewise, the established *in-situ* food processing area in the top levels suggest a more established habitation locus on the island from ca.AD1300-1430. The two distinct moments which appear to have taken place in TU-C will be discussed in the light of ceramic wares, production sequences and vessels forms in the next sections.

- ***6.7.4.3.1 Macro-fabrics distribution***

The distribution of macro-fabrics in TU-C was recorded by excavation section, context and arbitrary level. Minced pottery sherds (<1cm²) are registered as 'Other' (i.e. undetermined). A total of 1,432 ceramic sherds were classified into seven different macro-fabrics through the trench unit.

Cx.	Cx.	cmBS	Total	FS	C	CS	C+S	C+F	C+CP	C+WCP	Other
C1	101	116-125	12	0	2	2	5	0	3	0	0
C1	102	125-180	880	2	107	145	374	46	46	18	142
C1+C2		180-230	102	0	12	20	66	0	0	0	4
C2	102	180-230	270	0	33	33	98	25	71	2	8
C2	102/103	slumping	167	0	12	13	90	22	0	0	30
C1+C2	103	230-270	1	0	0	0	1	0	0	0	0

Cx.	Cx.	cmBS	Total	FS	C	CS	C+S	C+F	C+CP	C+WCP	Other
C1	101	116-125	100	0	16.7	16.7	41.7	0	25	0	0
C1	102	125-180	100	0.2	12.2	16.5	42.5	5.2	5.2	2.05	16.1
C1+C2		180-230	100	0	11.8	19.6	64.7	0	0	0	3.9
C2	102	180-230	100	0	12.2	12.2	36.3	9.3	26.3	0.7	3
C2	102/103	slumping	100	0	7.2	7.8	53.9	13.2	0	0	18
C1+C2	103	230-270	100	0	0	0	100	0	0	0	0

Table 6.7-9*. TU-C Macro-fabrics distribution per section and stratigraphic context, by number of sherds (top) and percentages (bottom). Rabo de Cochino site.*

The bottom context Cx.103 in the TU-C1+C2 excavation window (230-270cmBS) had only 1 Cauixí and Sand pot-sherd (0.06% of the total) from the Sponge Spicule Family (***Table 6.7-6***). This one sherd was found in a mixed context in TU-C2, were slumped material was recorded (***Fig.6.7-16***). TU-C2 ceramics represent 11.6% (n=167) of the total from the unit and contains four different macro-fabrics. The predominant fabrics within the overburden material were the Sponge and Mixed Fibre Family fabrics -Cauixí, Cauixí and Sand and Cauixí and Fibre- with 74% of the material, followed by the 'Other' with 18%, while the Coarse Sand fabric only represented 8%.

Cx.102 is divided into three different excavation sections. TU-C2 context Cx.102 (180-220cmBS) section held 18.8% (n=270) of the ceramic materials from the entire unit (***Fig.6.7-16***). In here, six macro-fabrics were recorded, five of which present sponge spicule tempering. Cauixí fabrics predominate with 84.8% of the sample while the Coarse Sand fabric, from the Granitic Family, represents 12.2%. Heavily fragmented sherds are only 3% of the sample. In here, two new macro-fabrics are introduced: Cauixí and Red Clay Pellets and Cauixí and White Clay pellets macro fabric, which together comprise 27% of the sample in this section.

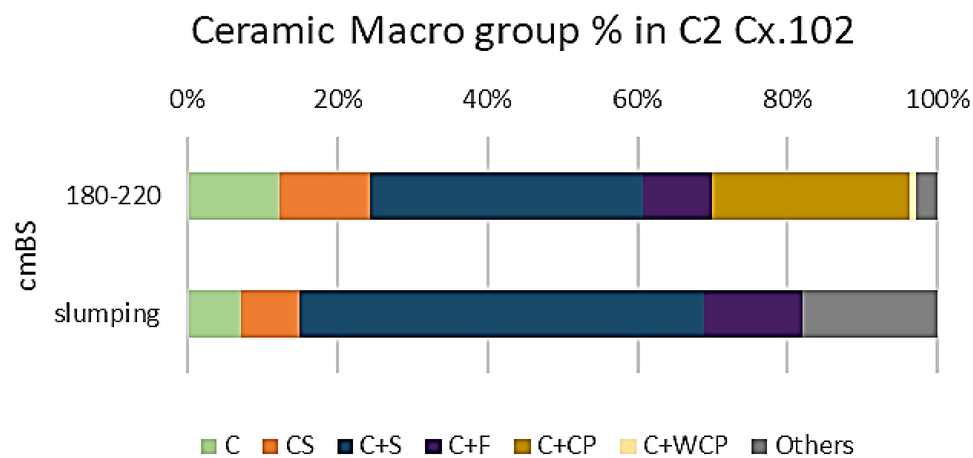


Figure 6.7-16. *Macro-fabrics percentages per arbitrary level in TU-C2. Legend: FS=Fine Sand, C=Cauixí, CS=Coarse Sand, C+S= Cauixí and Sand, C+F=Cauixí and Fibre, C+CP=Cauixí and Clay Pellets, C+WCP=Cauixí and White Clay Pellets.*

Cx.102 is also present in TU-C1+C2 (180-230cmBS), where 7% (n=102) of the materials from the unit and 8% of the sherds form Cx.102 were located. In this section, only three different macro-fabrics were registered (***Fig.6.7-17***), two of which corresponded to Sponge Spicule Family sherds -Cauixí and Cauixí and Sand- and the remaining sand-based Coarse Sand group. Cauixí-tempered fabrics represented 76% of the materials while Coarse Sand group had 20% of the total sherds. Finally, the undetermined fragments -Other- were only 4% (***Table 6.7-6***). The range of paste recipes is reduced in this section, as well as the sponge spicule tempered predominance, visible in the increasing number of Coarse Sand sherds with respect to the lower levels of this same context in TU-C2 (***Fig.6.7-16***).

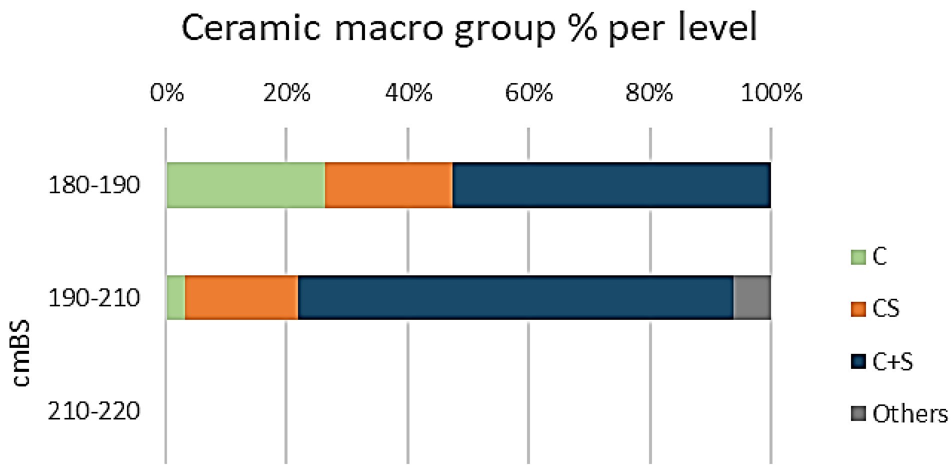


Figure 6.7-17. *Macro-fabrics percentages per arbitrary level in TU-C1+C2. Legend: FS=Fine Sand, C=Cauixí, CS=Coarse Sand, C+S= Cauixí and Sand, C+F=Cauixí and Fibre, C+CP=Cauixí and Clay Pellets, C+WCP=Cauixí and White Clay Pellets.*

Nevertheless, when analysed per arbitrary level (***Fig.6.7-17, Table 6.7-7***), ceramic sherds in TU-C1+C2 are concentrated between Lv.8 and 9 (180-210cmBS), followed by a sterile level Lv.10 (210-220cmBS). This gap is significant given that in the same depth in TU-C2 there were several materials reported (***Fig.6.7-16***). These materials comprised ceramic pot-sherds located on the western portion of the unit, towards the beach. As seen before, slump material, which had fallen from the river's bluff, was also accumulated in that area.

The presence of two additional sponge spicule-tempered fabrics -Cauixí and Fibre and Cauixí and Red Clay pellets, found only in TU-C2 between 180-220cmBS, can be interpreted as a consequence of contamination by slumping. If so, all of the materials from TU-C2 would be mixed. This is supported by the absence of these fabrics in the lower levels on TU-C1+C2, and the sterile level which extended between 210-270cmBS on the TU-C1+C2 excavation portion.

Cx.	Cx.	cmBS	Total	FS	C	CS	C+S	C+F	C+CP	C+WCP	Other
C1	101	116-125	12	0	2	2	5	0	3	0	0
C1	102	125-140	193	0	27	40	56	19	11	15	25
		140-150	101	0	25	26	32	3	13	1	1
		150-160	304	0	17	46	126	24	21	2	68
		160-170	117	2	18	9	67	0	1	0	20
		170-180	165	0	20	24	93	0	0	0	28
C1+C2	102	180-190	38	0	10	8	20	0	0	0	0
		190-210	64	0	2	12	46	0	0	0	4
		210-220	0	0	0	0	0	0	0	0	0
	103	220-230	1	0	0	0	1	0	0	0	0
C2	102	180-220	270	0	33	33	98	25	71	2	8
C2	102/103	slumping	167	0	12	13	90	22	0	0	30

Table 6.7-10. *Macro-fabrics frequencies per section and arbitrary level in TU-C. Legend: FS=Fine Sand, C=Cauixí, CS=Coarse Sand, C+S= Cauixí and Sand, C+F=Cauixí and Fibre, C+CP=Cauixí and Clay Pellets, C+WCP=Cauixí and White Clay Pellets.*

The top levels of Cx.102 (125-180cmBS) were restricted to the TU-C1 section, which concentrated 70% of the materials from this context and 61% of the total sherds from the unit. From a total of 880 ceramic sherds, 67% belong to sponge spicule-tempered fabrics, followed by Coarse Sand macro-fabric with 16.5% and the 'Other' with 16.1% (***Table 6.7-6***). The reduction of both sand-based and Cauixí-tempered sherds in this upper part of the context, in relation to the lower levels of Cx.102 in TU-C1+C2, is emphasised by the striking increase of heavily fragmented sherds, signalling an important shift in the area in the later period, possibly associated to more trampling and/or erosive process such as flooding.

When discussed by level (***Table 6.7-7***), important differences in the distribution of certain macro-fabrics within Cx.102 of TU-C1 can be recognised. As seen in ***Fig.6.7-18***, sponge spicule-tempered fabrics such as Cauixí and Fibre, Cauixí and Red Clay Pellets and Cauixí and White Clay Pellets are mostly concentrated between levels Lv.3-5 (125-160cmBS). Although these macro-fabrics are a minority, their absence in the lower levels Lv.6 and 7 (160-180cmBS) of Cx.102 in TU-C1 and Lv.8 and 9 (180-210cmBS) TU-C1+C2 reinforces the argument of TU-C2 as a mixed material section and the late appearance of these fabrics in the sequence. Also, other minority fabrics such as Fine Sand macro-fabric were only reported in level Lv. 6 (160-170cmBS).

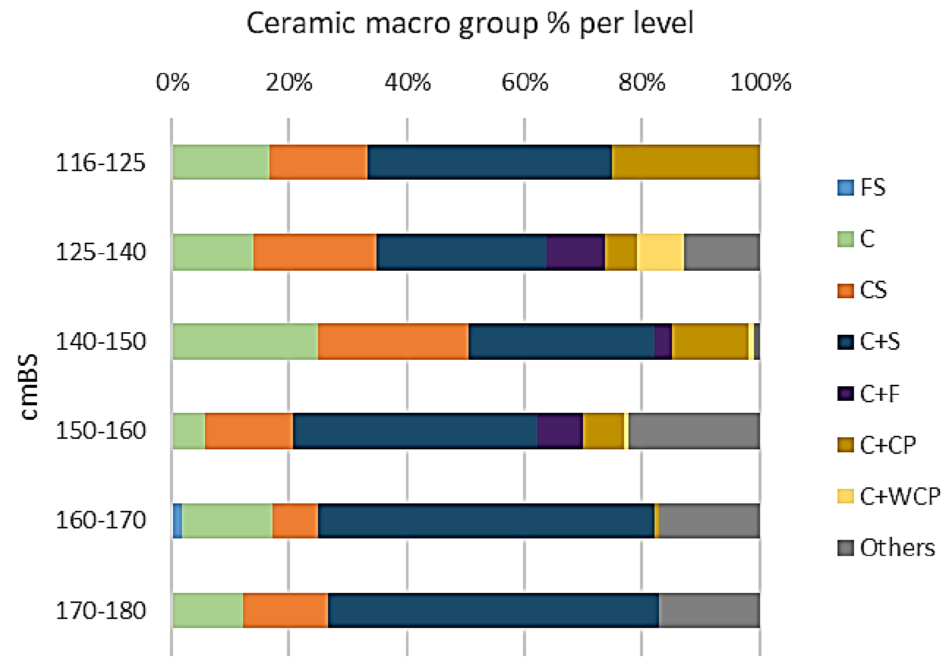


Figure 6.7-18. *Macro-fabrics percentages per arbitrary level in TU-C1. Legend: FS=Fine Sand, C=Cauixí, CS=Coarse Sand, C+S= Cauixí and Sand, C+F=Cauixí and Fibre, C+CP=Cauixí and Clay Pellets, C+WCP=Cauixí and White Clay Pellets.*

Finally, Cx.101 (116-125cmBS) of TU-C1 contains only 0.8% of the total ceramic pot-sherds registered on the trench (***Table 6.7-6, Fig.6.7-18***). These sherds were classified into four different fabrics, three of which correspond to sponge tempered pottery -Cauixí, Cauixí and Sand and Cauixí and Red Clay pellets- while only one belongs to the Coarse Sand fabric-. This context does not report any heavily fragmented sherds.

From the former analysis, the bottom levels of TU-C1 (160-180cmBS) and those in TU-C1+C2 (180-210cmBS), associated with an earlier date from Lv.9 (190-210cmBS) of AD1288-1295, show a less varied assemblage with only three macro-fabrics, two of which are tempered with sponge spicules. The predominance of sponge spicule-tempered sherds is maintained in the upper levels of TU-C1 (116-160cmBS), while new macroscopic fabrics with sponges, fibre and clay pellets diversified the assemblage and mark a more intense occupation period, shown by the increasing number of undetermined sherds (i.e. Others). These new fabrics were deposited somewhere between ca.AD1301-1441 (see ***Table 6.7-1***, Lv.3 and 5). Dates from Lv.8 (180-190cmBS), with an average range of ca.AD1300-1400, overlap these later dates and suggest this shift could have happened in a brief period of time.

6.7.5 Identifying Ancient Pottery Production Practices at Rabo de Cochino site

6.7.5.1 Geochemical Characterization of ceramic samples

A total of 71 ceramic sherds recovered at Rabo de Cochino site were subjected to X-ray fluorescence spectroscopy (pXRF) with a portable gun, to characterize their chemical composition. Using an in-house calibration method for ceramics (UCL Ceramics Cal 1) net count results for fifteen elements were obtained for each sherd. A final selection of 9 elements with an error of ≦25% (K, Fe, Ti, Nb, Rb, Sr, Zr, Co, Ga) was made to conduct further analysis.

To assess the chemical variability of the sample, a Compositional Variation Matrix (CVM) was calculated using the nine selected elements (***Table 6.7-8***). Total variance of the assemblage (*vt*=1.4153) indicates a high variability, not associated to a single production assemblage (Buxeda, Cau and Gracia,1999; Buxeda i Garrigós and Kilikoglou, 2003; Belfiore et al., 2007; Fantuzzi and Cau, 2018 p.764). A large part of the variation (*Ti*) among these samples is contributed by four elements: K (*T*i=4.4413), Ti (*Ti*=2.9586), Rb (*T*i=2.9079) and Sr (*Ti*=2.8561), while the ones with the least variation were Ga (Ti=2.4515), Fe (*Ti*=2.4107) and Nb (*Ti*=2.2767).

High K values are often associated with K-rich inclusions such as K-feldspars, K-micas (e.g. muscovite) and glauconite. Likewise, their content is usually higher when the grain size of the sediment decreases. Also, K and Rb values are positively related given that they share the same atomic and ionic properties. On the other hand, Sr is associated to K and Na feldspars, carbonates and the weathering degree. Finally, Ti is accumulated during chemical weathering, and is closely associated to Fe oxides, more common in coarser fractions (Degryse and Braekmans, 2004 p.194).

	Co	Fe	Ga	K	Nb	Rb	Sr	Ti	Zr
Co	0	0.0300	0.3157	0.4061	0.3356	0.3831	0.3485	0.4047	0.4024
Fe	0.0300	0	0.2491	0.4513	0.3102	0.3642	0.3279	0.3342	0.3439
Ga	0.3157	0.2491	0	0.7582	0.0782	0.4018	0.3208	0.0683	0.2594
K	0.4061	0.4513	0.7582	0	0.6335	0.1886	0.5432	0.9212	0.5392
Nb	0.3356	0.3102	0.0782	0.6335	0	0.3290	0.3141	0.1085	0.1676
Rb	0.3831	0.3642	0.4018	0.1886	0.3290	0	0.3667	0.5597	0.3148
Sr	0.3485	0.3279	0.3208	0.5432	0.3141	0.3667	0	0.3391	0.2958
Ti	0.4047	0.3342	0.0683	0.9212	0.1085	0.5597	0.3391	0	0.2229
Zr	0.4024	0.3439	0.2594	0.5392	0.1676	0.3148	0.2958	0.2229	0
$T_{i.}$	2.6260	2.4107	2.4515	4.4413	2.2767	2.9079	2.8561	2.9586	2.5459
vt/τ_i	0.5389	0.5871	0.5773	0.3187	0.6216	0.4867	0.4955	0.4784	0.5559
$r\ v,T$	0.4051	0.5329	0.8458	-0.0594	0.7863	-0.4845	0.9664	0.9137	0.7648
vt	***1.4153***								

Table 6.7-11*. The compositional variation matrix (CVM) calculated for Rabo de Cochino sample on the following elements: Co, Fe, Ga, K, Nb, Rb, Sr, Ti, Zr*

A bivariate scatterplot (***Fig.6.7-19***) with two of the most variable elements, K and Ti, was used to assert the clustering tendencies within Rabo de Cochino sample. Four main groups were identified. Three of the groups are within the same range of Ti concentrations (0.4-0.8), while the remaining one has a higher concentration (0.9-1.2). This last one also has a very low concentration of potassium (0-1). The three similar Ti range groups are separated according to their K values between: 1) 0 to 1; 2) 1 to 2.7; and 3) 3 to 3.5. Six outliers were also spotted on the scatterplot, four of which (RC-002, RC-009, RC-015, RC-048) are on the margins of the second Ti group (K=1 to 2.7ppm). Last two outliers, RC-065 and RC-068, exhibit the highest K (4.14015) and Ti (1.33445) concentrations on the sample, respectively.

The results of pxrf were also transformed with a log-ratio, using Nb as the divisor. The latter was chosen because it presented the highest *vt/ti* ratio (*vt*= 0.6216), which, following Aitchison (1986) and Buxeda i Garrigós (1999), corresponds to the element that least affects the total variation of the assemblage. The transformed data (***Appendix 18***) was used for Principal Component Analysis (PCA) and Hierarchical Cluster Analysis (HCA).

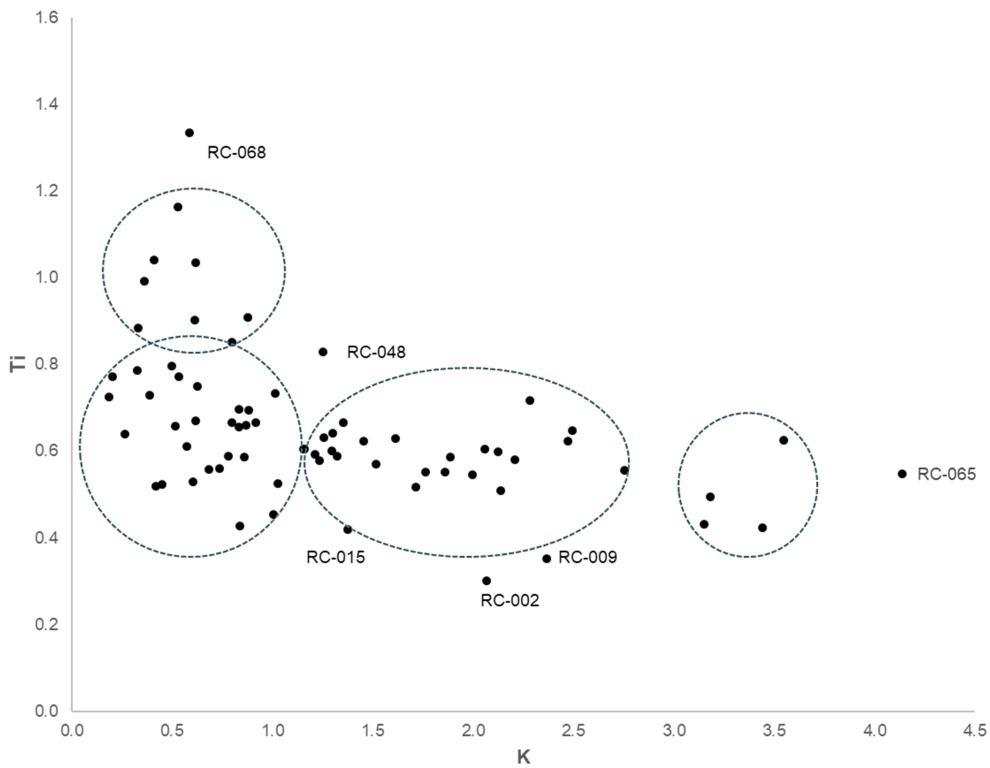


Figure 6.7-19*. Biplot using Ti and K with highlighted tendency groups.*

The PCA results display five distinct tendencies within the assemblage (***Fig.20***). Group A has five different samples on the right margin of the upper left quarter of the PCA graph, split from the rest due to its very high Nb concentrations (>0.00372). Neighbouring Group B, on the far-left margin of the upper left quarter, contains six samples, clustered together because of its high Ti values ($\bar{x}$ =0.9015) and the lowest Fe (<1.61807) and Co (<0.00080) concentrations on the assemblage.

Both Co and Nb are key elements for provenance sourcing given that they are one of the least soluble and more weathering resistant trace elements (Bhatia and Crook, 1986; Feng and Kerrich, 1990; Taylor and McLennan, 1985). Nb and Zr are associated to zircons and weathering. Nb alone is common in sedimentary sources and titaniferous minerals (Bonjour and Dabard, 1991), as well as with silica-rich inclusions (Wedepohl and Simon, 2010). Equally important, Fe values usually reflect the ferric oxides in the clay fraction, for which differences in their value might indicate distinct sources. On the other hand, Ti values are also associated to weathering and their usually higher in a coarser fraction, for which it is related with texture (Degryse and Braekmans, 2004 p.194).

Based on the former, high Nb values in Group A might be indicative of a very weathered source with silica-rich and titaniferous inclusions, while Group B high Ti values and low Fe counts might suggest a poor iron clay source with a coarser texture.

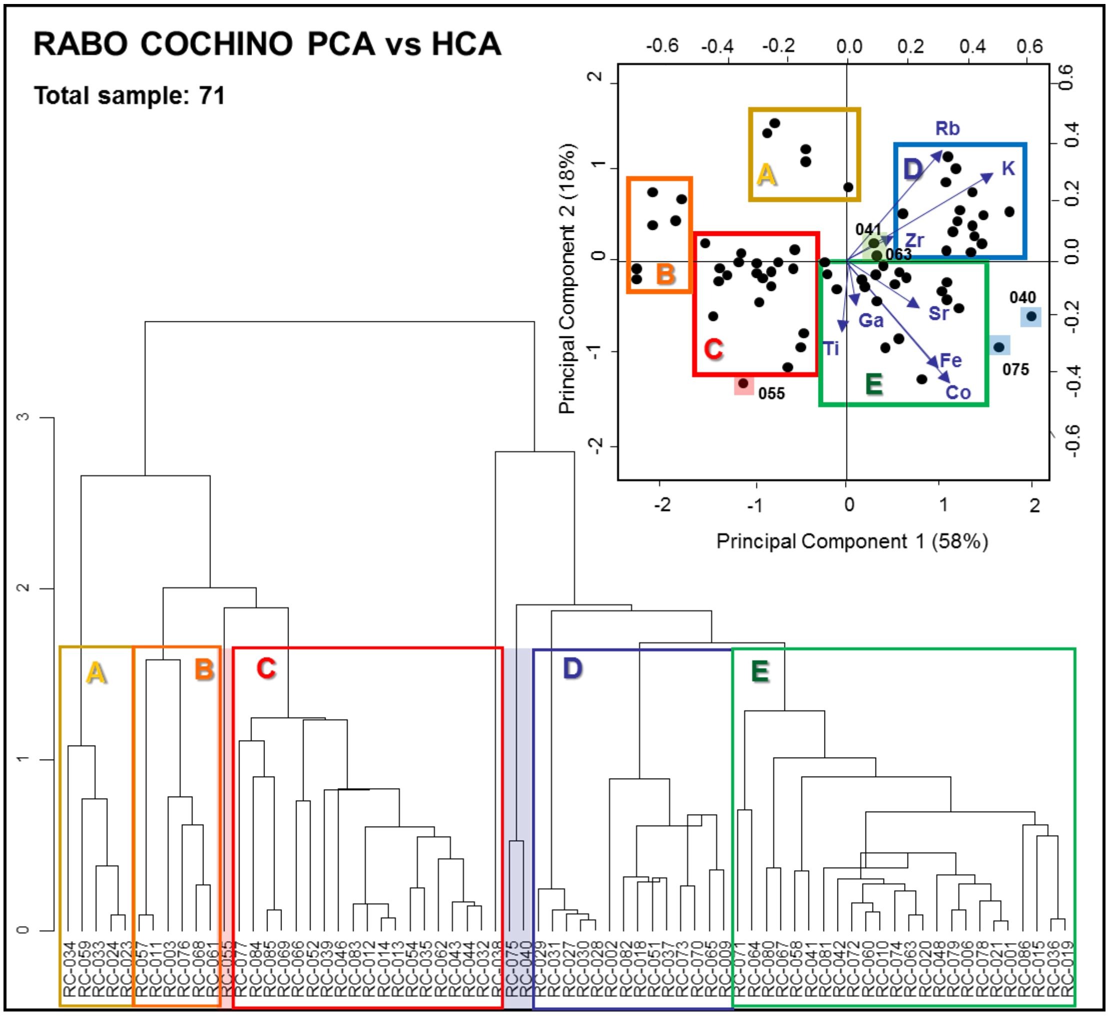


***Figure 6.7-20**. Bottom: Cluster tree of Rabo de Cochino site ceramics using the centroid agglomerative method and square Euclidian distance performed on log-ratio transformed concentrations, with Rb as divisor. Right top corner: scatter plot of a PCA analysis performed on the same transformed results, which accounts for 76% of the composition between the first two principal components..*

Group C, the second largest group in Rabo de Cochino site with 20 samples, can be distinguished from the rest based on its generally low counts, particularly in Co ($\bar{x}$=0,00156), K ($\bar{x}$=0.62689), Sr ($\bar{x}$=0.00568) and Zr ($\bar{x}$=0.02707) elements. Sample RC-055 is an outlier of this group, detached because of its higher Zr (0.04319) and Sr (0.00751) concentrations. As mentioned before, Zr and Sr are related to a heavily weathered profile. Sr is also directly linked to carbonate-rich clays while K low values are often the result of very few K feldspars or micas.

The remaining groups are located on the right half of the PCA graph. Group D, on the upper right quarter and with 17 samples, stands out from the rest of the assemblage because it has the highest concentrations of Fe ($\bar{x}$=4.86092), K ($\bar{x}$=2.44490), Rb ($\bar{x}$=0.01825) and Sr ($\bar{x}$=0.00746). It also presents very low Ti ($\bar{x}$=0.51635) values. Two outliers of this group are located close to the right margin of the graph. RC-075 and RC-040 are separated from the rest because of their higher Co ($\bar{x}$=0.00309) values. Finally, Group E, the largest group on the assemblage with 23 samples, has slightly lower concentrations than Group D in Fe ($\bar{x}$=4.41269), K ($\bar{x}$=1.11022) and Rb ($\bar{x}$=0.00895). Two samples from this group, RC-041 and RC-063, are not properly outliers, but rather slightly out of the green square frame. Higher K and Rb concentrations in these samples are usually associated to a larger number of K-feldspars and micas, while Fe high values are indicative of a ferric rich clay fraction. The larger number of feldspars is also supported by Sr high counts, in which it often substitutes for Ca and K. This last element is also related to carbonate-rich sediments and weathering processes.

From the HCA analysis (bottom of ***Fig.6.7-20***), further associations can be made between the group tendencies described on the PCA. Using the centroid agglomerative method, the dendrogram organizes samples according to the similarity of their centroids, which correspond to the average of all pairs from different clusters. Two main branches are visible in the HCA cluster-tree: 1) with Groups A, B and C and 2) with Groups D and E.

Groups A, B and C associations are supported by their shared low counts of Co, Sr and Zr. Both Co and Zr are used for provenance studies given that they are resistant elements, least soluble and relatively immobile. Their low counts might be the product of a fine weathered clay fraction. Sr low concentrations can be associated to either rich-carbonate sediments and/or few feldspars inclusions. Group A, splits from the other two because of its higher Zr and Nb concentrations along with lower Ti values. As explained before, higher Zr and Nb values can account for the presence of zircons and a greater weathering degree, whereas low Ti values can be the product of a finer grain size. On the other hand, high Nb concentrations are also potentially associated to silica-rich inclusions. Based on the former differences, Group A is likely to have silica rich inclusions in a fine and more weathered clay fraction than the one reported for Group B and C. Different weathering stages can be found in a single clay source, for which the former seems to be a subtle difference between the groups, whereas the presence or frequency of certain inclusions will need to be evaluated with a petrographic analysis. Meanwhile, Groups B and C separate from each other because of slight differences in Ti and Fe concentrations. Although higher Ti concentrations are likely linked to a somewhat coarser fraction, Group C´s high Fe values are indicative of more ferric oxides.

Second branch Groups D and E are closely associated because they share the highest counts of Fe, K and Rb in the assemblage, and are separated from each other due to the higher Fe, K and Sr values reported on samples from Group D. K, Rb and Sr values are all related to the presence of K-feldspars inclusions, for which a petrographic analysis of both groups should confirm their occurrence and higher frequency, particularly in Group D. Sr values are also linked to more carbonates and weathering. On the other hand, Fe higher values, related to ferric oxides in the clay fraction, can also be accounted on the petrographic analysis by checking the red colour of the base clay.

<u>6.7.5.2 Petrographic analysis vs Geochemical data</u>

To confirm certain observations from the PCA and HCA analysis, a petrographic study of 63 ceramic sherds from Rabo de Cochino site was performed. The analysed pot-sherds were among the chemically assessed samples using a portable X-Ray fluorescence spectrometer. Results confirm differences in terms of texture and mineralogy, as well as frequency of certain type of inclusions (see ***Appendix 2*** for detailed descriptions of each petro-fabric). ***Fig.6.7-21***, a PCA graph with all of the eleven petrographic fabrics reported for the site, does not seem to convey a strong pattern associated to any of the previously defined geochemical groups. Nevertheless, when viewed in terms of main components, some key associations can be made between the two.

Group A samples all have sponge spicules. Most of the samples belong to the Mixed Fibre Family, and only one belongs to the Mixed Sponge Family. Both fibre and sponge spicules are silica-rich inclusions, which can account for the unusually high Nb values reported in this group. No zircons were spotted. Few quartz present on this group were rounded and fine to medium-coarse sand in size (<0.3-0.1mm).

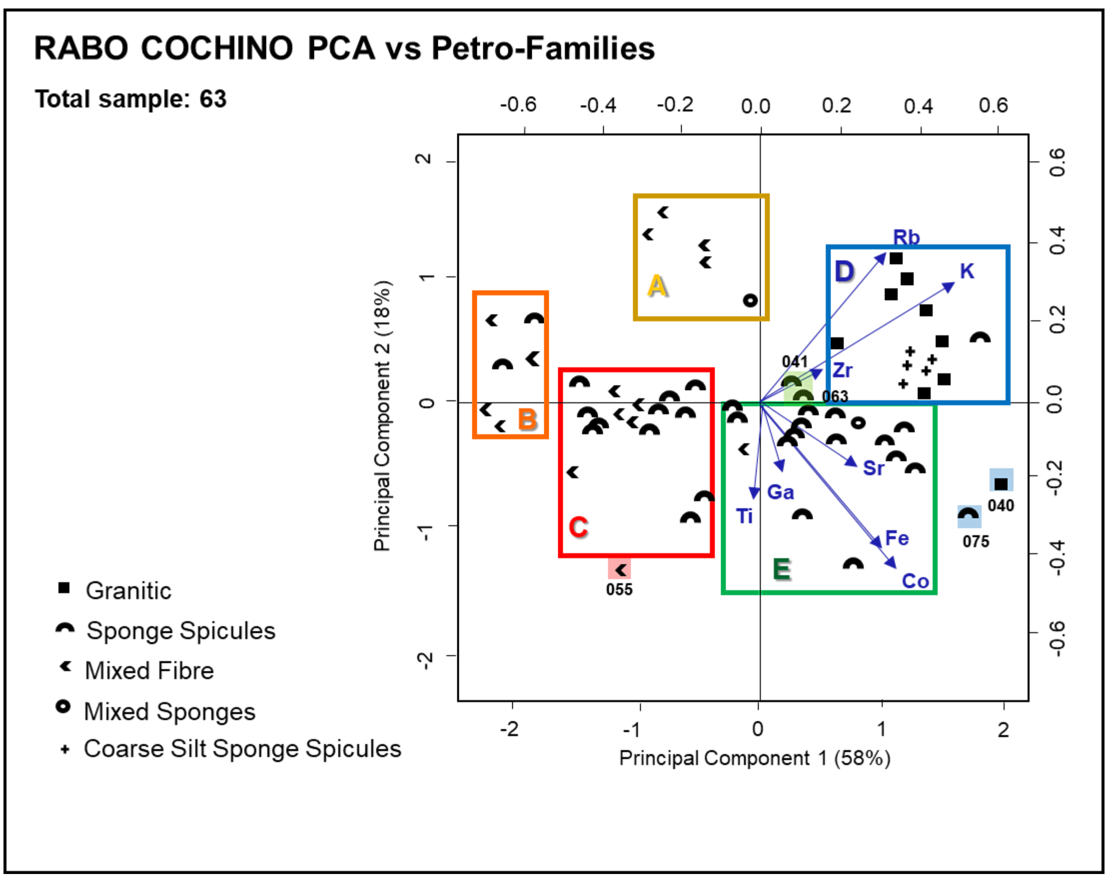


Figure 6.7-21. *Scatter plot of PCA analysis performed on log-transformed results from Rabo de Cochino site. Petrographic families are depicted vs different geochemical groups, highlighted with different colours.*

Group B and C samples were also all tempered with sponge spicules. As with Group A, 66% (n=4) of the samples from Group B contained bark as the predominant temper while 33% (n=2) only contained cauixí. This trend is slightly overturned in Group C, where from the 17 petrographically analysed samples, just 35% (n=6) have predominantly bark inclusions while 65% (n=11) have only sponge spicules.

Group B samples do present coarser mineral inclusions than the ones from Group A and C. These are mostly medium sand-sized round quartz and very few sub-rounded microcline feldspars and biotite micas. The latter represents only 5-10% of the paste, surpassed by elongated charred and un-charred bark and fibre inclusions, which constitute between 15-20% (***Fig.6.7-22***). The roundness of the aplastic inclusions suggest erosion and transport from the source of origin, supported by the scarcity of feldspars and micas. These characteristics agree with a sedimentary clay source, derived from a medium to fine grained igneous rock of acidic composition, possibly micro-granite.

On the other hand, Group E, with a total of 19 petrographically analysed samples, have a striking majority of sponge spicule-tempered sherds, which represent 90% (n=17) of the group. The remaining samples from the Mixed Sponge Family also present spicules along secondary inclusions, such as granitic grog (5%, n=1) or tree bark (5%, n=1). The few mineral inclusions present in these samples correspond to sub-rounded quartz and microcline feldspars, which constitute ca.10% of the matrix. Their grain sizes fluctuate between very fine sand to coarse-silt (0.05-0.1mm), with two noteworthy exceptions (RC-021 and RC-001) in which the rounded quartz particles and very rare microcline feldspars reached a medium-coarse sand size (0.2-0.4mm).

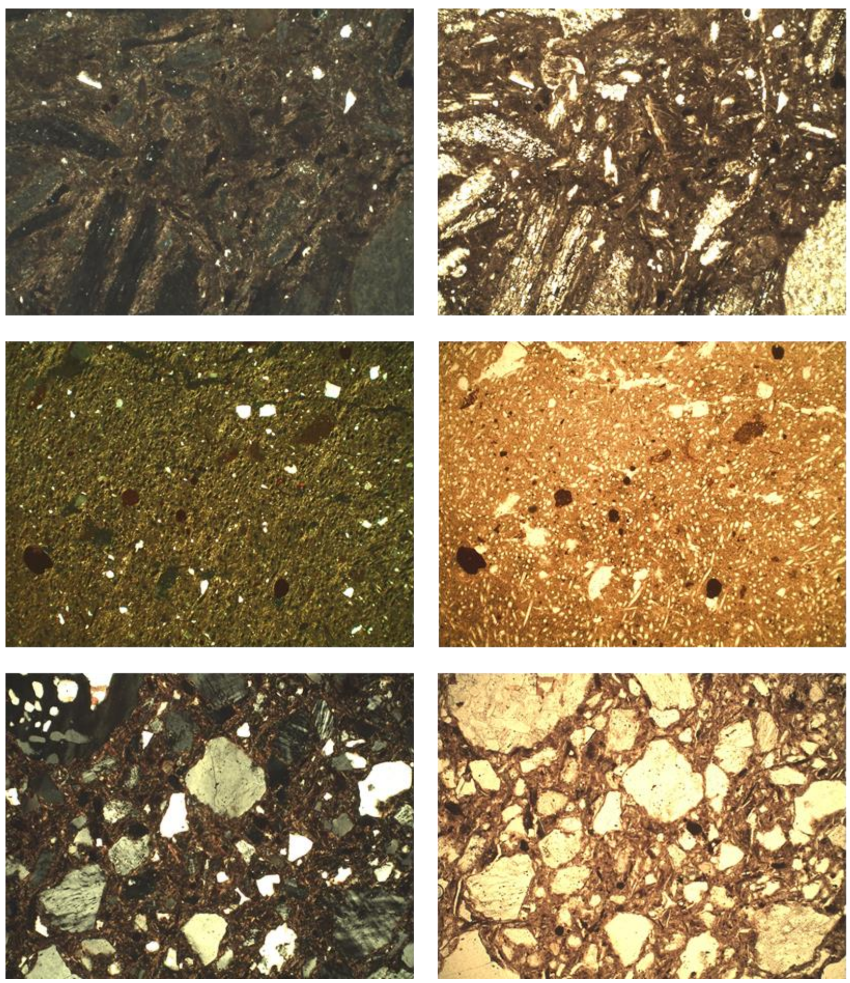
Unlike the samples from the previous groups, pot-sherds belonging to Group E had a striking majority of sponge spicule inclusions, which constituted more than 40% of the matrix (***Fig.6.7-22***). The former is not reflected in higher Nb counts. From these results, it is fair to suggest that the Nb values are more closely associated with silica-rich fibre and bark temper inclusions, rather than with silica-rich minerals such as quartz or structures such as sponge spicules.

The common appearance of K-feldspars among these samples is congruent with the higher K, Rb and Sr values reported for Group E. However, their numbers are still pretty low, which added to the roundness of this inclusions, suggest a weathered and transported clay, perhaps rich in carbonates, as expected from higher Sr values. Common very fine to coarse-silt sized sub-round quartz and microcline feldspars conform to the description of an alluvial silty clay source, possibly derived from a highly weathered granitic parent rock. Alluvial deposits are common on the island and in the adjacent river banks of the Orinoco (***Fig.3-1).***

The final Group D, with 16 thin-sectioned potsherds for petrographic analysis, has a majority of samples belonging to the Granitic Family, with 56% (n=9), followed by Coarse Silt with Sponges with 31% (n=5) and Sponge Spicule tempered samples with 12% (n=2). Granitic samples are so denominated because of their coarse and medium-grained (0.3-1mm) poorly sorted angular mineral inclusions, mostly quartz, microcline and microcline perthite, as well as biotite micas (***Fig.22***). Frequent K-feldspars are responsible for higher K and Rb counts, while the bright red colour of its matrix agrees with higher Fe concentrations. Coarse Silt samples exhibited the same aplastic inclusions but with a coarse-silt size (0.03-0.04mm) and rounder shapes. The latter also included very rare elongated sponge spicule inclusions, which appeared in less than 3% of the matrix, for which they are considered as naturally occurring inclusions. Sponge spicule tempered samples included in this group (RC-065 and RC-075) where plotted here due to their higher Fe values.

Quartz, microcline feldspars and biotite mineral inclusions are common in both Granitic and Coarse Silt samples. This composition corresponds with an acid igneous rock. Coarse-grained and poorly sorted samples are most likely derived from a granitic rock, while silt-sized sub-rounded inclusions are probably derived from a micro-granite parent rock. While the coarser mineral inclusions in Granitic samples have a pronounced angularity, which suggest a residual clay source, the roundness and size of the latter are more likely the product of a more weathered and transported clay, possibly alluvial in origin.

Based on the former results, HCA and PCA analysis reflect two main differences between the two cluster-tree branches: texture and type of aplastic composition. Groups A, B and C, from the first branch, have very fine to fine grained samples, with abundant silica-rich inclusions such as quartz, fibre and sponge spicules, but poor in K-feldspars and micas. The angularity, scarcity and size of these inclusions suggest an alluvial weathered clay source derived from a micro-granite parent rock.



B

E

D

Figure 6.7-22. *Micro photographs of Rabo de Cochino samples from groups B, E and D, in cross-polar (XP) (left) and plane polarizing light (PPL) (right). Image width: 3mm. Microphotographs taken by Natalia Lozada, 2017.*

Second branch comprised samples from Group E and D. Group E pot-sherds are very similar to the groups on the first branch, mostly tempered with sponge spicules, except from the more common presence of K-feldspars and a slightly coarser grain size, which suggest a less weathered source. Nonetheless, high K values and low Nb counts were the ones responsible for its closer association to Group D. Low Nb counts are most likely due to very few to none fibre inclusions, as higher K-values are associated to more K-feldspar and micas. As confirmed by the petrographic analysis, Group D and E had very few samples with fibre temper, as well as coarser and more frequent feldspars.

Despite Group E and D association on their similar composition, Group D is clearly different from the others. Its coarseness, angularity and poorly sorted minerals are diagnostic of a residual clay source, most likely derived from a granitic parent rock. This clay was not as weathered as the one from the first groups, probably obtained from a pit closer to the parent rock.

Sedimentary and alluvial clay deposits could be found on the island and in the river banks, subjected to constant erosion from the stream. Less weathered and perhaps more recent alluvial sediments might be located further inland, transported not as far from the rock parent source. Finally, residual clay deposits are most likely found ca.5km inland on the western bank, closer to where the Parguaza Granite Formation is located.

According to the former analysis, at least three different clay sources could be identified in Rabo de Cochino site. Tempered and not tempered sources were separated by the HCA analysis, where the coarseness and ubiquitous relative presence of K-feldspars and silica rich inclusions such as fibre were determinant to further divide the clusters. While sponges and fibre are associated to two sedimentary sources with different weathering degrees, the remaining residual source shows the largest amounts of K-feldspars and micas and no signs of tempering. All sources are found in relatively close proximity to the site, from which it could be said the potter used local sources.

In terms of their vertical distribution, all units and levels present all clay groups except for Group A samples (RC-023, 024,033, 034, 059), which only occurs in the upper levels of TU-A and TU-C1, even though this could be the result of sample bias. All other groups appear in both excavation units and all levels, for which they do not seem to have a chronologically sensitive value. Otherwise, in all levels through both excavations units there are both sedimentary-tempered and residual clay sources.

6.7.5.3 Paste preparation and Processing:

All ceramic pot-sherds excavated at Rabo de Cochino site were analysed in situ and classified according to their paste attributes (type of inclusion, grain size and colour). From this initial evaluation, seven macroscopic fabrics were identified. To confirm and further evaluate the observations made on the site, 78 sherds were sampled for petrographic analysis. The analysed sample comprised sherds from trench units A (n=38, all contexts), B (n=6, western profile) and C (n=27, Cx.102), as well as from the beach surface collection (n=7).

Petrographic analysis was employed to confirm the reliability of the initial classification of macro-fabrics, to determine the natural or added (i.e. temper) character of the observed inclusions and to reconstruct other manufacturing stages after the paste preparation, such as forming and firing techniques. As a result of the paste preparation study, ten different petrographic fabrics were identified at Rabo de Cochino site (***Fig.6.7-23,*** inner ring), grouped under four different petrographic families (***Fig.6.7-23,*** outer ring).

The main family in the site is the Sponge Spicule Family (47%, n=37), which encompasses the Sponge Spicules Fabric (the largest fabric on site [31%, n=24]), along with the less numerous Coarse Sand Sponge Spicules Fabric (6%, n=5) and the Sponge Spicules with argillaceous inclusions Fabric (10%, n=8). The second largest family is disputed between the Mixed Fibre Family, with 21% (n=16) of the samples and the Granitic Family, with 20% (n=16). The Mixed Fibre Family includes the smaller Fibre and Sponge Spicules Fabric (4%, n=3) and

Fibre, Charcoal and Sponge Spicules Fabric (4%, n=3), as well as the larger Tree Bark and Sponge Spicules Fabric (13%, n=10). Granitic Family has the second largest single fabric on site, the Granitic Fabric (15%, n=12), and the minority Weathered Granitic Fabric (5%, n=4). The last one is the Mixed Sponges Family, with two minority fabrics, which only comprises 4% of the samples (n=3). The Coarse Silt Fabric (8%, n=6) is not included in a particular family since it comprise samples of non-fired clay lumps found in site.

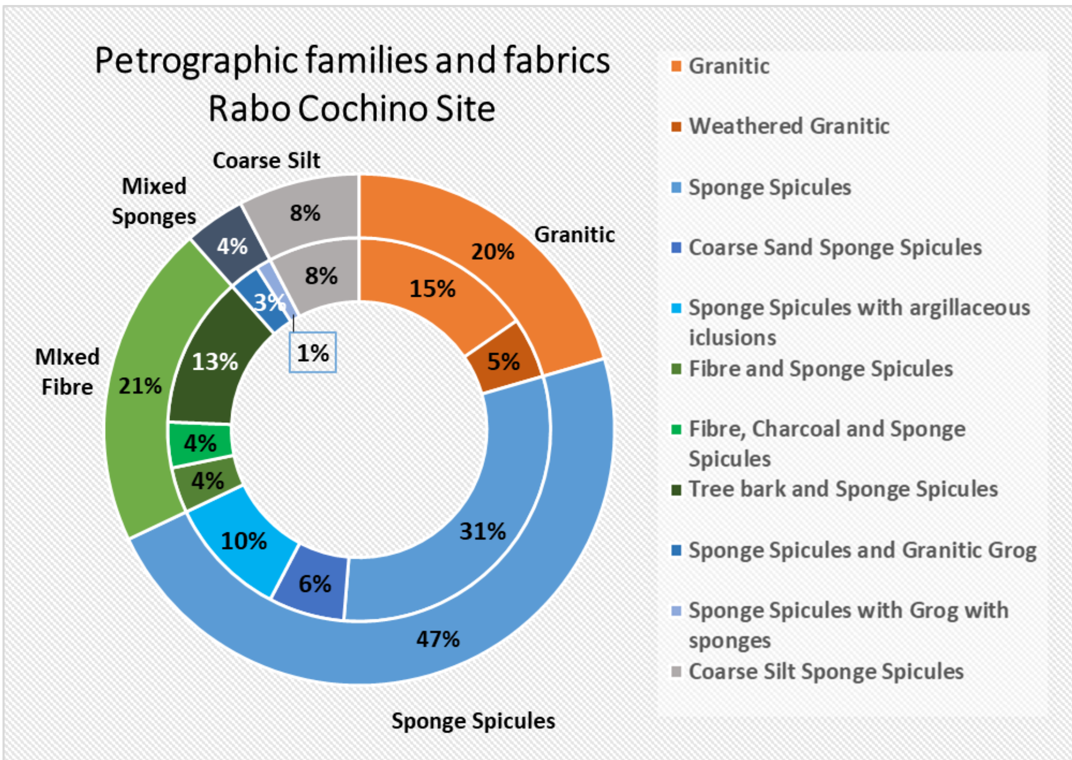


Figure 6.7-23. *Petrographic fabrics and families recovered at Rabo de Cochino archaeological site (n=78).*

The Sponge spicule temper is present in all petro-families except for the Granitic Family. This translates into 72% (n=56) of the samples, for which it could be identified as the main temper used at this site. Arguments for sponge spicule tempering have been discussed before, based on the uneven distribution of the spicules in the clay matrix and the formation of sponge clumps. Both traits, used to argue poor mixing techniques, were found in samples at Rabo de Cochino (***Fig.6.7-24***). Likewise, areas with accumulation of sponges in the form of rounded clusters are also observable.

Additional evidence for tempering can be found on the Sponge Spicules with argillaceous inclusions Fabric. While sponge spicule proportions in this fabric are similar to the ones present in the other members of the Sponge Spicule Family, the common presence of clay pellets in the matrix (10%) suggest a more deficient paste preparation procedure (***Fig.6.7-25***). The formation of the pellets can be the result of poor hydration of the paste.

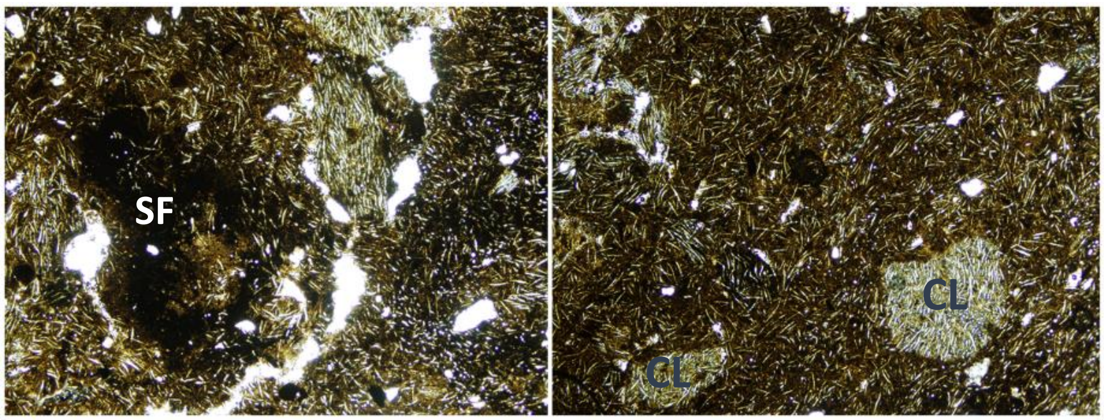


Figure 6.7-24. *Rabo de Cochino Sponge Spicule Fabric microphotographs with base clay 'spicule-free' (SF) areas and clay lumps (CL). PPL images of RC-044 from TU-A Cx.103 (Lv.10). Image length: 3mm. Microphotographs taken by Natalia Lozada, 2017.*

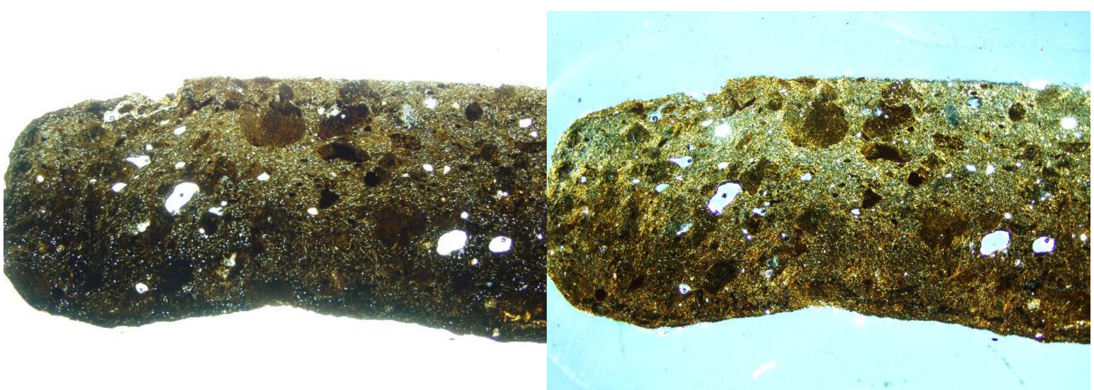


Figure 6.7-25*. PPL (left) and XP (right) microphotograph of sample RC-019 (TU-C1 Cx.102) of the Sponge Spicule with poorly hydrated clay lumps Fabric. Image length: 6mm.Microphotographs taken by Natalia Lozada, 2017.*

From the total of sponge spicule-tempered sherds, a significant 28% (n=16) used another dominant temper such as tree bark or fibre. These sherds can be found on the Mixed Fibre Family, where fibre (i.e. plant vessels), charcoal, and charred and un-charred tree barks were used in larger proportions. Both 'Fibre and Sponge Spicule Fabric' (n=3) and 'Fibre, Charcoal and Sponge Spicule Fabric' (n=2) (***Fig.6.7-26***) are very rare in the Rabo de Cochino sample, each representing less than 4%. The charcoal inclusions in one of the former fabrics are very rare, appearing in 3-5% of the matrix. The carbonization process is thought to have occurred before they were added to the clay paste.

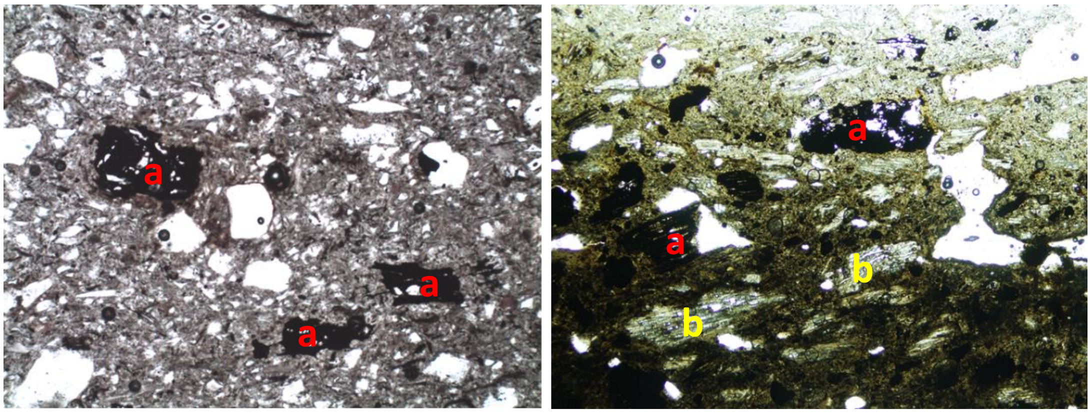


Figure 6.7-24. *Fibre, Charcoal and Sponge Spicule fabric samples. a) Charcoal and b) Un-charred tree bark inclusions. Left : PPL microphotograph RC-034, TU-C1 Cx.102. Right : PPL microphotograph RC-012, TU-B profile Cx.103. Image length: 3mm.*

On the other hand, Tree Bark and Sponge Spicule Fabric (n=11) is the third most frequent single fabric on the sample. Its main difference with respect to the other Mixed Fibre Family member is the clear predominance of tree bark and wood inclusions, which were identified from their remaining anatomical structures (***Fig.6.7-27***). Tree bark inclusions found on the samples are found both charred and un-charred. Different sizes between them suggest they were sieved through different meshes before adding them to the clay paste.

All the samples from the Tree Bark and Sponge Spicules fabric also exhibit poorly hydrated clay pellets, probably formed during the mixing of the paste and the addition of the tree bark as temper (***Fig.6.7-28***). The pellets contained very rare coarse silt-sized rounded quartz (1%) and sponge spicules (2%). The latter were almost absent (<1%) from the rest of the clay paste, where tree bark dominates along with fine sand-sized, sub-rounded quartz and feldspars. From this distribution it can be suggested that sponge spicules were perhaps naturally occurring in the clay paste, based on their very low frequencies and the absence of gemmules.

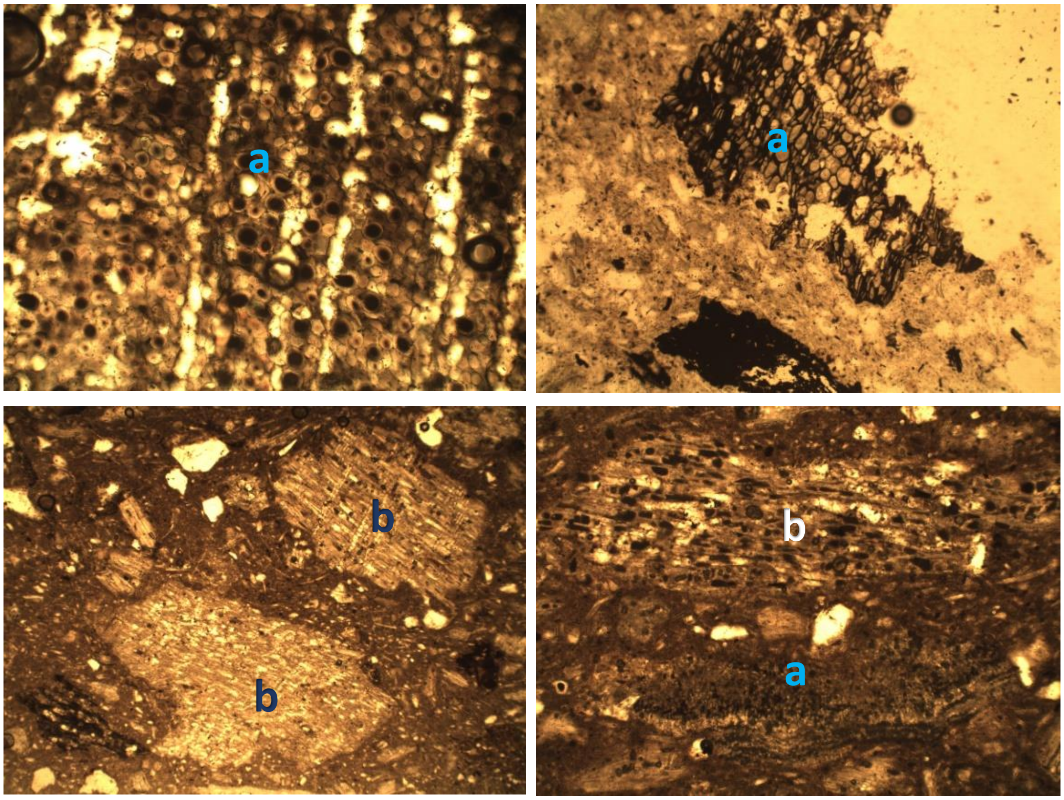


Figure 6.7-25. *Tree bark (a) and wood (b) inclusions in Rabo de Cochino samples. Top left: PPL microphotographs of a non-charred tree bark in RC-057 (TU-A Cx.103 Lv.15). Image length: 0.7mm. Upper right: Charred tree bark in RC-054 (TU-A Cx.103 Lv.15). Image length: 0.7mm. Bottom PPL microphotographs of RC-049 (TU-A Cx.103 Lv.15). Bottom Left: Non-charred wood inclusions (tangential cuts). Image length: 3mm. Bottom right: Non-charred wood and tree bark. Image length: 1.5mm. Taken by N. Lozada, 2017*

A similar composition was reported in the Coarse Silt with Sponge Spicule Fabric, which comprises the hardened clay lumps (e.g. *topia*) found on Feature-1 at TU-A (Cx.106). In this fabric, the scarcity of sponge spicules serves as additional evidence to argue tempering on pot-sherds. While hardened un-shaped clay lumps only had less than 2% of spicules in its matrix, these last ones constituted between 30-40% of the inclusions in Sponge Spicule Family's ceramic fragments.

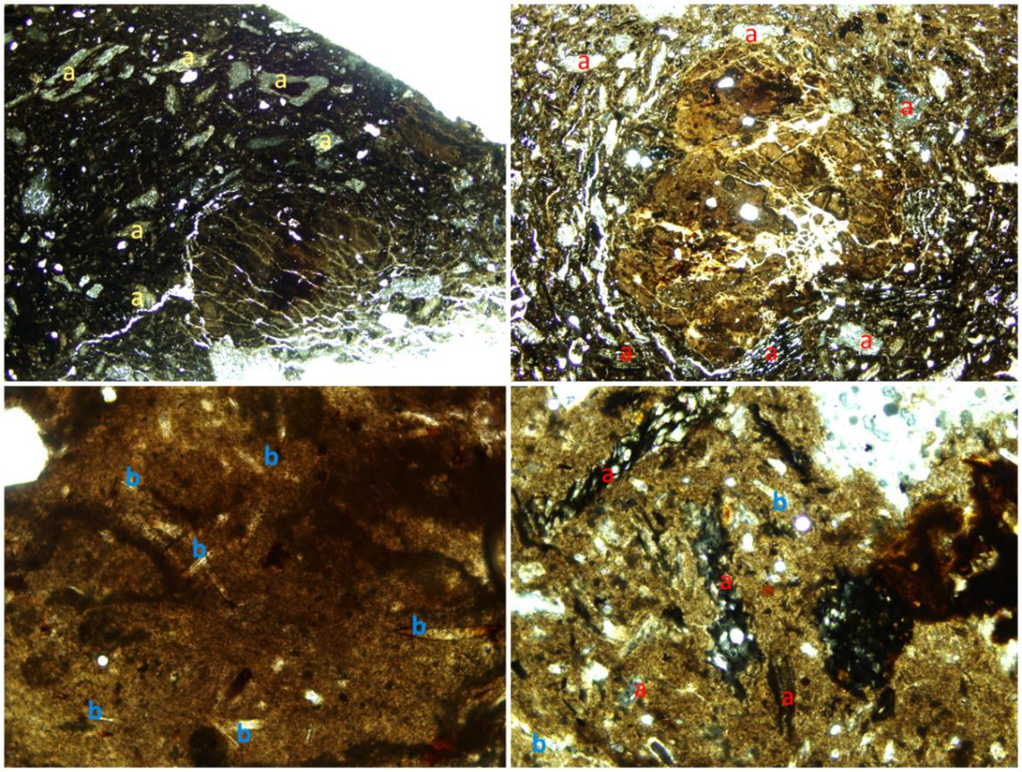


Figure 6.7-26. *Tree Bark (a) and Sponge Spicules (b) Fabric, RC-057 sample (TU-A, Cx.103, Lv.15). Top: PPL (left) and XP (right) microphotographs depicting a clay pellet surrounded by un-charred tree bark inclusions. Image length: 6mm. Bottom left: PPL microphotograph of the inside of the clay lump with sponge spicules. Bottom right: PPL microphotograph of the base clay. Image length: 0.8mm. N. Lozada, 2017.*

The Granitic Fabric is the second most frequent fabric in the sample; it is mainly composed of coarse and medium coarse sub-angular quartz (15-20%) and microcline perthite (***Fig.6.7-29***).The Weathered granitic Fabric presents similar proportion while showing altered microcline feldspars and myrmekite inclusions.

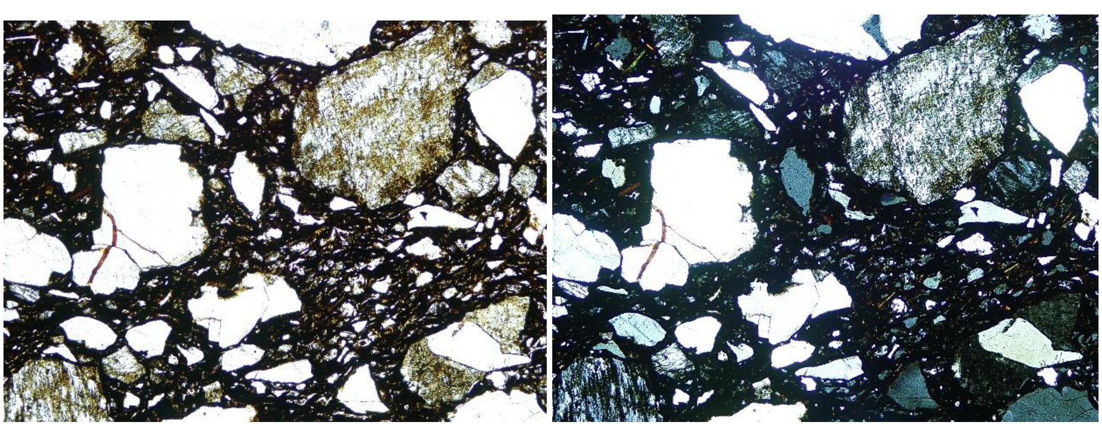


Figure 6.7-27. *Granitic sample RC-058 (TU-C1 Cx.102 Lv.14) from Rabo de Cochino site. PPL (left) and XP (right) microphotographs of RC-058. Image length: 3mm. Taken by N. Lozada. 2017*

Finally, minority fabrics from the Mixed Sponge Spicule Family present different types of grog inclusions (***Fig.6.7-30***). Two samples (RC-005 and RC-072) were Granitic-tempered Grog while just one sample (RC-059) was Sponge Spicule tempered. RC-059 and RC-072 were both found on TU-C1, Cx.102.

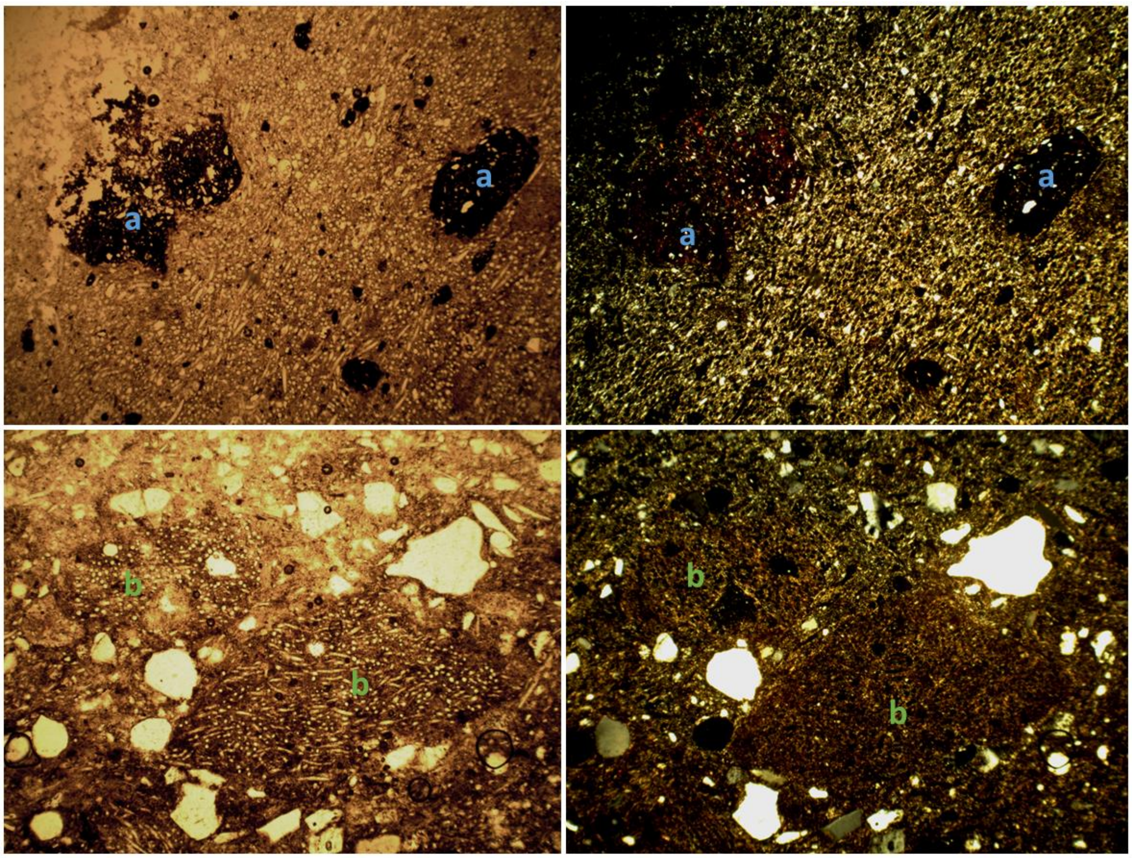


Figure 6.7-28. *PPL (left) and XP (right) microphotographs of Grog tempered samples from Rabo de Cochino site. Top: Sponge Spicule with granitic grog Fabric (RC-072, TU-C1, Cx.102). Bottom: Sponge Spicule with sponge grog Fabric (RC-059, TU-C1, Cx.102). Image length: 3mm.*

Sponge Spicule-tempered Grog, found on a sample from TU-C Cx.102, had a medium-coarse size (0.2-0.4mm), and there were very few across the section. Keeping in mind it was only reported in one sample, the intentional incorporation of the Sponge Spicule Grog to the paste is still debatable. Conversely, Granitic Grog inclusions were common (15-20%) and unevenly distributed though the thin sections. There are only two samples (2.5%) on site, suggesting that this recipe can be thought of as idiosyncratic grog-tempering was not a common practice in the site, and it was not limited to the same paste recipes with a similar base paste.

None of the identified petrographic families at Rabo de Cochino presented a restricted vertical distribution except for the grog-tempered sherds from the Mixed Sponges Family. These were recovered from the top levels of Cx.102 in each trench. As mentioned before, this last group does not seem to reflect a common paste recipe on site.

6.7.5.4 Fashioning

- ***6.7.5.4.1 Roughing Out***

Coiling and modelling were both identified as roughing-out techniques in Rabo de Cochino. From the 104 ceramic fragments analysed, 88% (n=92) were shaped using coils and 6% (n=6) were made with modelling, leaving and additional 6% as indeterminable. Both techniques were identified through macro-trace analysis based on the combined observations of the profile, radial section, type of fracture and topography of each fragment (for details, see ***Appendix 11****).* Petrographic analysis was also use as an independent method to identify forming techniques by observing the orientation and distribution of the inclusions.

From the macro-trace analysis, the coiling technique was recognized from the undulations on the surface, the chaotic orientation of its inclusions on the radial section, the equidistant cracks and empty spaces, and the type of fracture. Modelling, on the other hand, could be identified from the parallel-oriented inclusions and absence of empty spaces on the radial section, as well as lack of equidistant cracks.

Potsherds showing the coiling technique vary in the type of junction and placement. Coiling by ‘drawing’ (i.e. é*tirement)* was the preferred junction type, present in 97% (n=89) of the sherds, while coiling by ‘pinching’ (i.e. *pincement*) was only found in the remaining 3% (n=3). In terms of placement types, most of the sherds were placed in a ‘bevelled’ form, from ‘inside to outside’, while very few fragments corresponding to bases follow a ‘spiral’ form. In contrast, ceramic fragments from the deepest levels of TU-A (Lv.12-16 [165-215cmBS]) present ‘straight’ coils (***Fig.6.7-31***).

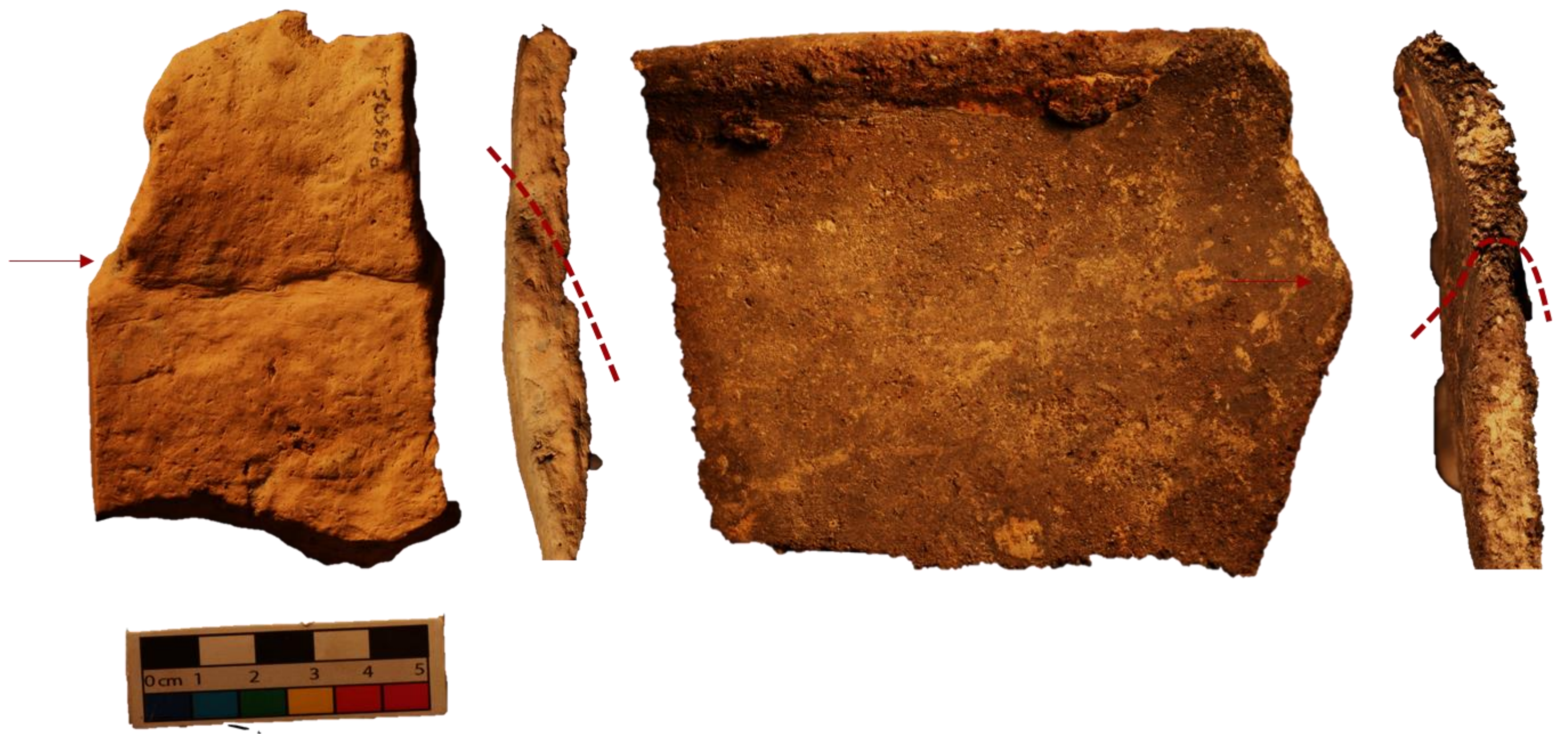


Figure 6.7-29. *Coiling by drawing with a pronounced bevelled inclination in a Sponge Spicule sherd (left, FS-505806). Coil junction is still visible inside the sherd. Granitic Family sherd (right, FS-505801) with coiling on a straight placement and joint by pinching.*

Modelled potsherds correspond only to roller stamps recovered from TU-A (Lv.3-5 [45-75cmBS], 8-9 [105-125cmBS]), all of which belong to the Sponge Spicule Family (***Fig.6.7-32***). Coils joined by 'pinching' all belong to the Mixed Fibre family fabrics found in TU-C (Lv.3-8 [125-190cmBS]), while coils joined by 'drawing' are present in all petrographic families and scattered throughout the site.

The petrographic analysis of ceramic thin sections also reveals coiling as the preferred roughing-out technique present in all petrographic families in Rabo de Cochino. As seen in ***Fig.6.7-33,*** coils were identified by the concentric circular orientation of coarse mineral and tree bark inclusions, as well as for the orientation of numerous spicules. The last ones are only useful for this type of analysis when the sponge runs parallel to the thin-section cut, in which case the orientation of their elongated bodies helps to follow the direction of the coil. However, most of the sponge spicule-tempered ceramics only displayed the spicules perpendicular to the cut, showing the circular tip of the spicule and no orientation. In such cases, the lack of orientation, added to the few and/or very fine-grained quartz, made it more difficult to reconstruct their forming technique.

Figure 6.7-30. *Roller stamps from Rabo de Cochino site, TU-A from the Sponge Spicule Family. All were made using the modelling technique.*

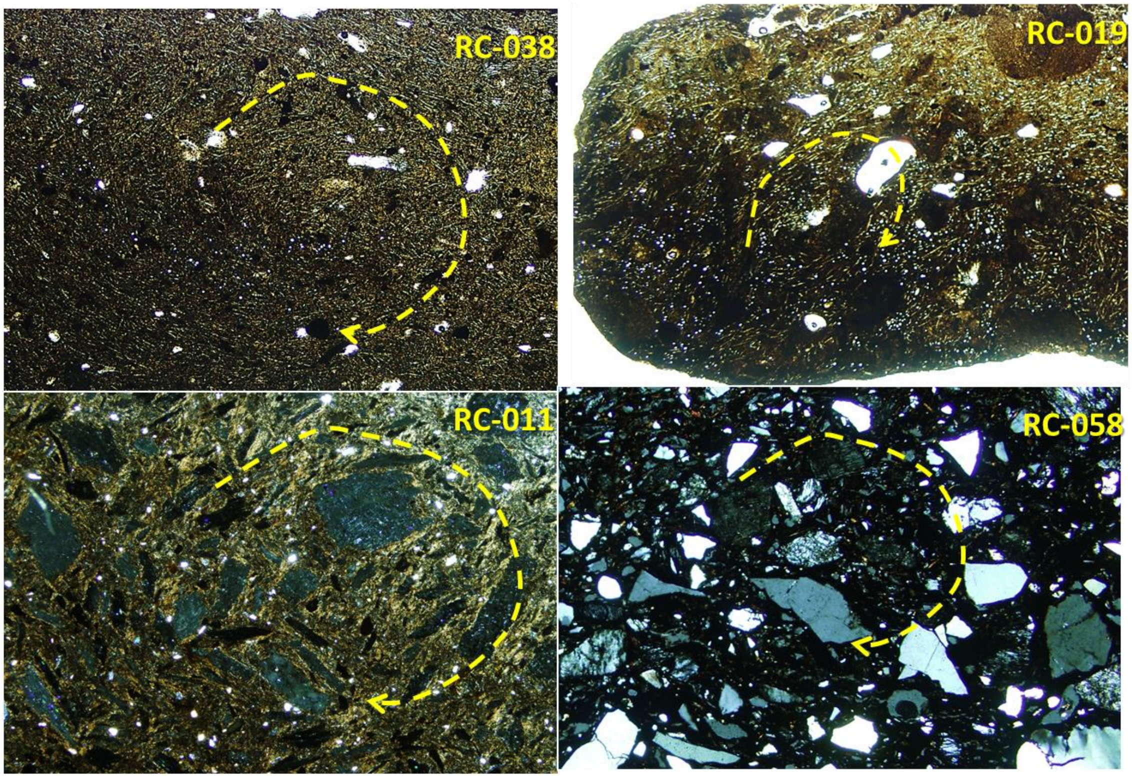


Figure 6.7-31. Plane polarized light (PPL) (top) and cross polar (XP) microphotographs (bottom) of Rabo de Cochino pot-sherds with circularly oriented inclusions and central voids. RC-019 (TU-C1 Cx.102) and RC-038 (TU-C1 Cx.102) are Sponge Spicule Family pot-sherds while RC-011 (TU-B, profile) belongs to the Mixed Fibre Family and RC-058 (Surface collection) is part of the Granitic Family. Images width:3mm. Microphotographs taken by Natalia Lozada, 2017.

- ***6.7.5.4.2 Pre-forming***

Pre-forming techniques are executed in the second phase of the fashioning stage to give a definite shape to the vessel. In order to identify them, macro-trace analysis evaluates the microtopography of the sherds in terms of striation and concavities, which can reveal the hygrometry state of the clay when it was shaped and if they used tools to do so. From a total of 104 sampled pot-sherds, just 34% (n=36) had visible traces for this phase.

Shaving, a pre-forming technique used for leather hard clay, is the most used technique in this sample, followed by the less popular scraping and continuous finger pressure, both used for wet clay shaping. Shaving is not chronologically restricted, appearing in every stratigraphic context and associated to all petrographic families. In contrast, scraping and finger pressure are only present in Sponge Spicule and Mixed Fibre Family's sherds scattered throughout the sequence in both trenches. Although not chronologically limited, wet clay shaping seems to be common among the sponge spicule-tempered sherds from this site. The latter suggests sponge spicule-tempered sherds are not as carefully finished as non-tempered Granitic sherds. Poor shaping may result in irregular shapes and uneven surfaces. On the other hand, continuous finger pressure often appears together with scraping, and seems to be the prior step. Lastly, there is no vessel form particularly associated to any preforming technique.

<u>6.7.5.5 Finishing</u>

Surface treatments in Rabo de Cochino ceramic samples include smoothing, slip, burnishing and polishing. Within the 104 sampled ceramic fragments, only 34% (n=36) preserved signs of the surface treatment, which indicates a very high level of erosion of the material.

Traces found in some sherds reveal that most of them use burnishing (19%, n=20) in both surfaces, although it is more often found on the inside face of the sherd. While in the earliest levels in TU-A (Lv.12-16 [165-215cmBS]) it is evenly applied, leaving no clear traces besides its characteristic light reflection, in fragments from the upper levels of both trenches it is poorly applied, with clear marked flatten bright 'paths' left by the burnishing tool, indicating it was performed when the clay was dry (***Fig.6.7-34***). This technique is not restricted to any particular petrographic family.

A much simpler treatment, such as smoothing, is the second most popular finishing technique, present in 10% (n=11) of the samples. This technique is often found on Sponge Spicule and Mixed Fibre Family sherds, in which water was added to soften and even the surface with the help of a tool that left striation marks.

In contrast, polishing is much more restricted, present in 4% (n=4) of the samples and only observed on the surface pot-sherds (FS-501102, FS-502401-02) from Trench A (TU-A: Lv.5 [75-85cmBS]) (***Fig.6.7-34***). It was often present in both surfaces and only in Sponge Spicule Family fragments. Finally, slip covering was only present in one sherd (0.9%) from TU-A Lv.14 (185-195cmBS) which belongs to the Mixed Fibre Family.

Figure 6.7-32. *Smoothing treatment (left) characterized by a soft striation on the surface and an 'unfinished' appearance. Burnishing (right) is found in various sherds in the site but only in inside of the vessel.*

- ***Decorative techniques***

<u>TU-A</u>

From the 3,410 ceramics found in Trench A, 2.1% (n=73) present decoration (***Fig.6.7-35***). Ten different decoration techniques are present in this trench, among which the most popular is the linear incision, both thin (1mm) and thick (2-3cmm), as well as punctation and punctated applique strips. Thin Line incisions were found alongside punctation in triangular composite motifs around the mouth of ceramic vessels recovered from Lv.8 (105-115cmBS). Thin lines are also found without punctation in the bottom levels Lv.12-13 (155-185cmBS). Punctated sherds were found in upper levels (Lv.4-8 [55-115cmBS]), whereas punctated applique strips are present only in Lv.4 (55-65cmBS) and Lv.10 (125-135cmBS). Thick linear incisions were scattered in the trench, in the upper levels (Lv.4-8 [55-115cmBS]), in Lv.10 (125-135cmBS) and bottom levels (Lv.12-13). Modelled applique round nubbins were found in the upper levels (Lv.5 [65-75cmBS] and 8 [105-115cmBS]) and bottom levels Lv.11-13 (135-185cmBS) with the particularity that the round nubbins from the upper levels had an incision in the middle of the nubbin. Modelled-applique anthropomorphic and zoomorphic motifs were also recovered from levels 4 (55-65cmBS), 7 (85-105cmBS) and 12 (155-165cmBS). Painted sherds were obtained from Level 8 (105-115cmBS) and bottom levels (Lv.12-15 [155-205cmBS]). Excision is an exclusive technique of this trench, present in the levels 3 to 5 [45-75cmBS] and 8 to 9 [105-125cmBS]). Finally, rare tripartite linear incised flanges were noted in level 3 (35-45cmBS), as well as a Textile impression on a sherd that came from Feature-1 (Cx.106).

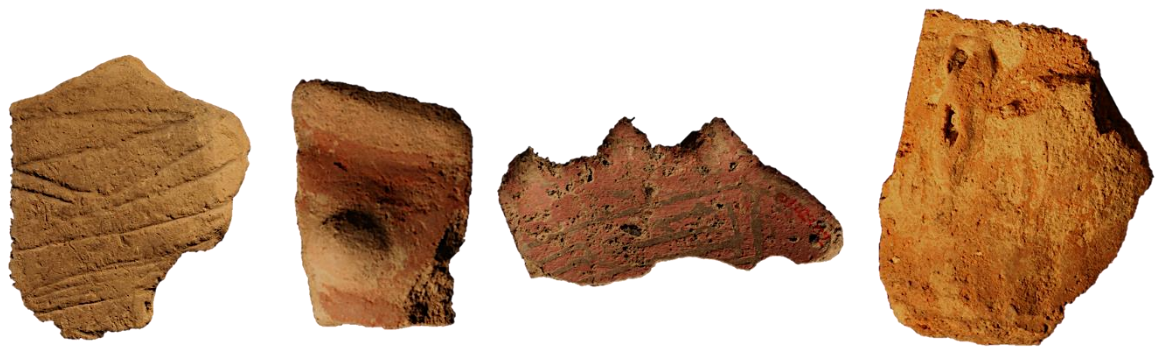


Figure 6.7-33. *Decorated sherds from TU-A. Bottom level Mixed Fibre sherds (left) and Granitic sherds (second from left) present Linear incisions and Red and White painting and Applique Round nubbins, respectively. The same groups in the upper levels were found associated to pink painting and punctated applique strips (third and fourth to the right). Taken by N.Lozada, 2018.*

<u>TU-C</u>

Decorated ceramics in this trench represented 1.7% (n=25) of the total of ceramic fragments (n=1,432) recovered (***Fig.6.7-36***). Seven decoration techniques were identified in TU-C with modelled-applique round nubbins and punctation as the most popular. Round nubbins were found in levels Lv.5-8 (150-190cmBS) and accompanied with incision or perforation in the middle of the nubbin in levels 6-7 (160-180cmBS). Punctated sherds, as well as punctated appliqué strips, were present in levels 5-6 (150-170cmBS). Rare, non-punctated strips forming circles are also found in this trench, in levels Lv.3 (124-140cmBS) and Lv.8 (180-

190cmBS), while a modelled-incised applique forming a zoomorphic motif is present in level 5 (150-160cmBS). Finally, thin linear (1mm) incisions are seen in levels 3 (124-140cmBS) and 8 (180-190cmBS) while double linear incisions on rim flanges and round nubbins were scattered in the trench, recovered in levels Lv.3-5 (124-160cmBS) and Lv.7 (170-180cmBS).

Figure 6.7-34. *Decorated sherds from the Sponge Spicule Family recovered at TU-C. Applique strips forming circular and sometimes associated with incised or punctated nubbins were identified exclusively in this unit. Taken by N.Lozada, 2018.*

<u>Decoration Technique Summary</u>

A significant number of ceramic sherds presented decoration in Rabo de Cochino site, adding up to 2.02% (n=98) of the ceramic materials recovered in both excavation units. Among the common techniques in both trenches the most popular were thin linear incisions and modelled applique round nubbins. Thin linear incisions on body sherds are found in some of the deepest levels of TU-A trench (Lv.12-13 [155-185cmBS]), associated to TL dates between AD240-570 (13.5% error). This technique is also found below the mouth or on the lips with punctation in both TU-A (Lv.3 [35-45cmBS] and Lv.8 [105-115cmBS]) and TU-C (Lv.8 [180-190cmBS]), associated to a relative date between ca.AD1300-1430. Modelled applique round nubbins, most with an incision or perforation in the middle, were reported in both trenches in the upper levels, associated to dates between ca.AD1166-1273 (TU-A) and ca.AD1300-1430 (TU-C). They appear without any incision or perforation in the bottom levels of TU-A (Lv.11-13 [135-185cmBS]) associated to an average TL date of AD400 (13.5% error).

Potsherds decorated with punctated strips also appeared scattered in both trenches. In TU-A they were identified in Lv.4 and 10, associated with a relative date of ca.AD1166-1273 and a ^{14}C date of cal.AD1273-1389, respectively, while in TU-C they were recovered in Lv.5-6, with two later radiocarbon dates between cal.AD1300-1430. Although rare, modelled incised appliques with zoomorphic and anthropomorphic motifs were also found in both units, most of which were located between Lv.4 and 7 in TU-A, with a radiocarbon date of cal.AD1273-1389. A zoomorphic modelled incised applique was also found in TU-A in Lv.12, somewhere after the TL dates obtained in the level below, with an AD400 (13.5% error) date average. Likewise, a single zoomorphic modelled incised applique figure found in TU-C (Lv.5) has a latter associated date of cal.AD1301-1413. Lastly, double and tripartite linear incised flanges on rims were also found in both units, most of them from TU-C (Lv.3-5 and Lv.7), with three radiocarbon dates between ca.AD1301-1441, and just one rare pot-sherd from TU-A (Lv.3), associated with a ^{14}C date of cal.AD1323-1348.

In contrast, painting and excision decoration technique was only reported in TU-A. Red and white zone painting was only found in the earliest part of TU-A (Lv.12-15 [155-205cmBS]) and in the profile of TU-B (205-220cmBS), both associated to a TL date range of 78BC-AD414 (13.2% error). On the other hand, pink painting was identified in a few fragments from Lv.8 (105-115cmBS), with an associated date of cal.AD1300-1400. Excision was found in roller stamps from levels Lv.3-5 (45-75cmBS) and Lv.8-9 (105-125cmBS) with associated radiocarbon dates within ca.AD1273-1389 for top levels and relative date of AD1166-1273 for the lower end levels.

Two additional exclusively techniques found in TU-A are the thick linear (2-3mm) incision and the Textile impression. The thick linear incised sherds were scattered through TU-A in all contexts, while a mat impression is found in a single sherd from Feature-1 (Cx.106) associated to a date of cal.AD1045-1218. Meanwhile, applique strips in circular shapes were only reported in TU-C (Lv.3 and 8), with associated radiocarbon dates between cal.AD1300-1440.

6.7.5.6 Firing

Macroscopic and petrographic analyses of the ceramics allow to infer the firing atmosphere and to elicit an approximate firing temperature. The Coarse Sand macroscopic fabric, belonging to the Granitic Family, presents a uniform red colour in both surfaces and in its radial section. On the contrary, Cauixí, Cauixí and Sand and Cauixí and Fibre macroscopic fabrics of the Sponge Spicule and the Mixed Fibre families, have a light grey colour and a dark nucleus in the radial section. These characteristics indicate that Granitic sherds had a complete firing in an oxidizing atmosphere, whereas Cauixí-tempered fabrics had an incomplete firing under the same conditions. The petrographic analysis also considered the presence of darker cores, as well as the clay matrix optical activity and the transformation of certain minerals to infer firing conditions and temperature. Darker cores in the Sponge Spicule sherds might be due to short-period firing or an important presence of organic matter (Rice, 1987). All sherds displayed birefringence in their clay matrix, for which it could be said that the firing temperature did not surpass <800-850°C (Quinn, 2013 p.191).

6.7.6 Vessel form

A total of 4,842 ceramic fragments were excavated from TU-A and TU-C at Rabo de Cochino site. From this total, 238 (4.9%) were diagnostic for form and/or decoration. Compared to Culebra or even Picure sites, this sample was not as heavily fragmented, with large fragments (>10cm in length), sometimes encompassing half of a small bowl, from rim to base. This allowed for a more complete form reconstruction of the vessels from this site, especially from the upper levels of both trenches, which also had less crushed and eroded potsherds. However, for comparative purposes with the other archaeological sites, rim and lip mode analysis was conducted in detail to explore their chronological implications. Subsequent formal dimensions such as body, handles, bases and their association with rims, lips and paste are explored in order to identify patterns in their distribution and to characterize the ceramic complexes (*sensu* Lathrap 1962:42) present in Rabo de Cochino.

6.7.7 Vessel form Modal Analysis Summary in Rabo de Cochino

Modal analysis for each dimension in both excavation units at Rabo de Cochino site is carried-out in order to detect significant patterns through time and space. A detailed modal analysis is provided in ***Appendix 12,*** however, the main modes, their distribution and combinations are discussed below.

6.7.7.1 Rim and Lip dimensions

Four rim angles were identified on Rabo de Cochino site, three (Direct, Out-sloping and Horizontal) corresponding to unrestricted open vessels and one (In-sloping) to restricted vessels. Lip treatments were varied, with a total of eight lip modes.

Pot-sherds from TU-A encompass all the rim and lip modes reported for the site. Unrestricted Direct and Out-sloping angles are present in all stratigraphic contexts and always represent the majority, while the Unrestricted Horizontal rim only appears in rare proportions in upper contexts Cx.101 (35-75cmBS) and Cx.102 (75-125cmBS). Likewise, Restricted In-sloping rims are rare and only identified in the bottom contexts, Cx.102 and 103 (125-205cmBS). Direct and Out-sloping rims appear in similar proportions in the upper contexts, even though Out-sloping rims are three times more popular in bottom Cx.103. In-sloping and Horizontal rims are always a minority.

In terms of lip modes, the Flat, Round and Externally Round lips are present in all contexts in varying proportions. The Flat and Round lip modes are represented in similar proportions in Cx.102 and Cx.103, with the Out-sloping rim as the slightly more popular choice, while in Cx.101 the Flat lip noticeably surpasses the other lip modes. The top of Cx.101 only had these three lip modes, whereas the bottom of Cx.102 and Cx.103, each yielded seven different lip modes. Cx.102 has an important number of Externally Rounded and Tapered lips, which are followed by rare lip modes such as Externally Flat, Internally Round and Internally Flat. This last mode is exclusive of Cx.102. On the other hand, Cx.103 also has same lip modes as Cx.102 except for the Bilaterally Flat lip mode, exclusive of this bottom context.

When seen per arbitrary levels, Horizontal rims are found in level 3 (45-55cmBS) and levels 8 to 9 (105-125cmBS), with a radiocarbon date of cal.AD1323-1348 and a relative date of ca.AD1166-1273, respectively. In-sloping rims, although always a minority, are more common between levels Lv.4-5 (55-75cmBS), associated to two radiocarbon dates which yielded between cal.AD1273-1389. Finally, Out-sloping rims are more common in the bottom levels, only surpassed by Direct rims from Lv.7 (85-105cmBS) and towards the top end of the unit, somewhere between ca.AD1166-1273.

Lip treatment diversity was more evident in certain levels within each stratigraphic context. In Cx.103, levels 14 (185-195cmBS) and 15 (195-205cmBS) have five and six lip modes each, with the commonly found Flat, Round and Externally Round lips. Level 15 has rare Externally Flat, Bilaterally Flat and Tapered lip modes while Level 14 has Externally Flat and Tapered lip modes. None of these two levels has an associated TL or radiocarbon date but based on the upper TL dates from TU-A (Lv.13 [165-185cmBS]) and those from TU-B1 profile (205-220cmBS), it has a relative average date range of AD168-400 (13.4% error). In particular, the Bilaterally Flat lip mode, introduced in the sequence in these bottom levels, persisted until Lv.12 (155-165cmBS).

In Cx.101, Lv.4 (55-65cmBS) and 5 (65-75cmBS) have each five and six lip modes, respectively. They both share Flat, Round and Externally Round lip modes, however, Lv.5 has rare Externally Flat, Bilaterally Flat and Tapered lip modes, while Lv.4 exhibits the Tapered and Internally Flat modes. The former level has an associated date of cal.AD1273-1389, while the level below is somewhere between ca.AD1166-1273.

On the other hand, ceramic fragments from TU-C show a more limited set of rim and lip modes, with four rim angles modes and five different lip modes. As seen before, all ceramic artefacts in TU-C were found in Cx.102, but within this context there is a different distribution of certain modes that suggest it could be subdivided. The bottom levels 8-9 (180-210cmBS) have only unrestricted vessels. Most are associated with the Out-sloping rim angle mode and very few are associated with Direct and In-sloping rim angle modes. Levels 6-7 (160-180cmBS) registered an increasing number of Direct rim angle specimens and the appearance of a rare restricted In-sloping rim vessel, even though Out-sloping continues to be the most popular rim choice. In contrast, levels 3-5 (124-160cmBS) have a clear preference for a Direct rim angle mode, and a more frequent number of Horizontal and In-sloping rims.

Regarding lip modes, the bottom levels 8-9 (180-210cmBS) only displayed Flat and Round lip modes in similar proportions, while the upper levels 6-7 (160-180cmBS) also exhibited rare Externally Flat lips. The top levels 3-5 (124-160cmBS) added the Externally Round and Tapered lip modes to the available choices. Round lips are the preferred choice in all the sequence, although Flat lips become more frequent in the top levels. Regarding radiocarbon dates available for this trench, the top levels 3 and 5 have three overlapping radiocarbon dates between ca.AD1301-1430, while the bottom levels 8 and 9 have two statistically equivalent dates in Lv.8 of ca.AD1300-1430 and an earlier date from Lv.9 of cal.AD1288-1295. If we choose the latter date for the bottom levels, it can be said that the introduction of restricted vessels and Externally Flat lips registered in Lv.6-7 happened somewhere around ca.AD1300.

6.7.7.2 Body dimension

Most of the body fragments recovered from Rabo de Cochino site correspond to soft-angled globular vessels. However, some inflected contours were identified in both trenches. A carinated body was reported only in TU-A Lv.15 (195-205cmBS), deposited somewhere between AD168-400 (13.5% error). Other soft inflections on the neck were also identified in this trench, corresponding to short neck (2-

3cm) bowls between Lv.3-4 (45-65cmBS) and 7 (85-105cmBS) in TU-A, with two associated radiocarbon dates with a range of ca.AD1273-1389. Same type of inflected bowls were spotted in TU-C between Lv.3-8 (124-190cmBS), which yielded a date of cal.AD1300-1430. Deep larger mouth vessels with a short neck, also denominated as necked-ollas, were present in both TU-A (Lv.3-5 [45-75cmBS]) and TU-C (Lv.5 [150-160cmBS] and Lv.8 [180-190cmBS]), with the same date range for necked-bowls in each trench. Lastly, spouts with 4-5cm tall necks were recovered only in TU-C (Lv.6 [150-160cmBS] and Lv.8 [180-190cmBS]), with two related ^{14}C dates of cal.AD1300-1400 and cal.AD1316-1430.

6.7.7.3 Handles

Three types of handles were identified in Rabo de Cochino excavation units. Short strip handles, which are non-functional, were registered in TU-A (Lv.3-4 [45-65cmBS]) and in TU-C (Lv.4 [140-150cmBS] and 7 [170-180cmBS]). These levels were dated with radiocarbon, yielding a range between ca.AD1273—1389 in TU-A and ca.AD1300-1430 in TU-C. Flat large handles of 5-7cm in length were very common in TU-C (Lv.3-4 [124-150cmBS], Lv.6 [160-170cmBS], Lv.8 [180-190cmBS]) but rare in TU-A (Lv.4 [55-65cmBS]). While in TU-C these handles are dated between ca.AD1318-1430, in TU-A they have a somewhat earlier radiocarbon date of AD1273-1389. Finally, small (2-3cm length) round incised non-functional handles, were reported only in TU-C (Lv.3 [124-140cmBS]), with a date range of ca.AD1318-1430.

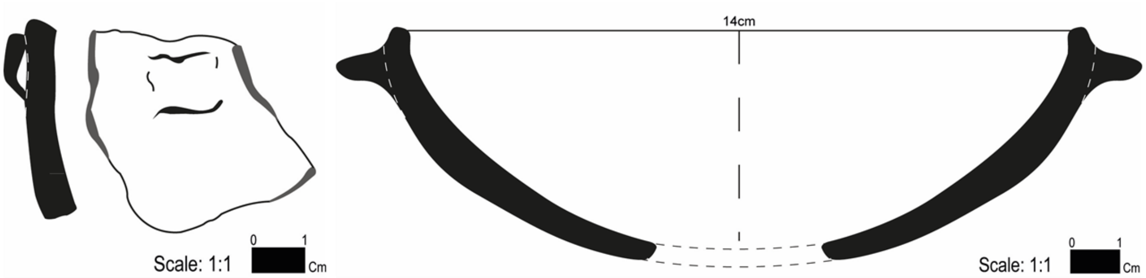


Figure 6.7-35. *Strip 'false' handle observed in Granitic sherds in TU-A (Left) and Flat Large handles in Sponge Spicule sherds from TU-C.*

6.7.7.4 Base dimension

From the excavated ceramic fragments recovered at Rabo de Cochino site, most of the sherds corresponded to body sherds and bases were not easily distinguished from the former, suggesting most of the bases were direct and also presented a soft curvature. However, direct flat bases were reported in both trenches with varying diameters. In TU-A (Lv.2 [35-45cmBS]) a flat base had 30cm in diameter, while in TU-C (Lv.3-8 [124-190cmBS]) they are smaller and vary from 6-12cm and 15-18cm in diameter. Vessels with Flat large bases part of Horizontal rim angled vessels were present in both trenches. Those with thickened upturned lips (i.e griddles), are found in TU-A (Lv.3 [45-55cmBS] and 8-9 [105-125cmBS]) and TU-C (Lv.3 [124-140cmBS]). Most were too fragmented to calculate their diameter with only one exception, a 34cm diameter griddle found in TU-C. Flat bases without upturned and straight lips (i.e. *aripos*), were spotted in both units but only three fragments were big enough to identify their diameters. In TU-A (Lv.9 [115-125cmBS]) one fragment yielded 52cm of diameter, while in TU-C (Lv.3-5 [124-160cmBS]) two sherds measured 48cm diameter.

Figure 6.7-36. *Aripo (left) and griddle (right) rim sherds from TU-A.*

6.7.7.5 Mode combinations

The analysis between different dimensions and how they relate to each other is useful to establish binding relationships through time.

-Rim/lip: In-sloping and Horizontal rim modes combine with three distinct lip modes, predominantly the Flat and Round lip modes and, in one instance, the Externally Round Lip mode. The latter rim mode, in fact, is only found co-occurring with the Externally Round lip mode in TU-C (Lv.3 [124-140cmBS]). The Direct and Out sloping modes most frequently combine with Flat and Round lip modes, combinations that are present throughout the sequence. However, the Direct Rim mode is also combined with other rare lip modes that also are much more restricted throughout the sequence. In Cx.101 (35-75cmBS) and Cx.103 (125-205cmBS) Direct rim combines with the Extremely Round lip mode, whereas in Cx.102 (75-125cmBS) it doubles the number of lip modes that co-occur with the Direct rim mode, including the Extremely Flat, Tapered and Bilaterally flat lip modes. Most of these occur only in TU-A Lev.5 (65-75cmBS), which dates to around AD1166-1273. In TU-C, the Direct rim mode combines with five different lip form modes, among which the Externally Round, Externally Flat and Tapered lip modes are found in low frequencies. Here, the Externally Round and Tapered lip modes only appear in levels 3 (124-140cmBS) and 4 (140-150cmBS) respectively and associated with two radiocarbon dates of cal.AD1330-1441 and cal.AD1318-1430.

The Out-sloping rim mode has a diversity of lips form choices in TU-A. They present more lip mode choices at the bottom of Cx.103 (125-205cmBS), where seven different combinations are attested; in Cx.102 only three are noted (Flat, Round and Externally Round lips) whereas in Cx.101 the Flat and Round lips combinations occur. Out-sloping rim with Flat and Round lips remains the most popular modal combination in all contexts. However rare lip treatments, such as the Tapered, Bilaterally Flat and Internally Round lip modes are only found in Cx.103, mostly between Lv.12-15 (155-205cmBS), dating an average TL date of AD400. The Internally Round lip is exclusively associated with the Out-sloping rim mode and is only found in Cx.103 at TU-A. In TU-C this rim angle only presented four lip modes, with Externally Flat (Lv.5 [150-160cmBS] and Lv.7 [170-180cmBS]) and Tapered lips (Lv.3 [124-140cmBS]), between ca.AD1300-1441.

While the Out-sloping rim mode shows more variability in lip forms early in the sequence, (around AD400), Direct rim and rare lip combinations only appear later, first in TU-A, around ca.AD1166-1273, and later in TU-C, about ca.AD1318-1441.

-Rim/lip and paste: Granitic Family sherds have 13 lip mode combinations in TU-A and only 3 in TU-C. Most of the combinations in this family co-occur with the Out-sloping rim mode, where Flat and Round lip modes are the most common choices. However, the distribution of rare lip combinations in both trenches seems to be significant. Out-sloping rims with Externally Round and Externally Flat lips are found in Lv.12 (155-165cmBS) while Bilaterally Flat and Internally Round lips only occur in Lv.14 (185-195cmBS), and at the bottom of Cx.103. In contrast, Direct rims with Externally Round, Externally Flat and Bilaterally Flat lips are limited to upper level Lv.5 (65-75cmBS) in Cx.102. In-sloping rims with Flat and Round lips were scattered in both Cx.102 and 103 in TU-A while they only have a rare appearance in TU-C (Lv.4 [140-150cmBS]).

Rim sherds of the Sponge Spicule Family show most diversity in lip form choice with 10 different lip combinations. While Flat and Round lips are the most popular combinations, rare lip modes among both the Direct and Out-sloping rims are more frequent in the top levels of both units. Lips such as the Externally Round are reported in both the Direct and Out-sloping rims in TU-A (Lv.3-5 [45-75cmBS]), while Tapered is only associated to the Direct rim and the Internally Flat to Out-sloping rim, in the same levels. In-sloping rims with Round lips in this family only occur in TU-A (Lv.7 [85-105cmBS]) while Horizontal rims with Flat and Round lips are scattered in Cx.101 and Cx.102 and in Feature-1 (Cx.106). In TU-C (Lv.4-7 [140-180cmBS]), Tapered and Externally Flat lips are present in both the Direct and Out-sloping rims, while In-sloping and Horizontal rims have only Flat and Round lip combinations.

Mixed Fibre Family rims displayed 9 different combinations, mostly Direct and Out-sloping rims, with 2 and 3 combinations each. In both, the Flat and Round lips are the most common in both trenches, with the rare appearance of Tapered lips combined with the Out-sloping rim mode in TU-A (Lv.14-15 [185-205cmBS]). In-sloping rims only have Rounded lips (TU-A Lv.5 [75-85cmBS]) while Horizontal rims have Flat, Round and Externally Round lips, this last one found only in TU-C (Lv.3 [124-140cmBS]).

-**Body and paste**: Necked-bowls were reported in every petrographic family while Necked-ollas were only identified in the Sponge Spicule Family sherds. This last family is the only one that present spouts (in TU-C). Lastly, the Carinated body from TU-A belonged to the Mixed Fibre petrographic Family. However, in general, there is an absence of sharp or marked neck or body inflections (corner points), suggesting that rounded or direct vessel bodies predominate in all trenches.

-Handle and paste: Strip non-functional handles were reported in the upper levels of both trenches present in the Granitic and Sponge Spicule families. In contrast, Flat large and Small round handles are both exclusive of the Sponge Spicule Family fabrics.

-Bases and paste: Direct flat bases were common in all petrographic families, while Griddle and *aripos* flat bases were associated with the Sponge Spicule and Mixed Fibre families.

-Paste and decoration: Techniques found on TU-A, such as Textile Impression, Excision and Pink Painting, are found only among Sponge Spicule Family sherds. Only one excised roller stamp in TU-A (Lv.5 [65-75cmBS]) belonged to the Granitic Family, in which also excisions were reported. Red-and-White zoned painting was only identified in the bottom levels of TU-A (Lv.12-15 [155-205cmBS]) in granitic sherds. Thick-incised lines were also described in sherds in the upper levels of this unit (without painting) in Sponge Spicule Family sherds.

Common techniques in both trenches such as Punctation and Tripartite and Double linear incisions on semi-circular flanges on rims were exclusive techniques of the Sponge Spicule Family sherds. Applique strips in circles, found only in TU-C, were also exclusively associated to this petrographic family.

The remaining techniques reported in both trenches such as Thin line incisions were identified among Mixed Fibre and Sponge Spicule Family sherds, while Punctated strips, Round nubbins and Modelled-incised applique motifs were spotted in both Granitic and Sponge Spicule Family sherds. These last ones only displayed zoomorphic motifs in Granitic Family sherds in both trenches, while Sponge Spicule Family sherds also showed anthropomorphic motifs.

6.7.6 Rabo de Cochino Ceramic complexes

6.7.6.1 Early Picure Complex Component 100BC – AD400

Rabo de Cochino site was occupied for ca.1,520 years, according to the earliest TL date between 134 BC- AD370 (13.26% error) (TU-B1, profile) and the latest radiocarbon date of cal.AD1330-1441 (TU-C1 Lv. 3 [124-140cmBS]). Based on the previous technological and modal analyses, two main periods were identified at this site.

The first occupation period is denominated as the Early Picure Complex (EP hereafter). Components of the EP are present at Rabo Cochino and Picure island sites. EP was first identified at Picure site, from which the ceramic complex derived its name (see Picure chapter). The foregoing description complements that found in the Early Picure component from Picure (AM-2) site. Here, EP was defined from a sample of 406 ceramic sherds, recovered from TU-A bottom levels of Cx.103 (Lv.12-16 [155-215cmBS]). These levels are associated to three TL dates, two of which were considered valid and have an average date range between AD348-458 (13.5% error). However, two TL dates from below Lv.16 (205-215cmBS), corresponding to the profile of TU-B1, have two additional TL dates with an average date range of 100 BC-AD392 (13.28% error) (see ***Table 6.7-2***).

At Rabo de Cochino, ceramic sherds are more abundant in bottom levels Lv.14-16 (185-215cmBS) and they experienced a significant decreasing trend toward Lv.11-13 (135-185cmBS). This coincides with the introduction of a new sponge spicule tempered fabric. While in most of the mentioned levels Granitic Family fabrics represent between 40-60% of the materials and Mixed Fibre Family fabrics account for 20-30%, the Sponge Spicule Family is rare, with very few sherds (<10%) in Lv.15 (205-215cmBS) and only constant in the sequence from Lv.12

(155-165cmBS) upwards. Based on this percentages, two main wares are part of this complex, along with an intrusive Sponge Spicule ware.

EP-Coarse Sand ware comprises the Corse Sand macroscopic fabric, which belongs to the Granitic petrographic Family. Sherds from this ware used a residual clay derived from a granitic parent rock, common in the eastern margin of the Orinoco, across the Parguaza Granite formation. This clay was not tempered or sieved, given the poorly sorted angular mineral inclusions. Coils were identified as the roughing-out technique. They were placed straight on top of each other, joined by 'drawing' and shaped through shaving. Thick line (2-3mm) incisions on top of the rim, mouth and body, as well as round nubbins and modelled-incised applique zoomorphic motifs were used as decoration. The external and internal surfaces were then smoothed and burnished, followed by zonal painting using red and white pigments. Based on the homogenous strong red colour in all sherds, firing can be characterized as complete under an oxidizing atmosphere. Associated vessel forms include mostly unrestricted vessels, in particular vessels with Out-sloping rims exhibiting Externally Round, Externally Flat, Bilaterally Flat and Internally Round lip forms (***Fig.6.7-39***). A few In-sloping rim-angled vessels with Flat and Round lips are also present.

EP-Cauixí and Fibre ware comprises the Cauixí and Fibre fabric from the Mixed Fibre Family. Clay use for its manufacturing is a heavily weathered sedimentary clay source derived from a medium-grained igneous rock, most likely found in the Parguaza Granite formation area. Based on their very low frequencies (<10%), this clay contains naturally occurring sponge-spicules and is enriched with previously sieved charred and uncharred tree bark inclusions. Coiling is identified as the fashioning technique for this ware. Coils were placed straight and joint by 'drawing'. They were then shaped when the clay was still wet by using a scraping technique, followed by a smoothing of the surface. Thin linear (1mm) incisions are placed on the exterior below the mouth and on body fragments. Slip on the external surface consists of a light cream-coloured pigment found in only one sherd from this ware (Lv.14 [185-195cmBS]). The light greyish colour of its surfaces with a dark radial section is indicative of an incomplete firing under an oxidizing atmosphere. It could suggest a significant amount of organic inclusions (such as tree bark). This ware is only found in Unrestricted vessel forms, with Direct and Out-sloping rim angles (***Fig.6.7-40***). They both exhibit Round and Flat lips as the most common lip modes, with the Tapered lip being less frequent and exclusively associated with Out-slopping rims.

EP-Cauixí ware comprises the Cauixí and Clay Pellets macroscopic fabric of the Sponge Spicule petrographic Family. The petrographic analysis indicates a similar paste to the EP-Cauixí and Fibre ware except that sponge spicules are more conspicuous, suggesting that they were intentionally added as temper. Sherds from this ware are largely eroded body fragments with very few rims present. Their poor conservation prevented the reconstruction of their forming and finishing stages. No decoration is observed. Incomplete firing under oxidizing conditions is also present among these sherds given the occurrence of darker middle sections. Rim forms related to this ware belong to the Direct and Out-sloping rim angled vessels with Round and Flat lip modes. Given its low frequency and presence (only in Lv.12 and 15), it may be suggested than this ware is intrusive to this complex.

Reconstructed vessel forms for EP-Coarse Sand ware include forms with circular horizontal cross sections (see ***Appendix 19***). Most of the diagnostic rims pertain to Out-sloping moderately deep (Form1a) and deep bowls (Form 6) with simple contours and an average mouth diameter of 17cm. EP-Cauixí and Fibre ware reported one out-sloping moderately deep bowl with a larger mouth diameter (Form 1b) and a Direct angled moderately deep bowl (Form 4a) with a short neck (i.e. short necked-bowl). The latter also includes the only inflected/carinated body fragment in the sequence (TU-A Lv.15 [195-205cmBS]). Finally, EP-Cauixí ware had a single diagnostic rim with a Round lip and an Out-sloping angled deep bowl with a simple contour (Form 6). Moderately deep bowls were most likely used for food service and consumption, while short necked-bowls and large deep bowls served for food processing.

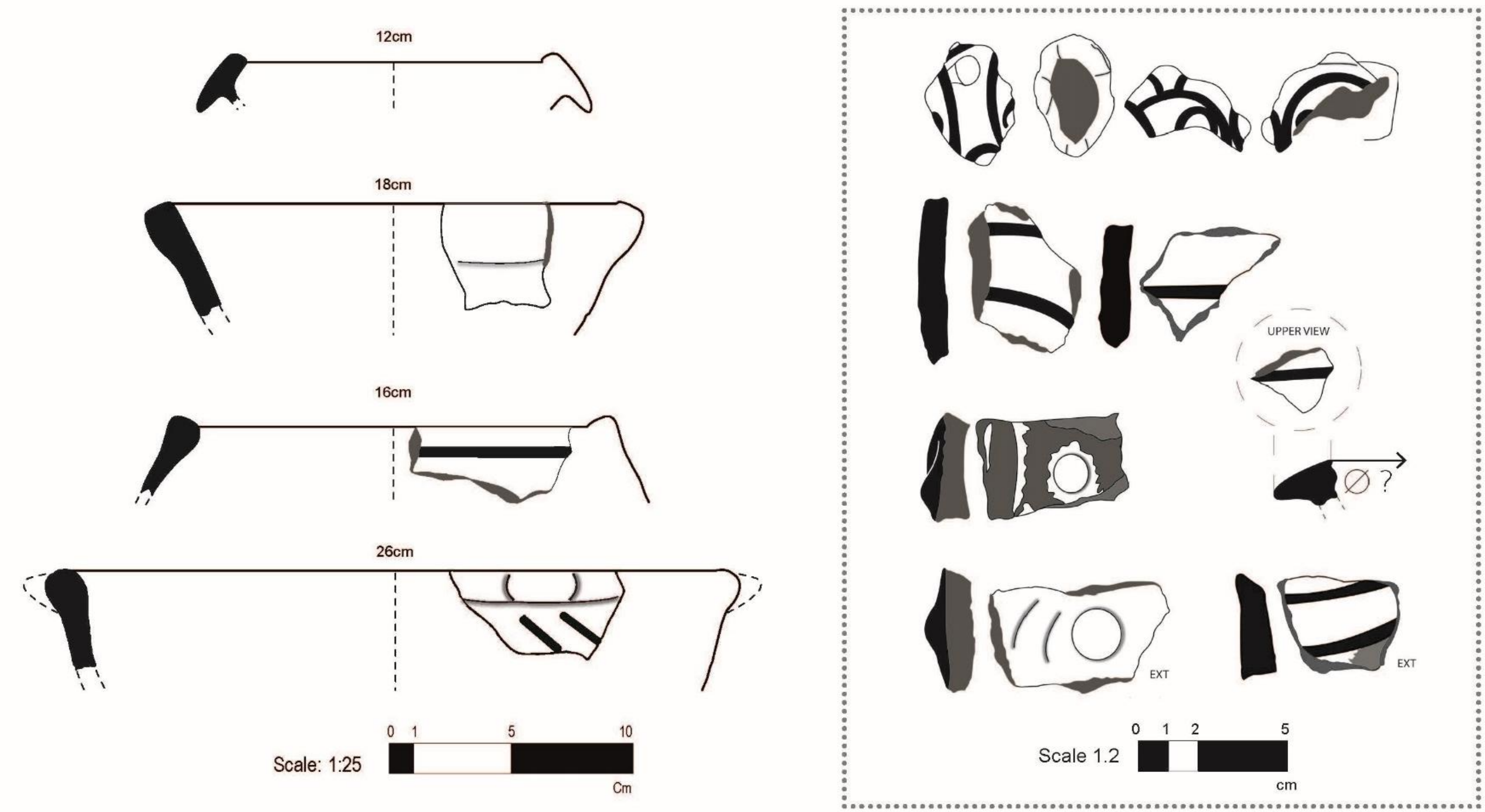


Figure 6.7-37. *Early Picure Coarse Sand ware diagnostic forms and decorated sherds from TU-A, Rabo de Cochino site. Thick Linear incisions, Modelled-Incised zoomorphic applique adornos and White and Red zonal painting.*

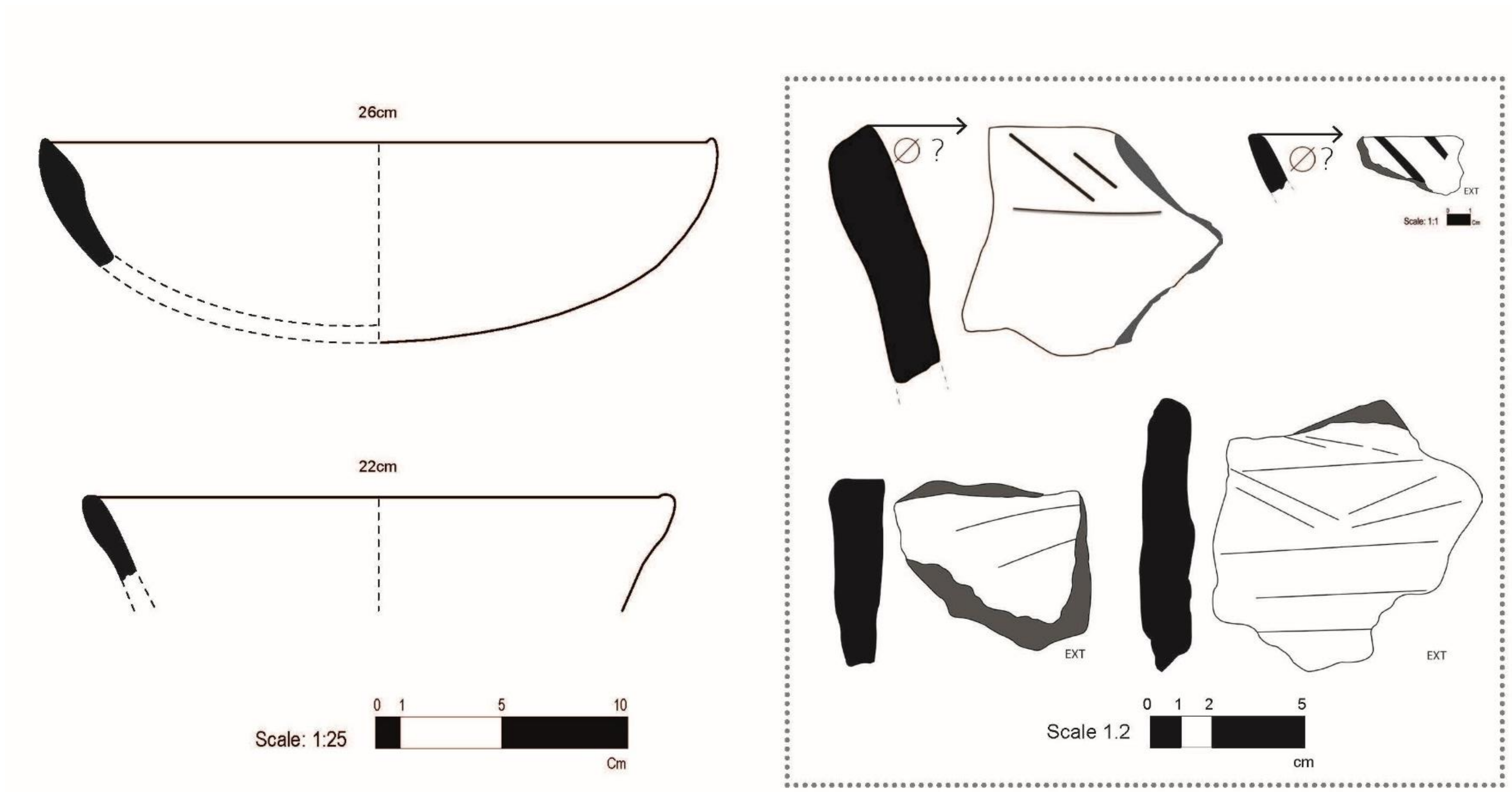


Figure 6.7-38. *Early Picure Cauixi and Fibre ware. Reconstructed forms and decorated sherds with thin linear incisions recovered from TU-A, Rabo de Cochino site.*

6.7.6.2 Late Rabo de Cochino Complex AD1030-1440

Late Rabo Cochino Complex (i.e. LRC hereafter) is subdivided into two stages, based on the distribution patterns of ceramics and the presence and frequency of certain modes and vessels forms. The gradual appearance of new modes and forms in LRC is characteristic of an 'Elaborating Tradition', as defined by Haury et al. (1955 p.44). The LRC complex comprises a total of 3,987 ceramic materials recovered from Cx.101-102 (Lv.2-11 [35-155cmBS]) in TU-A and Cx.102 (Lv.3-9 [124-210cmBS]) in TU-C.

- ***6.7.6.2.1 Rabo de Cochino I AD1030-1295***

The first stage of the LRC complex was documented in TU-A (Cx.102-103, Lv.6-11 [75-155cmBS]) and TU-C (C1+C2 Cx.102, Lv.8-9 [180-210cmBS]). In TU-A, this stage is marked by an initial, strong presence and increasing frequency in the bottom levels and witnessing an abrupt decline at the top. The bottom level 11 (135-155cmBS) is associated to a radiocarbon date of cal.AD1030-1166, while top Lv.6 (75-85cmBS) can be relatively dated to ca.AD1166-1273. In TU-C (C1+C2), the bottom levels contained the least amount of ceramics and presented an associated early radiocarbon date of cal.AD1288-1295 (Lv.9 [190-210cmBS]). Levels with scarce ceramics in both trenches share a similar chronology, close to the end of the second half of the 13th century.

Regarding fabric distribution in LRC-I, in TU-A, the Sponge Spicule Family sherds is the most popular with 35-40% of the pot-sherds, followed by Granitic Family sherds (20-25%) and Mixed Fibre Family sherds (less than 10%), except for level 6, where the latter reaches 19% of the samples. Likewise, in TU-C the Sponge Spicule Family is the majority, reaching 75% of the sherds, while the Granitic Family only reaches 20%. This stage is defined from a total of 1,430 ceramic fragments and it has two main wares and a possible intrusive Cauixí and Fibre ware.

LRC-Cauixí I ware, the dominant ware of the assemblage from this stage, comprises the Cauixí, Cauixí and Sand and Cauixí and Clay Pellets macroscopic fabrics, all of which belong to the Sponge Spicule Family. Clay used for their manufacturing was a weathered silty clay source, most likely found in the river banks areas. Sponge Spicules, a silica-rich inclusion, were found evenly distributed and in significant percentages in the matrix (30-40%), indicating intentional tempering. Scarce and rounded coarse silt-sized mineral inclusions suggest a previous cleaning process before adding the sponges. The presence of clay pellets or porphyroclasts suggest tempering was completed with a powdered clay to which water was added. Coils were identified as the preferred fashioning technique, applied in a 'bevelled' form from 'Inside to Outside'. Coils were joined by both 'drawing' and pinching and shaped by scraping, when the clay was still wet. Smoothing of the surface was performed by adding water, while polishing of the internal surface was only observed in very few sherds. The decoration includes modelled applique anthropomorphic motifs, punctation, pink painting and thin linear incisions with punctation in complex triangular and geometric motifs in the internal surface below the mouth. Rare decoration techniques, in the form of circular applique strips and double linear incised semi-circular flanges, were only found in TU-C (Lv.7-8 [170-190cmBS]) while excisions in roller stamps were recovered from TU-A (Lv.8-9 [105-125cmBS]). Strip handles were only reported on TU-C (Lv. 7 [170-180cmBS]). Associated rim angles include mostly unrestricted upper vessels with Direct and Out-sloping rims, as well rare restricted In-sloping rims and a new unrestricted Horizontal rim, all with Flat and Round lips. Horizontal rim was only reported in TU-A (Lv.9 [115-125cmBS]). Rare Tapered lips were observed in the Direct rims in TU-A (Lv.8 [180-190cmBS]).

LRC-Coarse Sand I ware shares the same raw materials and paste preparation procedures of the EP-Coarse Sand ware. However, it presents distinct forming and finishing techniques. Coiling remains the preferred roughing-out technique, although coils are here placed 'bevelled' (i.e. oblique) from 'Inside to Outside'. Likewise, a few bases allowed to identify spiral coiling in the bottom of vessels from this ware. Coils were joined by 'drawing' and shaped by shaving. Surface treatments include smoothing and burnishing, this last one when the clay was dry. Applique decoration, such as incised round nubbins and punctated strips, were added as decoration. Firing was completed under an oxidizing atmosphere, as indicated by its strong and evenly distributed red colour. Associated Direct and Out-sloping rims have only Flat and Round lips, while rare In-sloping rims only have Round lips (***Fig.6.7-41***).

LRC- Cauixí and Fibre I ware, includes the Cauixí and Fibre fabric from the Mixed Fibre Family, which appeared very rarely in this part of the sequence, constituting a minority. Raw materials and paste preparation are similar to the ones described for the EP-Cauixí and Fibre ware, while there are differences in terms of fashioning and finishing. Coils were identified as the preferred roughing-out technique, placed in a spiral and joined by continuous finger pressure (pinching). Pre-forming consisted of shaving the internal surface, when the clay was leather hard. Pot-sherds were then smoothed and burnished in the internal surface. Firing was incomplete and performed in an oxidizing atmosphere, based on the light grey colour of the surface and darker middle section. No decoration was reported in this ware for this stage. Associated rims include only unrestricted Horizontal rims with Flat lips.

Vessel forms for the LRC-Cauixí I ware comprise unrestricted moderately deep bowls with varying mouth diameters (Form 1 [a and b], Form 5 [a]), and deep necked-bowls with large mouths (Form 3 [b and d], Form 6) **(*Fig.6.7-42***). Additionally, in TU-A there were also open shallow bowls with a simple contour (Form 9 [a]) and two horizontal flat rims (Form 11 [a and b]) belonging to a griddle and an *aripo*, this last one with a 52cm diameter. On the other hand, LRC-Coarse Sand I ware vessel forms include mostly open moderately deep bowls (Form 1 [a]) and necked-bowls (Form 4 [a]) with mouth diameters between 10-20cm and a rare restricted moderately deep bowl (Form 8 [a]) with a 20cm mouth diameter. Lastly, LRC-Cauixí and Fibre I ware only has one horizontal flat rim with an upturned lip, corresponding to a griddle (Form 11 [b]).

Moderately deep bowls with similar mouth diameters are present in both main wares, associated to food service and consumption (see ***Appendix 19***). Short necked-bowls, common in both wares and used for cooking, are deeper and have a larger mouth diameter in the LRC-Cauixí ware. Shallow bowls, also used for food service, belonged only to the LRC-Cauixí ware. Rare forms such as a restricted moderately deep bowl, griddles and *aripos*, used for cooking and food processing, belong to the LRC-Cauixí and LRC-Cauixí and Fibre wares. This last one only was only associated to a griddle form in this stage, and appears in very low proportions, indicating it could be intrusive or a trade product.

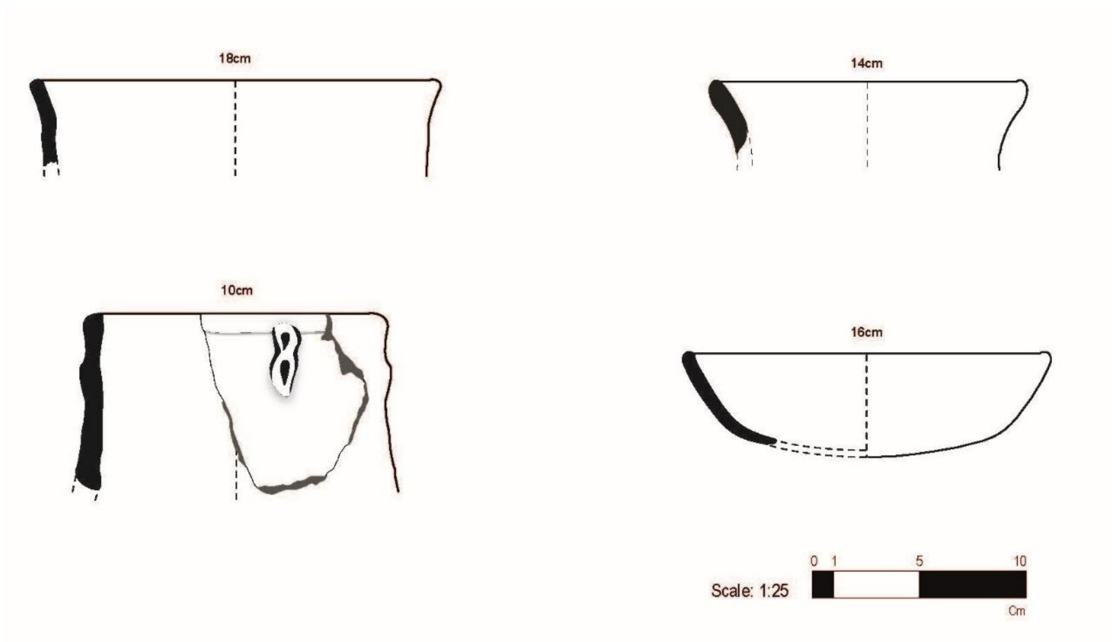


Figure 6.7-39*. Late Rabo de Cochino I Coarse Sand ware. Only one sherd presented a punctated applique strip perpendicular to the lip.*

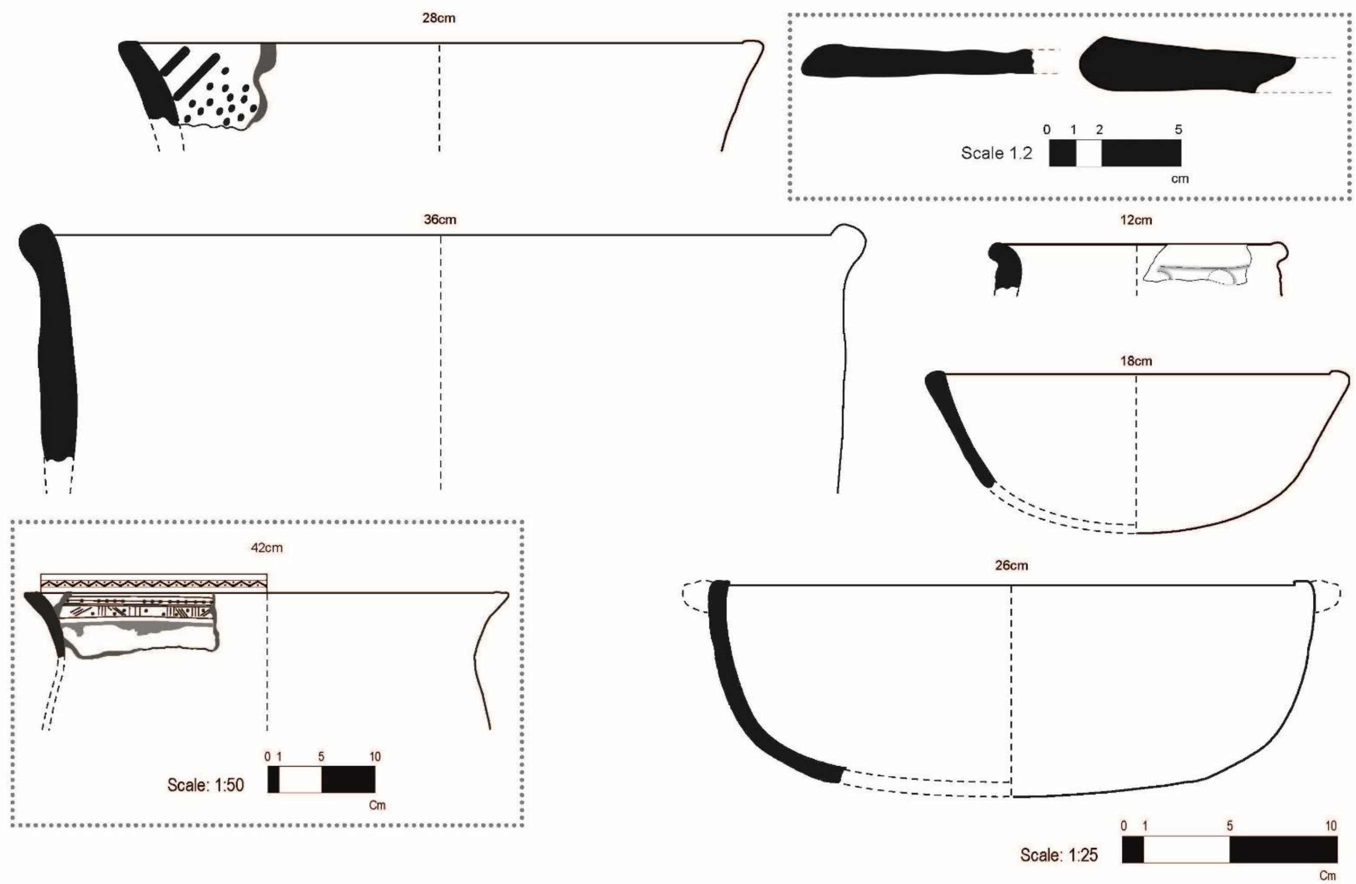


Figure 6.7-40. *Late Rabo de Cochino I Cauixi ware. Few reconstructed forms which include bowls, ollas and griddles. Punctation and thin linear incisions were reported in this ware.*

- ***6.7.6.2.2 Rabo de Cochino II AD1300-1440***

LRC-II complex is found in TU-A (Cx.101-102, Lv.2-5 [35-75cmBS]) and TU-C (C1 Cx.102, Lv.3-7 [124-180cmBS]. In TU-A, the artefact count increased to almost 90% in the bottom levels (Lv.4-5), followed by a rapid decrease of almost 60% in the top two levels (Lv.2-3). Compared to TU-A, TU-C's ceramics are not as varied in terms of forms, decorations and shapes, but the top levels show more diversity. The dates of LRC-II from the top levels of TU-A date to ca.AD1270-1390, while TU-C has three associated later dates between ca.AD1300-1440. In terms of fabrics, Granitic and Sponge Spicules each have 30% of the samples while Mixed Fibre families only comprise between 5-7%. This stage was defined from 2,481 ceramic sherds, classified in three main wares.

The Coarse Sand ware in LRC-II shares the same raw materials, paste preparation process and fashioning than the one described for the LRC-I Coarse Sand ware. Surface treatments consisted of smoothing and burnishing, but this last one was performed with a leather hard clay state. Strip handles and modelled-incised round nubbins and appliques with zoomorphic motifs were then added as decoration. This ware has only one large flat handle, found in TU-C (Lv.5 [150-160cmBS]). Firing is complete, under an oxidizing atmosphere. Rim and lip mode combinations mostly include Unrestricted Direct and Out-sloping rims with Round lips, followed by rare Direct rims with Bilaterally Flat and Externally Flat lips (TU-A Lv.5 [65-75cmBS) (***Fig.6.7-43***). Very few restricted In-sloping rims with Round and Flat lips are also present in both trenches, one of which is associated with a large flat handle.

The LRC-Cauixí ware in LRC-II shares the same raw materials, paste preparation, fashioning and finishing techniques as the one in LRC-I. Differences with respect to the previous stage have more to do with the appearance of handles, some decoration techniques and vessel forms during this later period. The added handles were presented different forms, including the flat large handles at the rim or just below the mouth and the small rounded linear incised handles on the middle of the body (TU-C Lv.3 [124-140cmBS]). Decoration techniques include thin linear incisions forming triangular shapes on the rims, tripartite incised semi-circular flanges on rims, punctation, modelled-incised zoomorphic applique motifs (TU-A Lv.4 [55-65cmBS]), modelled-incised round nubbins, punctated strips and rare circular applique strips (TU-C Lv.3 [124-140cmBS]) and excisions. The latter technique is only executed in roller stamps of Cauixí ware and only found in TU-A (Lv.3-4 [45-65cmBS]). Related rims pertain to unrestricted and restricted vessels (***Fig.6.7-44***). Direct and Out-sloping rims have Round, Flat, Externally Round, Externally Flat, Tapered and Internally Flat lips. Restricted In-sloping rims with Round and Flat lips are scarce, as the Horizontal rims with Flat and Round lips.

The Cauixí and Fibre ware in LRC- II period, a minority within this complex, comprises the Cauixí and Fibre fabric of the Mixed Fibre Family. Unlike the Cauixí and Fibre ware in LCR-I, the heavily weathered sedimentary clay source derived from a medium-grained igneous rock is tempered with siliceous-rich inclusions such as fibre (i.e., 20-25% plant vases and phytoliths) and sponge spicules (15-20%), rather than tree bark. Identified coils were placed in a 'bevelled' form from 'Inside to Outside' in bowls, while they were placed in a spiral in bases associated to griddles and *aripos*. Pre-forming consisted of shaving, when the clay was leather hard, followed by burnishing on the internal surface. The Cauixí and Fibre is a plain, undecorated ware. Associated rim and lips include unrestricted vessels with Direct and Out-sloping rims and Round and Flat lips in both trenches (***Fig.6.7-45***). In-sloping rims with Round lips are only present in TU-A (Lv.5 [65-75cmBS]) while unrestricted Horizontal rims with Flat, Round and Externally Round lips are only found in TU-C (Lv.3-4 [124-150cmBS]).

The Coarse Sand ware in LRC-II has open, moderately deep bowls (Form 1 [a]) and direct moderately deep short necked-bowls (Form 4 [a]), both with small mouth diameters between 15-20cm. Rare direct, deep bowls (Form 2 [b]) and restricted, moderately deep bowls (Form 8 [a]) are also present in this stage. There is also an excised roller-stamp recovered from TU-A (Lv.5 [65-75cmBS]).

The Cauixí ware from the LRC-II complex includes open, moderately deep (Form 1 [a]) and deep bowls (Form 6 [a]) with simple contours and small mouth diameters, both likely associated with cooking and food processing. Deep and moderately deep, short necked, bowls (Form 3 [a and b] and Form 4 [a]) with small and large mouth diameters are also likely associated to cooking, while tall neck (i.e. Spout) moderately deep bowls (Form 4 [b]) are most likely used for pouring or serving liquids. Likewise, shallow bowls with small mouths (Form 7 [a] and 9 [a]), for food service and consumption, and shallow bowls with large mouths diameters (i.e. platters) (Form 9 [b]) are also probably used for serving food. In-sloping, moderately deep bowls with small and large mouth diameters (Form 8 [a and b]) are also found, as well as Horizontal flat vessels with upturned rims (Form 10 [a]) which correspond to griddles. These last two vessels forms are also use for food processing and cooking.

LRC-Cauixí and Fibre II ware has open moderately deep bowls with small and large mouth diameters (Form1 [a], 5 [b]), moderately deep short necked-bowls (Form 4 [a]), In-sloping moderately deep bowls with small mouth diameters (Form 8 [a]), and Horizontal rim with Flat and Upturned rims (Forms 10 [a and b]), all associated to cooking. Shallow bowls with small and large mouth diameters (Form 7 [b] and Form 9 [a]) are also reported and correspond to food service and consumption.

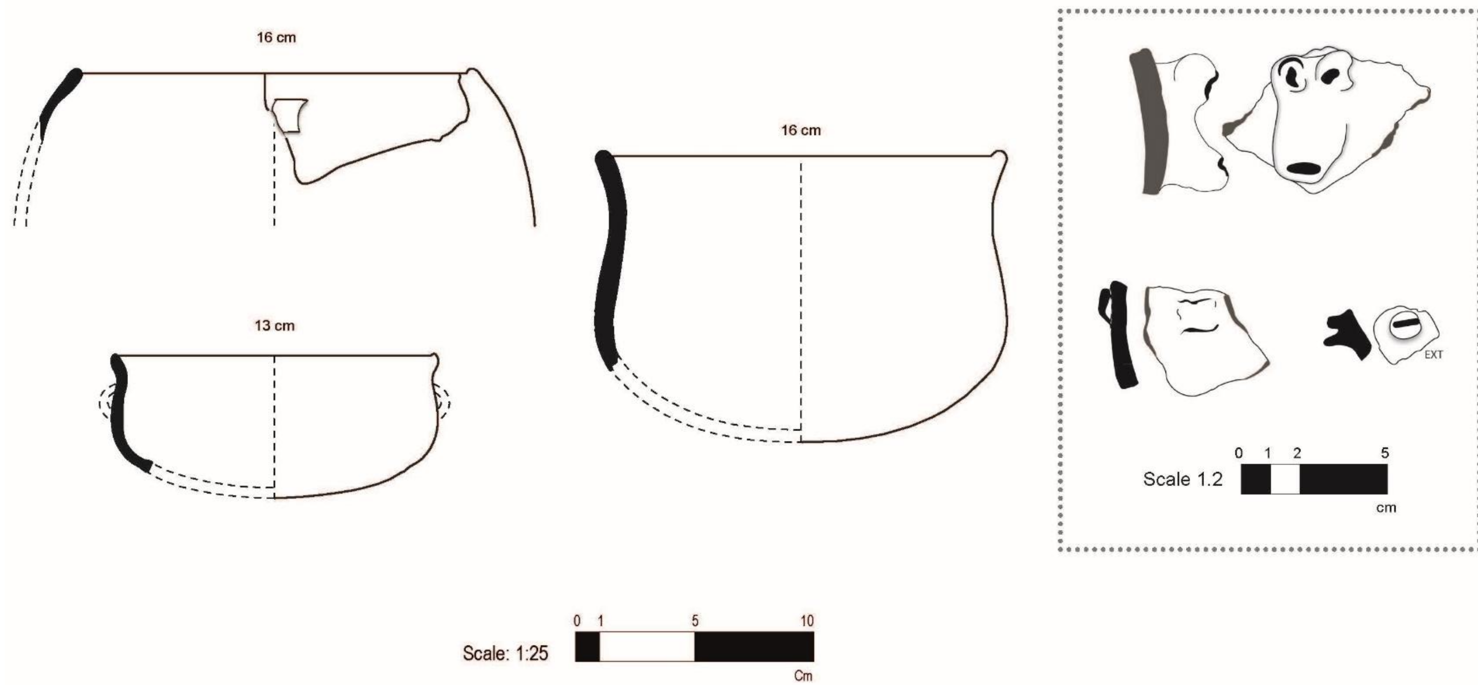


Figure 6.7-41. *Late Rabo de Cochino II Coarse Sand ware. Handles, Modelled-incised zoomorphic motifs and an incised round nubbin were identified in this period.*

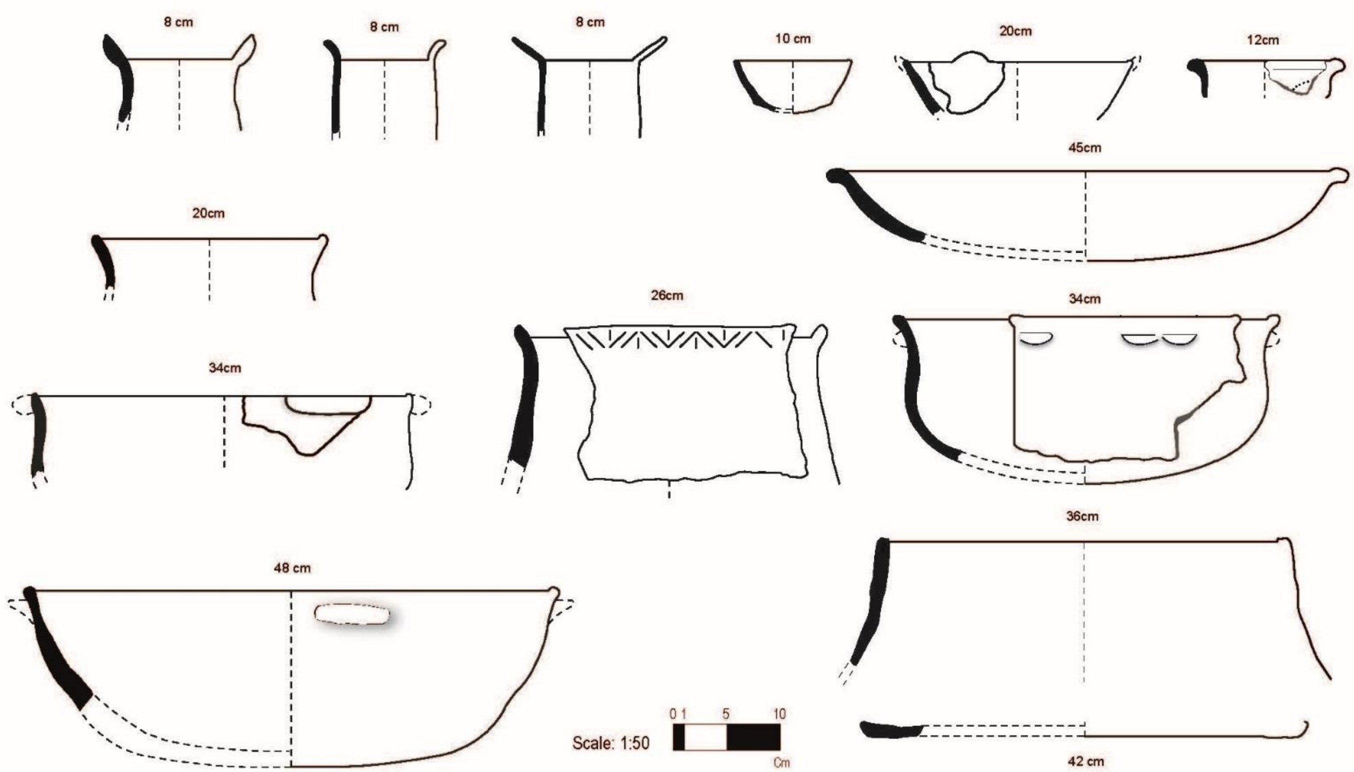


Figure 6.7-42. *Late Rabo de Cochino II Cauixi ware. On the top row, new forms such as spouts and small shallow vessels appear in the sequence.*

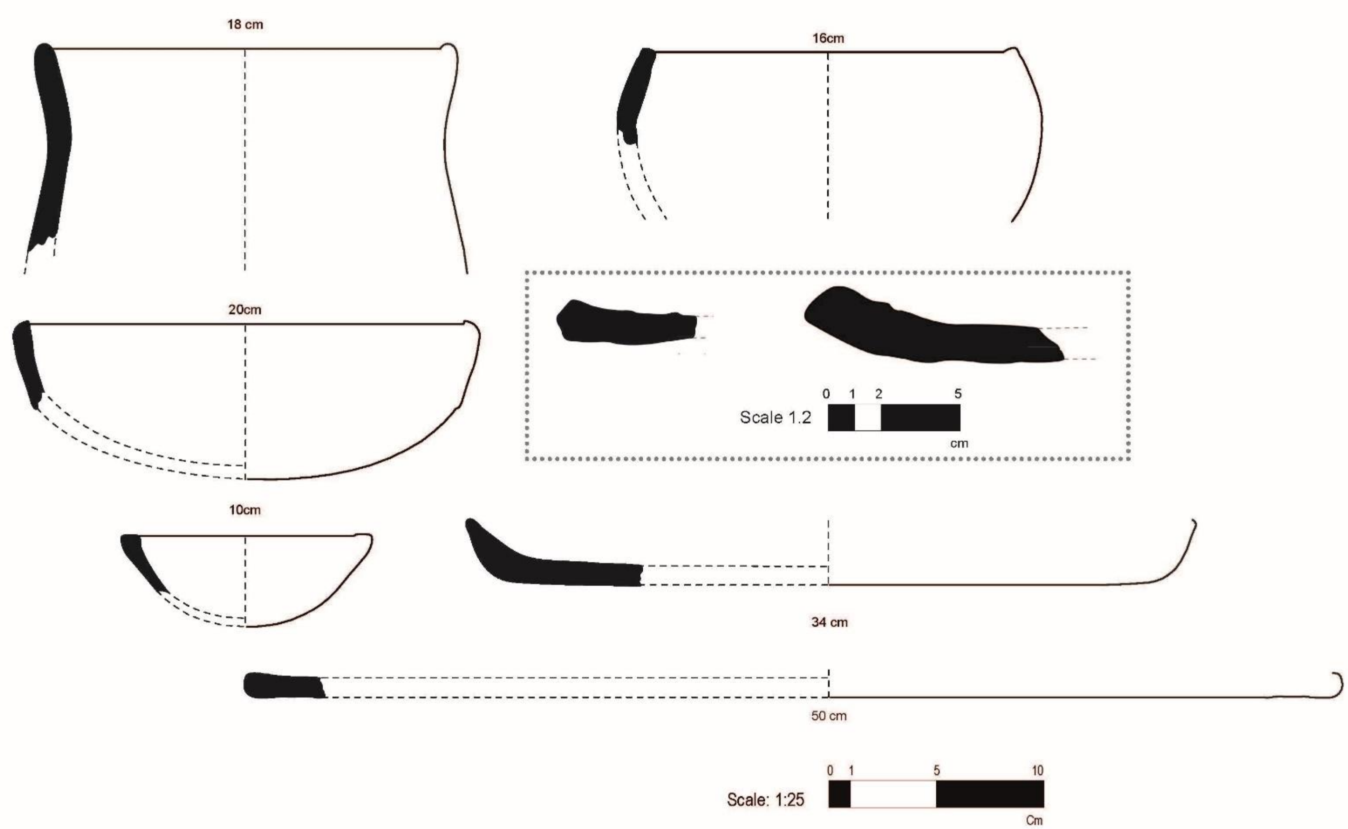


Figure 6.7-43. *Late Rabo de Cochino II Cauixi and Fibre ware. Aside from griddles and small vessels, during this late period a few other small bowls and inflected contours were observed for this ware.*

7. SUMMARY AND DISCUSSION

Based on the analysis of the ceramic materials obtained in the Cotúa project between 2015 and 2017, this study aimed to build a techno-stylistic chronology model to reconstruct the occupation sequence in the Átures Rapids area, and to explore interaction and identity through time in this strategic spot of the Orinoco River. The early written accounts of travellers, conquistadors and missionaries who first entered the Orinoco in the 16th century reported that its river banks accommodated a mosaic of indigenous groups who belonged to Arawakan, Carib and Independent linguistic families, sharing a broad territory and practicing different economic activities ranging from foraging and fishing to farming (Morey, 1975; Arvelo-Jimenez and Biord, 1994; Gassón, 1996; Zucchi y Gassón, 2002). According to these early reports, some of the groups were involved in alliances, marriage, warfare and trading. Exchanged goods were traded directly or in specialised locations such as La Urbana or the Átures Rapids, where the Adoles indigenous people were located at the time of the conquest (Rivero, 1956 [1736] p. 42-43; Ojer, 1966 p.54). Inspired by the ethnohistoric accounts about the trading that took place on the rapids among diverse indigenous communities from the Western plains, the Upper Negro-Atabapo River and the Guyana, this research set out to explore whether the practice could be traced back to pre-colonial times. In addition, it sought to examine the relevance of ceramics and their use as identity markers in the past and the normative approach upheld in the region.

Although pots are not people, the practices behind their production, the forms and decorations made by potters are the product of a process of learning and transmission of knowledge of this craft by a social group. The patterned choices involved in each ceramic production stage and dimensions of variability exhibited a distinct shared set of rules and ways of making, which can serve as evidence in identifying community of potters at a given time and place.

Ceramics on their own, without dates and other artefacts such as lithics, beads or habitation or funerary structures, are insufficient to define a ‘cultural’ phase. However, their changing manufacturing techniques and formal dimensions may reflect a new ‘vocabulary’ being applied to the pots in the assemblage, either through innovation built within the group and/or by adoption from outside contacts. Meaningful changes are those that become the new norms which serve to outline a distinct period. Identified alterations do not necessarily imply a rupture with the previous period and so their vertical distribution must consider both the incorporation and the persistence of different attributes along the production chain to reconstruct a sensible chronology.

Once the detailed analysis was completed, the subsequent ceramic complexes defined for each site were meant to reflect distinct pottery-making practices performed by a certain social group in a given time, following Lathrap’s definition (1962:48). However, some of the excavated sites in this study are multi-component deposits with coexisting ceramic styles and no prior occupations in which only a single style dominates the area. This same behaviour has been reported in many other sites along the Orinoco river bank, such as Agüerito and La Urbana, apparently suggesting they were never occupied by one culturally homogeneous group of people at a time.

These sites with techno-styliscally plural ceramic assemblages constitute a challenge to the normative culture historic approach since the ‘norm’ in this area consists of such mixed ceramics. Co-occurring wares within these deposits are not usually made by the same group of people but they do always coincide together in the same contexts. Under this scenario, a ceramic complex can be reframed as the assemblage of artefacts used by a group of people in a given time and place. Their co-occurrence is not necessarily a reflection of a historical association derived from a common origin (i.e. as a ceramic series, *sensu* Cruxent and Rouse, 1958), but rather of a possible co-habitation or alternatively of the sharing of an area by different groups, each with their distinct wares. In other words, the notion that one and only one ceramic style/culture -and hence ‘people’-

can exist in one locality at a given time cannot be defended given the evidence not just in Átures, but in other sites in the Middle Orinoco. Rather, the social group produces and uses a ceramic complex that exhibits plural ceramic technological wares and styles.

Under the proposed definition of a ceramic complex, the normative elements which allow to identify and organize the record by distinguishing different styles produced by one particular group of people are preserved. At the same time, various complexes, can be part of a single assemblage, implying that different pottery making and using groups are somehow bonded as a social unit and follow a restricted distribution pattern through the sequence, indicating a persistent and stronger relationship among them despite of their differences. The character of their association and the possible interpretations of the plurality of styles will depend on a detailed comparison of their ceramic 'vocabulary' to check if encounters and/or exchanges were made.

Regarding the circulation of ceramic materials, although a more systematic regional survey is needed to address networks of circulation, we based our results in the interaction spheres approach proposed by Gallay (2007) and Roux (2017 p.11). Their model is based on ethnographic research focused on trading pottery communities with intertribal alliances and patrilocal relocation of women potters; a similar scenario proposed previously to explain mixed assemblages in the Middle Orinoco area (Zucchi, Tarble and Vaz, 1984; Gassón, 1996; Zucchi and Gassón, 2002; Tarble Scaramelli, 2006). Gallay and Roux suggested there are three main interaction spheres, distinguished from each other based on the quantity of vessels, their forms and their recurrence through time. The central sphere is considered to be the closest to the production and distribution of a particular kind of vessel, while the other two (i.e. peripheral and remote) refer to a wider distribution and circulation area.

On the basis of recently obtained dates and excavated ceramics in the Átures Rapids, it is possible to argue for a new occupation model for the upper end of the Middle Orinoco from a plural and multi-ethnic perspective. It will evaluate the previous models proposed for the area and suggest an alternative interpretation based on a systematic technological and formal (i.e. stylistic) analyses of ancient ceramic materials, used and circulated in the area in pre-colonial times. The proposed periods will be explained as part of local or external innovations, recognised from a detailed definition of distinct pottery-making practices. It will also compare the findings with the wider region to understand the movements and interactions of the different groups which occupied this territory. Finally, it will explore the roles of ceramics in the exchange network along the river and its interpretation as identity and/or ethnicity markers.

7.1 A New Chronology Model for the Átures Region

The Átures region, where the strong rapids act as the first river toll on travellers going up stream, was known in the early 16th century as a pivotal exchange centre along the Orinoco, where peoples coming from distant regions met and traded (Ojer, 1966 p.54; Arellano, 1986 p.728; Perera, 2000 p.384). Previous archaeological research conducted in the vicinity of the rapids, suggested a large and continuous occupation period, from ca. 9000BP to European contact (Barse, 1989; Gassón, 2000). Nonetheless, new dates and materials found in recent excavations challenge the previous model (eg. As synthesised in ***Fig.2-9***, Chapter 2) and suggest shorter occupations in which the rapids serve as both a confluence point and a border between the Upper and the Middle Orinoco.

According to the analysis here undertaken of the ceramic from Culebra, Picure and Rabo de Cochino sites, three major occupation periods with its distinct ceramic complexes, established based on the newly obtained dates and the stratigraphic distribution of modes for every stage of the ceramic production sequence. Evidence from an early occupation at the turn of the Christian Era indicate that the first inhabitants with pottery of Átures Rapids belonged to different groups that visited or scouted this area for relatively short periods of time. This period was followed by a transition stage, just before the first millennium, which witnessed the incursion of a new group in the area that resulted in the displacement of the earlier parties. Lastly, the 400 year period before European contact in 1538 exhibited a more intense occupation of this area by different groups who settled in their banks for longer periods.

7.2 Early occupation (100 BC - AD 600): the Átures Rapids as a boundary between the Middle and Upper Orinoco

7.2.1 Early Explorers on the banks of the river: Down-river from the rapids

New AMS dates and ceramic analyses of the recently excavated trenches at Culebra site provide a new framework to understand how ancient inhabitants on the southern end of the Middle Orinoco lived and interacted in this area. The single previous study performed on this site by William Barse (1989) suggested a *long-dureé* occupation, starting with pre-ceramic component of hunter-gatherers estimated from ca. 9000 BP, and ending just before the Spanish conquest. From a careful re-evaluation of the stratigraphy and new AMS dates (humin fraction) from soil samples obtained during our excavations at Culebra, we were able to refute the pre-ceramic component at this site. The new data indicates that the fragmented quartz cores, shatter and micro debitage for the production of bifacial stone tool (projectile point) preparation, were instead produced sometime between ca. AD 670-1010 and, thus, interpreted as a lithic workshop contemporaneous with later ceramic components of Culebra (Riris et. al., 2017).

This late date in Culebra cannot be interpreted as a rejection of the archaic presence at other sites of the Middle Orinoco, given that an early date of 9020±100 BP (ca.7070 BC, Beta22638) was reported by Barse (1989 p.270) for the Provincial site, further north from Culebra site. This date is also joined by additional AMS dates obtained by Scaramelli and Scaramelli (2017:437) at Cerro Gavilán 2, close to the Parguaza river, which ranged between cal.9250±60 BP 2σ (Beta-252625) to cal. 3440 ± 40 BP 2σ (Beta-252621), undoubtedly proving early human presence in this area. Nonetheless, by rejecting this archaic component at Culebra site, the earliest occupation registered in the Átures area corresponds to the Early Picure complex (see ***Fig.7-1,*** p.447), with two components, one in Rabo de Cochino site and another one in Picure site. The earliest Rabo de Cochino component, with a TL median date range of ca.100 BC- AD 400 (13.2% error), constitutes the largest deposit of this early occupation in the area. Some sherds belonging to this complex were found on the beach surface and falling from the cliff, suggesting it might have been a larger occupation than the one registered in TU-A and TU-B1, significantly reduced due to the seasonal flooding and erosion of the river bluff.

According to the ceramic analysis of the recovered fragments, three different wares were defined for this early period, one of which is thought to be intrusive and which only appears at the end. The main wares that define this early period are the Early Picure Coarse Sand and Cauixí and Fibre wares, easily distinguishable because of their distinct paste recipes, fashioning techniques, decoration and associated vessel forms (see Chapter 6.6.5.9.1 and 6.7.6.1 for a detailed description of each ware). The Coarse Sand ware, affiliated to the Granitic Family, is the most common during this period, representing half of the sample, followed by the Cauixí and Fibre ware, a member of the Mixed Fibre Family and comprising a third of the sample. The disparities between non-tempered and tempered wares, pre-forming and decorative techniques differences noted between the two main wares indicate that the production sequences of both are independent. It also indicates that potters manufacturing Coarse Sand wares were more experienced and produced resistant and better-quality pots, based on the drying times for shaping, complete firing and elaborate painting, modelled applique zoomorphic motifs and thick incised decoration.

Whilst the sand and fibre-tempered wares differ in terms of their production sequences, they both share unrestricted out-sloping vessels, although a few restricted in-sloping rims are present in the Coarse Sand ware. The latter also has flat or round thickened rim modes, often decorated with linear incisions, while the Cauixí and Fibre ware has mostly flat or round lips and rarely tapered ones. Reconstructed vessel forms in both wares include circular horizontal cross sections and bowls with some key differences. The Coarse Sand ware also has deep and moderately deep bowls with simple contours, while the Cauixí and Fibre ware has moderately deep bowls with larger mouths, short-neck bowls and a carinated body fragment. While moderately deep bowls, present in both wares, were most likely used for service and food consumption, the deep bowls and short-necked bowls were good for food processing and cooking.

Finally, an intrusive Cauixí ware was registered in the site of Rabo de Cochino as part of this Early Picure complex, where it occurs in rare proportions (<10%) and only in the upper end levels of this early occupation. This ware, associated to the Sponge Spicule Family, did not exhibit any decoration and the presence of a dark core indicates an incomplete firing. Based on the number of spicules in the paste, is fair to assume they were added and not naturally occurring as the ones reported for the Cauixí and Fibre ware. The presence of clay pellets within these Cauixí sherds also serve as an argument in favour of tempering, and specifically, of mixing spicules with clay in a powdered dry form. Samples were significantly eroded, preventing from further reconstruction of the *chaîne opératoire*. Related vessels correspond to unrestricted deep bowls with simple contours and round and flat lips, most likely use for food processing and/or cooking.

The Coarse Sand and Cauixí and Fibre wares are also present in very rare proportions and poorly preserved in Picure site, associated to a TL median date of AD 315-621 (13.85% error). This date overlaps with the end of the Rabo de Cochino median date but strongly suggests this early complex could have extended until the 6th century of the Christian Era. However, given that the potsherds belonging to these wares found on the rapids were scarce, it is likely that this component was the product of a rather late ephemeral excursion or short occupation of this site.

The former descriptions of the two main wares present within the Early Picure complex agrees with the dual ware assemblage argument forwarded for other early sites along the Middle Orinoco, such as Ronquín (Howard, 1943; Roosevelt, 1978; Rouse, 1978) and Agüerito (Zucchi, Tarble and Vaz, 1984). Following the earliest occupation sequence model proposed by Howard (1943 p.22), the Early Picure wares are very much the equivalent of the quartz sand 'Y' group and the cauixí/ash and sand tempered 'Z' group from the Early Ronquín polychrome complex. Likewise, Howard's 'X' group, described as a cauixí or sponge spicule tempered group, is also comparable to the Cauixí 'intrusive' ware found at Rabo de Cochino site.

Despite their paste composition similarities, Early Picure Complex's Coarse Sand and Cauixí and Fibre wares have different stylistic affiliations than the ones reported by Howard. His 'Y' ceramic group was later classified as part of the Saladoid series (Cruxent and Rouse, 1958 p.22), and particularly with the Ronquín style (Rouse, 1978), while the Coarse Sand ware, here defined, is closer to the Ronquín Sombra phase, as defined by Roosevelt (1978, 1980). The essential difference between the two is the 'Barrancoid' influence evident on the latter, such as linear-incised flanged rims, thick and moderately deep linear incisions and modelled lugs, as well as the zonal painting (Rouse, 1978).

The painted decoration found in the Coarse Sand ware differs from the rectangular and curvilinear White-on-Red designs on exterior surfaces, characteristic of the early styles of the Saladoid series (Cruxent and Rouse, 1958 p.252). Instead, the Coarse Sand ware exhibits large plain red- or white-painted zones delimitated by applique nubbins and linear incisions, which is common in the Barrancoid series (Cruxent and Rouse, 1958 p.260). Nonetheless, the observed painting techniques in Rabo de Cochino and Picure sites in this early period are either only red or white or White-on-Red, which suggest a local adaptation.

The Cauixí and Fibre ware, however, is closer to the Cedeñoid series (Zucchi and Tarble, 1985), which has been characterized by its fibre and dry clay tempering, thin linear incised geometric motifs and carinated shapes. The so-called minority fabric of the Saladoid series, which was previously associated with Howard's 'Z' group (1943), was conceived as an independent series after a larger sample of this ware was recovered from Agüerito and other sites in the Venezuelan western llanos in the 80's. Initially thought as a trade ware (Roosevelt, 1978 p.176), its appearance in Agüerito and the Early Picure complex in significant proportions confirms its close association with Ronquín Sombra's sand-based ware.

Even though the co-occurrence of the two main wares has been consistently attested, the character of their association remained debatable. One of the usual arguments is to suggest that they can be thought as a dual-ware assemblage because each performed a different function (Barse, 1989 p.383). However, based on the vessel reconstructions at Rabo de Cochino site in this study, both wares share common forms such as moderately deep bowls with simple contours, probably associated with food service and consumption. Sand ware has deeper and larger bowls, while the Cauixí and Fibre ware has large mouth with short-necked bowl; nevertheless, all of the former were most likely used for cooking and food processing. The main differences come from the carinated body sherds present in the Cauixí and Fibre ware and the few restricted in-sloping rims of the Coarse Sand ware, both possibly part of jars or small bowls used for either liquid pouring and/or storage. When compared with the vessel forms reported at Agüerito for the equivalent Wares A and B, both had open bowls, small jars and ollas, even though Ware A additionally had griddles and bottles (Zucchi, Tarble and Vaz, 1984 p.158).

Given the overlap of vessel forms, the function discrimination argument is not strongly supported. Instead there are more indications to support the argument that they belonged to two different groups that used the same space during the early period. The lack of evidence for technical or decorative exchanges between them must not be understood as the absence of contact or trade although, if it happened, it was not expressed in their ceramic materials. On the other hand, the intrusive Cauixí ware, thus named because of its rare frequency on all sites along the Middle Orinoco, including Rabo de Cochino, lacks sizeable fragments with which to address in detail its technology and formal elements in order to establish stylistic affiliations. Nonetheless, Cauixí ware must certainly by an exogenous intrusive ware, which uses a different paste preparation process. Their presence in the sequence is very rare and thus it could have reached the area in the form of traded pots; as indirect trade, though it does not necessarily imply direct excursions by people or short stays in the sites.

Bearing in mind their different *chaîne opératoire* and common vessels forms, Rabo Cochino and Picure can be interpreted as multi-component sites. Based on the number of potsherds and the range of vessel forms recovered, Rabo de Cochino site appears to have a more permanent occupation, while that of Picure site was ephemeral. While both Coarse Sand and Cauixí and Fibre wares always co-occur together, the former are slightly more common, suggesting they are potentially locally made or closer to their production centre. Cauixí and Fibre ware, which uses a kind of tree bark that grows further inland in elevated areas (see Chapter 6.3.4), appears in slightly lesser amounts and seems to be in a peripheral circulation sphere (*sensu* Gallay, 2007 and Roux, 2017 p.11). Finally, Cauixí ware is too rare in the assemblage and so both sites appear to be in a remote circulation sphere of this ware. Regardless of their abundance or closeness to their production site, these wares share a common circulation area along the river, indicating that the Orinoco River banks in the Átures area were most likely a buffer zone or *entrepôt* where different groups met and traded.

Following this interpretation, both the Coarse Sand and Cauixí and Fibre wares were made by two different groups who visited and sometimes stayed at Rabo de Cochino (AM-3) and Picure (AM-2) sometime between 100 BC -AD 621. The earliest occupation occurred down river, at the AM-3 site, where it extended at least until the 4th century of the Christian Era, followed by a slightly later and more ephemeral component up-river in the Átures Rapids (AM-2), which might have lasted until the 6th century. The materials observed in both sites are not currently found associated to any hearth or dwelling feature, and the reconstructed vessel forms do not have a diverse functional range, indicating that they are not necessarily the result of a continuous or intense occupation. The absence of griddles, known for their large diameters and for being fixed on the top of hearths, might indicate that the early occupation of these sites consisted of scouting or fishing parties who visited the area, perhaps several times, but for relatively short periods of time while the main or permanent settlements might have been further inland.

The chronology suggested here requires further explanation in order to propose a new occupation sequence model for this portion of the river. The obtained dates in the recently conducted excavations at Rabo de Cochino and Picure correspond to TL dating of mostly Coarse Sand ware potsherds, given that the charcoal samples obtained from the deepest levels did not yield sufficient material for AMS dating and that quartz fractions are ideal for TL dating. Only one Cauixí and Fibre sherd (FS 5157.03, see ***Table 6.7-3***) from Rabo de Cochino site was submitted for thermoluminescence dating, yielding a TL date of 3132 BC (12.61% error). This date was dismissed by Kotalla Lab arguing contamination from the burned tree bark used as temper. Curiously, this last date in particular is very similar to some of the ^{14}C early dates obtained by Alberta Zucchi and Kay Tarble at the bottom levels of Pits 2,4 and 5 in Agüerito (1984 p.175), which dated 3730 BC (5680 ± 165 BP, I-10.009) and 2030 BC (5425 ± 195 BP, Gx5181). In contrast, the TL dates they obtained from the deepest levels of Pit 6 in the same site are significantly later, yielding AD 436 ± 222 (Zucchi, Tarble and Vaz, 1984 p.175-176). Additional dates corresponding to the Cedeñoid series are reported in the western llanos, particularly at Los Caros, El Choque, Guayabal and Médano Grande sites, with a much later chronology of AD 300-1000 and AD1000-1400 (Zucchi and Tarble, 1984 p.303), raising serious doubts on the chronology of this ware.

Unfortunately, the great disparities showed by both radiocarbon and TL dates in the Middle Orinoco sites associated with this ware remain and could not be solved by our recent excavations. The lack of sizeable charcoal samples and quartz-rich fractions needed for TL dating demanded complementary dating methods, such as OSL for future research in the area. For the time being, the distribution of the

Cauixí and Fibre ware in the Rabo de Cochino and Picure sites confirms that this ware only appears in the same levels as Early Picure's Coarse Sand ware, for which the chronology associated with this last one can be used, at least in this area where no single component sites for the Cauixí and Fibre ware have been found.

The TL dates obtained from Coarse Sand wares of the Early Picure complex suggest a much later chronology for this Ronquín Sombra affiliated period. An early radiocarbon date obtained in Picure at TU-1, which yielded a date of cal.1193-934 BC 2σ (2878±34 BP, X-2716-27), was dismissed because it was not associated to any type of artefact in the trench and it was obtained in a disturbed corner of the trench (see Chapter 6.5.3.1). This last date is the only one from the bottom levels of these two sites which resembles the long chronology period range proposed by Rouse (1978) and Roosevelt (1978). Due to its doubtful provenance within the stratigraphy we have to rely on the TL date range for this early period.

Even though TL and radiocarbon dates are not directly comparable due to differences in the calibration systems and probability errors, the closest references we have for the ranges obtained from our TL dates are mostly from radiocarbon samples from Los Merecutores, Ronquín and Agüerito sites. The latter, in particular, is the only one with two TL dates associated to Saladoid and Cedeñoid ceramic materials, which yielded AD 436 (±222) and AD 828 (±158) (Zucchi, Tarble and Vaz, 1984 p.176). Although the error margins of these dates are too broad to be meaningful, their median values do coincide with a more recent occupation after the turn of the Christian Era.

Recalibrated ^{14}C dates (2σ) (Stuiver Reimer and Reimer, 2019) from the Middle Orinoco sites associated with Ronquín Sombra ceramic materials (***Appendix 20),*** report similar ranges to the ones obtained through TL. The earliest dates are around AD120-540 (1720±80BP, I-9233), while latest dates locate this phase around AD420-690 (1450±75 BP, QC-311B). The remaining dates (SI-1371, I-

8544, 1-8545) are mostly concentrated between AD 330-650, significantly overlapping with the top end of the TL date range we obtained in the Átures Rapids.

The proposed occupation range, encompassing the first years before the Christian Era and the first half of the first millennium, is closer to the range contemplated in the short chronology model, proposed by Vargas and Sanoja (1979). However, their proposition that the Saladoid style derived from the Barrancoid (in Lower Orinoco) is not accepted here as part of my new occupation model, since no new evidence of earlier and single-component occupations of these traditions were identified during our excavations. Due to this, the origin of the Ronquín Sombra phase and its relationship with the Saladoid series from the Middle and Lower Orinoco cannot be clarified and it's resolution is beyond the scope of this study.

Finally, the interaction sphere of the Saladoid, Barrancoid and Cedeñoid series can be extended as far upriver as the Átures Rapids, where multi-component assemblages with their associated wares support the long hypothesized strong ties between these groups in this area. The Saladoid-Barrancoid shared spatial distribution has been documented through the Middle and Lower Orinoco, Guyana, Surinam and the Antilles (Rouse, 1983; Versteeg, 1983; Boomert, 2000; Bérard, 2013; Rostain, 2016), although the trajectories of both series and their associations have not been discussed beyond their distribution and decorative techniques.

In the Átures Rapids, the complete lack of shared modes between the Ronquín Sombra and member styles of the Cedeñoid series (i.e. Early Picure Cauixi and Fibre ware) along their production chains indicate their interactions were not as strong, since no technological or stylistic exchanges or innovations were observed in the archaeological register. The latter is expected in a case of intermarriage of women potters who relocate and adapt their craft to a new tradition (Deetz, 1968; Lara, 2017; Roux, 2019), but for which there is yet no empirical evidence from the excavated sites. Detecting differentiated activity loci (houses, workshops, etc.) from this early period is much needed to be able to systematically compare both ceramic traditions and determined the nature of their relationship.

7.2.2 Fishing camps and simpler pots: Up-river from the rapids

Despite the relevance given to the Saladoid series in the discussion of the pre-colonial occupation of the Orinoco basin, no evidence of its influence [and/or presence] can be traced upriver from the Átures Rapids along the Orinoco River. Based on the excavations at Culebra site, ca. 5 Km upriver from Picure, the ceramic materials recovered south of the rapids and along the lower Ventuari River (Evans, Meggers and Cruxent 1959; Zucchi 1996) do not have any of the main defining characteristics of the Saladoid series. Even though the sample is not a large one, the Early Picure complex potsherds in Picure site show the paste preparation and formal modes observed in the sherds recovered from Culebra indicate an independent complex made by a different group located in the Upper Orinoco.

The Early Culebra complex ceramics showed a rather modest assemblage, associated with two radiocarbon samples that yielded statistically equivalent dates of cal.AD437– 645 2σ (1491±29 [OxA-34374], 1488±30 [OxA-34375]). This period overlaps with the end of the Early Picure complex. Two earlier dates found in one of the recently excavated trenches at Culebra (see TU-A, Chapter 6.5.3.1) located this earlier complex between ca.2800-900 BC, making it older than the accepted dates for Early Picure. However, bio-disturbances in the profile associated with their stratigraphic context, makes it impossible to confidently accept them. Likewise, previous excavations at Culebra site conducted by William Barse (1989:202) provided a similar date associated to ceramic materials in the deepest levels of unit N99-E55. When recalibrated (Stuiver, Reimer and Reimer, 2019), the obtained charcoal yielded cal.AD131-550 (2σ) (1690±90 BP, Beta-22641), which overlaps with our own accepted dates for this Early Culebra complex and suggests it can be slightly earlier, from ca. AD 200 (see ***Fig.7-1***).

The assemblage found in the earliest levels of Culebra was composed of three sandy wares (see Chapter 6.5.8.1 for detail descriptions), one of which was sand-tempered. All of the identified wares followed common forming and fashioning techniques, indicating a homogeneous and possibly local technical tradition. Differences in terms of their paste preparation and vessel range suggest a specialised production according to the type of vessel rather than different groups sharing the same place. Regarding paste recipes (see Chapter 6.3), all three wares are made with a sandy paste, one from a naturally occurring and hand-cleaned residual clay suitable for pottery making, another by crushing this residual clay and the third one by adding sand to a sedimentary clay source, tempered to make it more refractory, to reduce their shrinkage and its drying problems. All wares are made with local materials. Both residual and sedimentary clay sources can be found in the river bank of the Orinoco and Cataniapo rivers during the summer period, when they are exposed.

During the Early Occupation (AD 437-645), the majority of sherds (60%) correspond to the Coarse Sand ware, closely followed by the Cream Coarse Sand ware (20%) and a minority of Fine Sand ware (10%). The last two types of paste are found only in unrestricted small and thin-walled vessel forms for which it could be said there was a preferred finer and/or tempered paste specially prepared for bowls used for food service, while the thick-walled deep and large ollas, as well as a few moderately deep bowls, were made with coarse quartz inclusions. This suggest that they can be part of a unique assemblage used by a single group with paste preparation preferences according to the size and function of the vessels.

The absence of diagnostic attributes for the Early Culebra complex prevents determining any stylistic affiliations, for which reason it remains an hypothetical independent complex. However, the Early Culebra potsherds do show a clear differentiation from Middle Orinoco ceramics, starting with the lack of cauixí and/or fibre tempered sherds, thickened-incised rims or standardized lip treatments. This last mode is important since involves transmittable motor skills and it means the Culebra potters applied unequal pressure to the top of a single vessel, leaving both round and flat lips in the same rim. The high variability in the rim shape on this site indicates they were not carefully made, perhaps only used for their short stays and following a more flexible set of rules for their making. It might also suggest they were the result of an expedite production, perhaps only for a relatively short stay on the site. This scenario is not uncommon in the area today, where contemporaneous local fisher groups usually camp on top of granitic rock slabs in the rapids or on the river banks for a week or two.

From our excavations, there is no evidence of a pottery workshop at Culebra site. Considering the site's location and the limited vessel forms and functions reconstructed, this locus is not a permanent habitation site, but more likely a temporary camp in the juncture of the Orinoco and Cataniapo rivers. The few identified vessels were used for both cooking and food service, yet the absence of any bottles, jars, griddles, cups or highly decorated/prestigious vessels, reinforces the idea of a short-stay settlement with a basic and expeditious 'utilitarian' vessel set for food preparation and consumption.

In relation to the previous occupation model proposed for Culebra site by Barse (1989:388), the so-called Cataniapo Phase (AD260-500), with its Cataniapo Plain ware, is similar to the Cream Coarse Sand ware in terms of its sand-tempered paste and bell-shaped bowls with no decoration. Carinated bodies, reported as part of the vessel forms of the Cataniapo Plain, were not found in our excavations, neither in the Cream Coarse Sand ware nor any other wares of the Early Culebra complex. The fragmentation rate was particularly high at Culebra site and the impact of over 30 years of seasonal flooding and erosion since Barse's last fieldwork in the area, are most likely responsible for their absence.

Despite these similarities, the affiliation of the Cataniapo phase with the Saladoid series, proposed by Barse's model, needs to be abandoned. Arguments in favour of this association relied mainly on its vessel range forms of bell and carinated shaped bowls with triangular lip treatments (Barse 1989:389). Nonetheless, the Saladoid series' main attributes of white-on red painted sherds, modelled-incised handles, shallow incisions on flanges, red slips and hemispherical and navicular bowls, jars and bottles are all lacking in Barse's Cataniapo Plain ware. The opportunistic occurrences of sand temper paste and bell-shaped bowls is not evidence of their association to the Saladoid series. Likewise, the geographical distance argument to justify independent courses of development between the Cataniapo Plain and the Ronquín style in the Middle Orinoco (Barse 1989:392) is not a satisfactory explanation given their broad discrepancies.

From the defined ceramic complexes and their distribution for this early period, it can be said that the Átures Rapids acted as a boundary between the interaction sphere of the Middle Orinoco and independent groups south of the Átures, in the Upper Orinoco. Under this interpretation, the plain vessels from up-river of the rapids seem to correspond to fishers who camped in this area for short periods sometime around ca. AD500. Evidence of groups with Saladoid and Cedeñoid ceramics who first explored and visited the Átures region, also for relatively short periods at the beginning of the Christian Era, are only located in the Middle Orinoco, north of the rapids. Ceramics associated with these last groups have also been found in engraved and painted caves and rock shelters near Átures, Parguaza, Cedeño and Caicara, downriver from the rapids (Perera and Moreno, 1984 p.31; Greer 1995 p.325; Scaramelli and Scaramelli, 2017 p.448). Although more systematic research is needed in the Upper Orinoco and its tributaries (Gassón, 2002), the currently reported sites (Castaño Uribe, 2013; Oliver, 2019) do not have ceramic resembling those found downstream, reinforcing the hypothesis of independent groups belonging to a different sphere of interaction.

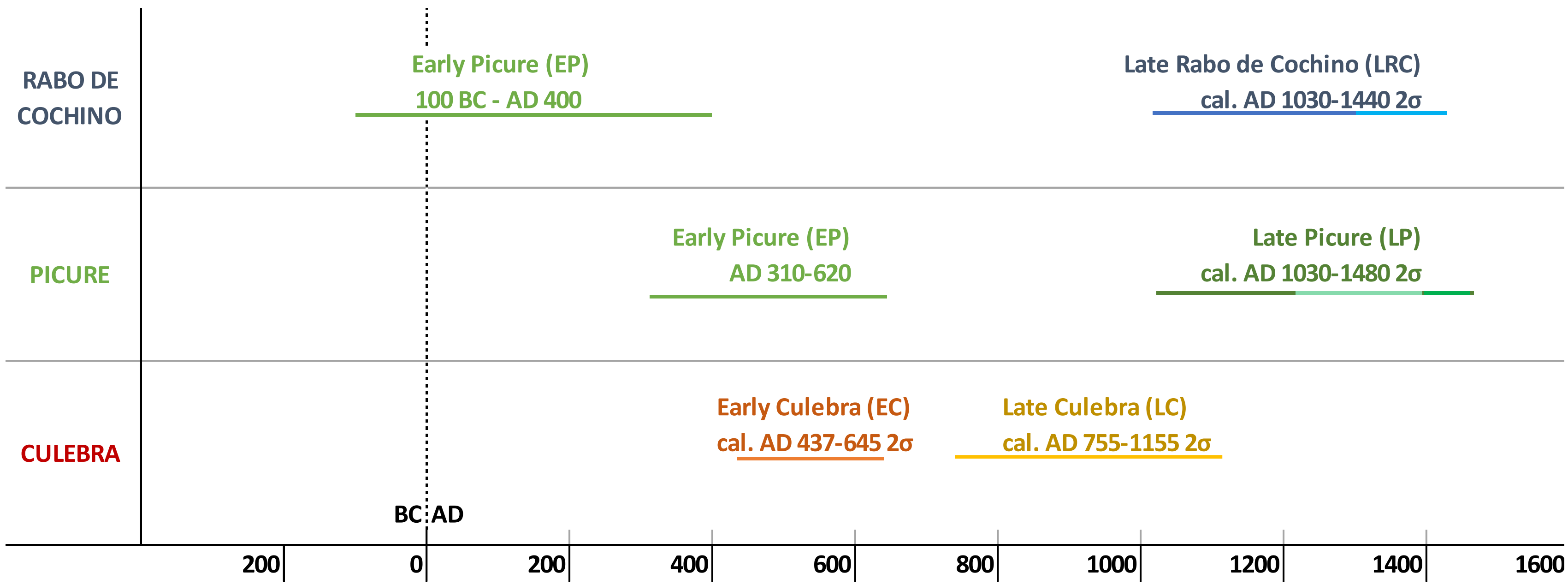


Figure 7-1. *Occupation periods defined for each site, organized in the left axis from north to south of the river. Non-calibrated dates in the Early Picure components correspond to TL dates. Note the chronological gap in the islands Picure and Rabo de Cochino.*

7.2.3 Fluid borders at the Átures Rapids (AD 700 - 1000): first encounters up the River

Culebra site, on the Cataniapo river bank, just up the confluence with the Orinoco river and after the Átures Rapids, went through an important transformation sometime ca.AD700-1000. As seen in the ceramic materials recovered from this site, the Late Culebra ceramic complex consisted of a wider range of paste preparation recipes, lip treatments and decoration techniques, which were added to the previous component. New modes were accompanied by an increasing number of artefacts and a higher fragmentation rate, which together suggest a more intense and frequent occupation of the area. In contrast, Rabo de Cochino and Picure sites, down the river, show a significant decrease in the abundance of artefacts and were almost certainly abandoned during this same period.

Based on the newly introduced modes, local groups who settled in Culebra site incorporated new attributes stemming from the Barrancoid series during this period. The Late Culebra complex, which comprises four different ceramic wares (see Chapter 6.5.8.2), retained three wares present in the Early Culebra complex but adopted an intrusive Fibre and Cauixí ware, which constitutes only a very small portion of the assemblage. The continuing wares preserved paste preparation, fashioning techniques and unrestricted vessel forms described in the earlier period but differ from the former in the diversity and standardization of lip treatments and the application of linear incisions, punctation and modelled applique decoration techniques in different decorative fields.

In general, not only new modes were adopted and innovated, but also their application followed more defined standards, probably due to a better establish pottery practice and a non-expeditious production. Rare new lips, namely the tapered, externally, internally and bilaterally flat lips, usually decorated with single and double linear incisions, were added to the Coarse Sand and Cream Coarse Sand wares, while the Fine Sand ware remained plain. Characterized as the ware with more diverse lips and decorative techniques in all of the Late Culebra complex, the Coarse Sand ware also included the use of strap handles, some with modelled applique nubbins, and annular bases during this late period. None of these new modes are observable in the Fibre and Cauixí ware, from the Mixed Fibre Family. Due to its small size, eroded surfaces and low numbers, only the paste preparation stage was defined for this minority ware, which contained fibres and tree bark temper. Sponge spicules, present in very rare proportions inside the clay matrix, are most likely naturally occurring. These spicules were also observed in very small numbers in a portion of the Fine Sand ware sherds, reinforcing the argument of a clay source with naturally occurring spicules.

The Barrancoid affiliation of some of the newly introduced modes include the incised out-sloping rim with externally and bilaterally thickened flat lips reported on the Late Culebra Coarse Sand and Cream Coarse Sand wares. Likewise, modelled handles and annular bases, present in the Coarse Sand ware, are also common in the Barrancoid series. These attributes give room to speculate contacts with groups bearing Barrancoid vessels, which could have influenced the incorporation (adoption) of these two new modes in the late part of the sequence.

The incorporation of these new modes did not affect the previously established *chaine opératorie* or vessel forms available in the site. They remained the same but adopted linear incisions and punctation (shallow dots), as well as bilaterally, internally and externally flat lips and C- and D- shaped handles, these last ones with modelled applique nubbins. These attachments and adornments are not technological innovations associated with cultural change. On the contrary, they constitute imitation traits, which do not imply direct contact with another group but rather the mimicry or emulation of a style, possibly known through direct or indirect contact, such as commercial exchanges (Roux, 2019 p.291).

Considering the above discussion, people settled in Culebra more permanently in the Late period than in the previous period. In the last years of this occupation, close to the first millennium after the Christian Era, the assemblage found on the site became more elaborate, with diverse decorative modes and lip modes, including a rare new ware. Such changes might suggest that interactions occurred with groups bearing Barrancoid pots from the Middle Orinoco and an additional group that produced a cauixí tempered ware. The latter has a similar paste recipe than the Early Picure Cauixí and Fibre ware associated with the Cedeñoid series. However, it lacks its characteristic fine-line incised decoration, carinated bowls or out-sloping tapered lips, making it impossible to affiliate this rare cauixí tempered ware to a particular ceramic style and/or series spanning other regions. The tree, whose bark is used as temper, is not found in the flooded sabana of Culebra site but further inland (Chapter 6.3). Thus, the tree bark-tempered maybe was brought into Culebra or it corresponds to a non-local production and hence was likely imported through trade. Unfortunately, the sherds which corresponded to this ware were heavily eroded and did not exhibit any diagnostic vessel form to be able to ascertain its locality or similarity to other wares in the site.

While some of the Barrancoid decoration and lip modes were incorporated, cauixí tempering was not adopted; therefore, the interaction between both groups must have been quite different. The incorporation of Barrancoid modes could be interpreted as product of a stronger relationship between the two groups that, nonetheless, did not entail a replacement of the previously established independent pottery complex from the area. In contrast, the few sherds found with sponge spicule tempering were most likely product of indirect trade or a more distant contact.

As a consequence of the introduction of new Cauixí and Cauixí and Fibre wares, the Cream Coarse Sand and Fine Sand ware decreased during the Late Occupation period in Culebra site. Although they are still present in the assemblage, their reduction seems to be associated with the introduction of non-decorated fibre-tempered vessels. Based on the thin-walls of this fibre ware, they probably belong to small vessels and may fulfil the same function of the Cream Coarse Sand and Fine Sand wares during this period.

At the Cataniapo-Orinoco confluence, groups who previously camped in the area began to settle for longer periods at the site. The ceramic materials associated with this Late Occupation reveal that Culebra's inhabitants sustained close interactions with people bearing Barrancoid pottery (or had access to such vessels), given the incorporation of certain decorative and lip treatment modes distinctive of this series. The ceramics also suggest trade with the other groups in the area, based on the appearance of rare Cauixí potsherds in the assemblage. Due to the lack of diagnostic vessel forms or decorative motifs, these last ones were not affiliated to a particular ceramic series. However, they do have a restricted chronological distribution, present only by the end of the late period, somewhere around ca.AD1200, after which Culebra site was abandoned.

The opening of the Átures Rapids border near the end of the first millennium was accompanied by the disappearance of the Early Picure complex in the upper portion of the Middle Orinoco. This indicates that a significant change occurred in the area, which involved the displacement of the previous Ronquín Sombra affiliated groups located north of the rapids, all the way to the Parmana-Ronquín area. Currently there seems to be a 400 to 600 years occupation hiatus in both Rabo de Cochino and Picure sites between the end of the Early Occupation (ca. AD 400-620) and the beginning of the Late Occupation (ca. AD 1000) (see ***Fig.7-1***). However, this gap might be even longer, if one considers the broad margins of error provided by the TL dates. On the other hand, this hiatus could also be significantly shorter. It also may be the product of sampling bias where the sites chosen for excavation in the area were, by chance, precisely those abandoned during this time, and not others surrounding the river banks or further inland.

The previously existing chro nological gap between the Saladoid and Arauquinoid-related styles in the Parmana-Ronquín area, was eventually filled-in by the identification of the Corozal tradition, dated to sometime ca. 700 BC-AD 700 (i.e.2750-1200 BP). This long period was viewed as a slow transition towards a more elaborate and sponge spicule-rich ware that characterizes the later Camoruco tradition (Rouse, 1978; Roosevelt, 1997). Up the river, in the Átures area, there is as yet no evidence of such Corozal-like transition, and the gap has been interpreted as a partial abandonment of the area until the beginning of the Arauquinoid series in the sequence, sometime between ca. AD 800-1000 (Barse, 1989). The latter can be explained if we consider the

Caicara to Ronquín-Parmana area as the place where the Arauquinoid series first arose and then spread fully developed both up and down the river.

The chronology proposed by Roosevelt (1978, 1980) and Rouse (1978) has been questioned and, following new dates obtained from the excavations at Agüerito site and for the Corozal tradition in Parmana (Zucchi, Tarble and Vaz, 1984 p.174, 178). In a detailed review and synthesis Boomert (2000 p.112-113) has placed the gap of the Middle Orinoco somewhere between ca. AD 450-650 (i.e. 1600 BP). This range agrees with dates for Corozal phase downriver in the Parmana area provided by both Roosevelt (1978) and Zucchi et al. (1984) and the abandonment dates recorded by both Barse (1989) and the present Cotúa project in the Átures Rapids.

Beyond the chronology issue referred above, this period between the early and late occupation marks a milestone in the population of the area. The reasons behind the disappearance of the early ‘explorers’ (Early Picure Complex) are unknown, especially considering that limited climate records for relatively close locations such as the Guiana coast, appear to indicate stability (De Souza et al., 2019). More data needs to be analysed from sites along the river and further inland, combining paleo-climatic and radiocarbon records, to be able to ascertain what occurred half-way through the first millennium in this area to account for this apparent ‘disappearance’ (Riris, 2019 in review). Nevertheless, the Arauquinoid affiliated groups, which dominated this region during the last centuries before European contact, most certainly took over the Orinoco Basin, the current Venezuelan norther coast and the west Guiana starting in ca. AD 600-700.

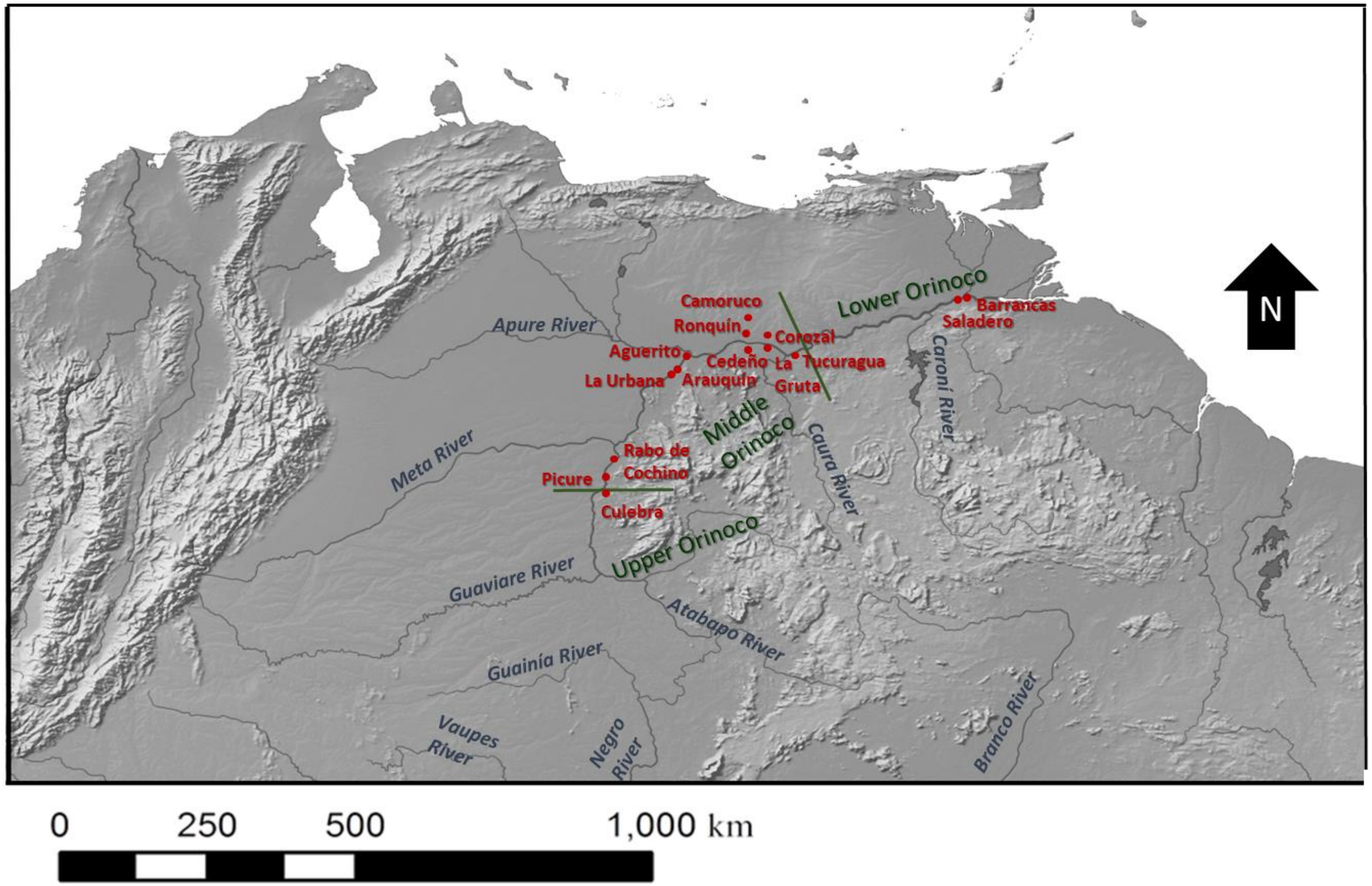


Figure 7-2. *Orinoco river basin divided into Lower, Middle and Upper Orinoco sections, according to the discussion proposed by this dissertation. Names of the archaeological sites mentioned on the text appear in red. .*

7.3 Elaborating Traditions and Riverine Contacts (AD 1000 - 1500): Multi-ethnic Communities and the Late Middle Orinoco Interaction Sphere

At the turn of the first millennium AD, a slow and fluctuating process of repopulation of the upper portion of the Middle Orinoco occurred, downstream of the Átures Rapids. Groups that re-occupied Rabo de Cochino and Picure sites along the river banks were different from the early explorers (Early Picure Complex), given the appearance of new multiple paste recipes, fashioning techniques, decorative motifs and formal modes that helped to define newly introduced ceramic wares to this region. Assemblages from this period comprised of multiple wares, co-occurring since the beginning of the new occupations, slowly but steadily added more modes to their 'vocabulary' through time.

Some of the introduced modes are common to all wares, suggesting that these occupations are not the product of single groups which alternated occupying a spot in the river banks. Instead, the pattern might be indicative of co-habitation and even were part of multi-ethnic communities. Technological and stylistic exchange, as well as innovation processes, were addressed by comparing production sequences and intra-site variability in order to distinguish trading from local inventions or developments, and to address the configuration of multi-ethnic groups.

The interaction among the producers and users/consumers of these wares are the key defining element of this last period, characterized as a time of population growth, change in settlement and diet patterns, trade and development of chiefdom or ranked organization systems in the wider Orinoco basin (Roosevelt, 1997 p.165; Spencer, 1998 p.112). This Late Occupation period can be subdivided into three different subsequent stages during which the ceramic materials gradually increased their variety of vessel forms and formal modes (i.e. rim, lips, handles), as well as their decorative techniques, most likely resulting from more enduring encounters with diverse groups along the Orinoco river banks.

7.3.1 On riverine multi-component assemblages, experimental pottery productions and territorialities (AD 1000-1200)

Based on the ceramic materials recovered at Picure and Rabo de Cochino, there was an initial stage of the occupation, between ca.AD 1000-1200, where the new groups responsible for this second large occupation wave where establishing themselves in this area (see ***Fig 7-1, 7-2***). The increase in artefact frequencies and 'minced' (i.e. highly fractures) pottery counts during this period suggests a more intense occupation of the area took place in the first millennium of the modern era. During the first centuries AD, three different wares occurred at both Picure and Rabo de Cochino site, with important differences that can be used to infer the character of the occupation, local variations and whether they correspond to different groups.

The Coarse Sand, Cauixí and Cauixí and Fibre wares shared several modes in both Picure and Rabo de Cochino sites: however, there are important variances in their distribution, production stages and formal modes that suggest that the communities that occupied these sites were constituted in a different way. Half of the ceramic potsherds recovered in Rabo de Cochino site for this period belong to the Cauixí ware, followed by the Coarse Sand ware (20%) and the minority of Cauixí and Fibre ware (5%). In contrast, Picure's samples are dominated by the Corse Sand ware (60%), with a third of Cauixí ware sherds (20%) and rare Cauixí and Fibre ware fragments (5%). Aside from the contrasting frequencies, the production, decoration and functional range of vessels in each site reveals striking differences between neighbouring communities and suggest different interaction scenarios in this area.

In Rabo de Cochino, the dominant ware is heavily tempered with sponge spicules and contains conspicuous argillaceous inclusions, the product of poor hydration of the paste and incomplete mixing of the sponges. Likewise, coil-merging in this ware is incomplete, and joints are often exposed or visible. Shaping was also made in a very wet clay state, making the vessels less resistant. Despite a more careless and poor technique seen in Rabo de Cochino, their Cauixí vessels had a wider functional range and decoration techniques. Vessel forms included unrestricted and restricted moderately deep bowls, some with strip handles, necked-ollas and griddles, all with round or flat lip treatments, as well as roller stamps for body painting and/or textile printing. Some open bowls presented decoration such as modelled applique anthropomorphic motifs, possibly lugs placed on top of the rim, as well as pink/mauve colour painting and thin linear incisions with punctation in complex triangular and geometric motifs in the internal surface below the mouth and the lip. Also, rare circular applique strips and parallel linear-incised semi-circular knobs were registered for this site. Finally, surfaces were covered with a watery slip and soft smoothing, followed by an incomplete firing under oxidizing conditions.

Coarse Sand and Cauixí and Fibre wares found in Rabo de Cochino island had a very distinct production sequence and associated formal modes. Tempered and non-tempered paste recipes (Chapter 6.7.6.2), one of which includes bark from non-local trees, are the first evidence of a different *chaîne opératoire*. They were both formed with coils and shaped via shaving, when the clay was leather hard, which prevents deformation, shrinkage and fractures. Merging techniques did vary between wares, with drawing gestures for the Coarse Sand ware and pinching gestures for the Cauixí and Fibre ware. Both surfaces in the granitic sherds were burnished while only the internal surfaces of Cauixí and Fibre sherds present the same treatment. Vessel forms within the Coarse Sand ware comprised necked-*ollas*, restricted moderately deep bowls and a cylindrical drinking cup, while Cauixí and Fibre ware was only seen in griddles. Regarding the decoration, a few Coarse Sand ware sherds had applique punctated strips and round nubbins. Lastly, all wares presented an incomplete firing under an oxidizing atmosphere, based on visible dark cores.

The sponge spicule wares, which constitute the majority of the assemblage, present the widest functional and decorative range on site. Additionally, vessel forms such as griddles, reported for the first time in the sequence, are evidence of a more permanent settlement in this area. Likewise, clay and tempering materials are likely to have been locally procured (see Chapter 6.3), suggesting this ware was produced in a nearby location, making Rabo de

Cochino a domestic/habitation site within the 'central circulation sphere' (*sensu* Gallay 2007) of the sponge spicule sherds. Lastly, the sponge spicule-tempered roller stamps present in this first stage suggest Rabo de Cochino could have been part of a wider trade or gift giving circuit, considering that such forms have been previously reported in Arauquinoid components at various sites, sharing common triangular excised motifs in a wide spread area, all the way from the Caura river confluence to the Western Llanos (Tarble and Vaz 1986; p. 2, 5).

In this context, Coarse Sand and Cauixí and Fibre wares must be considered as part of a domestic and everyday assemblage. Coarse Sand ware, with a distinct *chaîne opératoire*, was not made by the same group of people which produced and/or consumed the sponge spicule-tempered pots. Distinct paste recipes, fashioning technique, lip treatments and decoration motifs (see Chapter 6.7.6.2.1) support the argument of two different origins for both wares in which there was no technological or stylistic exchange between their makers and/or users. Likewise, given the limited vessel range, the granitic clay pots are most likely part of a 'peripheral circulation sphere' (Gallay 2007), even though its clay materials are potentially local (Chapter 6.3). Nonetheless, the vessel forms found on the assemblage are not specialised, highly decorated or exclusive, therefore, their incorporation does not replace or fulfil a function that the majority ware does not full fil. In the same way, Cauixí and Fibre griddles, which are found next to sponge spicule-tempered griddles, are not a specialised ware produced to perform an exclusive function. However, both Coarse Sand and Cauixí and Fibre wares are more resistant and less likely to shrink or fracture, for which they could have been acquired considering their better quality and performance.

In contrast, the Late Picure ceramic complex does not seem to correspond to a domestic or habitation site (a homestead). Despite the majority of the ceramics belonging to Coarse Sand wares, the limited functional range of the reconstructed vessels does not suggest a permanent settlement during this period. Granitic vessels found in Picure island, in the Átures Rapids, do not differ from the ones found in the Late Rabo de Cochino complex in terms of their production chain, however, they present a wider range of lip treatments (see Chapter 6.6.5.8.5) and more frequent decoration. Reconstructed vessels from this ware are mostly unrestricted moderately deep bowls, deep bowls and necked-ollas with large mouths (Chapter 6.6.5.9.2.1), associated with food preparation and consumption. The same forms were reported among the Cauixí and Fibre and Cauixí wares, although the latter ones had a smaller mouth and were not decorated. None of the wares included griddles.

Dominant Coarse Sand ware, made with local materials, did not present a wider range of vessels, and the ones reported were limited to cooking and food service purposes. Other wares were represented by similar vessels forms for which reason their presence in the assemblage was not meant to fulfil a specific function. Nonetheless, their production chain was not particularly different, and on the contrary, both Cauixí and Cauixí and Fibre wares shared fashioning techniques with the majority ware. Particularly, Cauixí wares were made from a different production sequence in Picure, with variations in the paste recipe, fashioning and lip treatments in relation to the ones described in Rabo de Cochino. In terms of its paste recipe, Picure ceramics have conspicuous fibre and tree bark tempering alongside sponge spicules. Possible explanations for this variation could relate to difficult access to sponges, which are not found in the rapids, and also to the initial stages of experimentation when groups from Picure were trying to incorporate spicules in their paste recipes. Further differences within the Cauixí ware are observed in the fashioning stage, where coils were better merged by using a drawing (i.e. *étirement*) technique and shaped by shaving, while the clay was leather hard. They also present burnishing operations in the external surface. Lastly, in terms of formal modes, Cauixí wares in the rapids present externally round lips.

The evidence of a shared technological tradition between the different paste recipes suggests a single component, with a majority granitic ware, and additional vessels made with newly developed paste recipes that resulted from encounters with other groups that circulated their pots in the area. Sponge spicule-tempered sherds do not resemble those of the contemporary Cauixí ware from Rabo de Cochino, as they combine different types of silliceous rich inclusions and lack similar fashioning and finishing techniques, as well as key similar vessel forms (e.g. necked-ollas and/or griddles). The Cauixí ware, as well as the Cauixí and Fibre ware in this case, are likely the product of experimentation from contact with foreign potters and/or the restricted availability of sponges and bark, which could only be accessed or collected during certain seasons (Moraes, 2013). The resulting vessel were not necessarily made on the island but perhaphs in the main river bank or nearby areas (based on the lack of evidence for a ceramic associated with a workshop), are plain and share similar forms with the majority Coarse Sand ware, for which they could have been made by the same social group.

Based on their paste recipes, decorative motifs and vessel forms, wares found at Rabo de Cochino site during this period can be related to different ceramic series previously reported for the Middle Orinoco, dated between ca. AD 600-1600. Cauixí ware can be associated to the various styles of the Arauquinoid ceramic series by its conspicuous sponge spicule tempering, thin linear incision and punctation organized in geometric decorative motifs around the lip and neck and by similar open vessels, griddles and cylindrical stamps. On the other hand, Coarse Sand ware has been associated to the Valloid series, based on the coarse quartz paste and the punctated strip decoration (Zucchi, Tarble and Vaz, 1984 p.162; Zucchi and Tarble, 1984; Blanco, 2004). In contrast, the Cauixí and Fibre ware is similar to one of the ceramic types reported within the Nericagua phase, in the Ventuari river confluence, defined by Evans, Meggers and Cruxent (1959) and Zucchi (1996), which is mostly undecorated and has a paste combining tree bark and sponge spicules. Other associations of the Cauixí and Fibre ware could be the Ware B+C of Aguerito site described by Zucchi, Tarble and Vaz (1984 p.162), which they associated to the Corozal tradition, part of the Parmana-Ronquín sub-area of the Middle Orinoco ceramic series defined by Roosevelt (1978) from the excavations in Corozal and La Gruta sites. This ware combines both fibre and sponge spicule tempering and presents open bowls and griddles as common forms. Additional modes characterizing this ware include decorated bowls with linear incisions, punctation, punctated strips and painting, which are notably absent in this ware in this stage at Rabo de Cochino site.

On the other hand, at Picure, the only direct association that can be made is between the Coarse Sand ware and the Valloid series, based on its paste and decorative techniques, while the additional wares are most likely made by this same people with variations on the paste recipe. This pattern has been reported before within the Arauquinoid interaction sphere, where various communities belonging to this macro-regional entity had variations in their paste recipes, surface treatments and decoration, while maintaining a shared technological and stylistic tradition (Coutet, 2011; 2016). A similar scenario is also reported in earlier interaction spheres such as the Barrancoid. As documented in the Guyana, groups with Abary and Mabaruma ceramics (ca. AD 300), affiliated to this series based on their modelled anthropomorphic motifs, decorated handles and incised spirals; have varying paste recipes using fine sand or tree bark, broken shells or mica (Versteeg, 1985; Rostain, 2016).

While the sponge spicule Arauquinoid-related wares are more common down river, the granitic and fibre tempered ones, associated with the Valloid and Nericagua or Corozal ceramics, are significantly more popular upstream in the rapids. Although their frequency could be associated to territorialities or areas of influence of the people with Arauquinoid and Valloid ceramics along the river, the occurrence of the latter in both sites along with the minority fibre and sponge spicule tempered ware, certainly suggest those territories were not exclusive and the river kept acting as a buffer zone during this period.

We also have to consider the distribution of certain wares in relation to the tempering materials. The sponge spicule tempering preference found in Rabo de Cochino could be explained by resource proximity and predictability: sponges abound in flooded river banks nearby this site. Meanwhile, tree bark, mainly belonging to the *Licania* genus is more abundant in the higher elevations in the Guyana highlands. Trees belonging to this genus are known to be located in mountain forest near La Reforma community, close to Culebra site and the Átures Rapids. In any case, a more systematic distribution of both sponges and *Chrysobalanaceae* family trees is required to confirm this hypothesis.

Beyond territoriality or access to raw materials, this period is marked by permanent settlements in the southern portion of the Middle Orinoco where two different kinds of communities lived. One settled on Rabo de Cochino Island and were part of the Arauquinoid macro-regional interaction sphere; however, they also used Valloid associated vessels and fibre tempered griddles as part of their daily cooking ware. These supplementary wares did not replace their equivalent forms in the predominant sponge spicule-tempered ware but could have been incorporated based on their higher quality. Fibre-tempered griddles found in the assemblage can be interpreted as a product of trade and functional preference. This preference has modern echoes in the study area, among certain contemporaneous indigenous communities in the Orinoco and Caura rivers, which prefer cassava graters made by the Ye'kuana indigenous groups and trade with them to incorporate this specific form into their own food preparation wares (Coppens, 1971). In contrast, the coeval granitic sherds seem to be part of a more systematic exchange with a Valloid associated group which produced these types of vessels based on their higher frequency in the assemblage. To argue exchange it is necessary to emphasize that the vessel forms available for this Coarse Sand ware had few vessel forms and there was no evidence of formal or decorative modes shared with the majority ware, which is expected in a co-habitation scenario where potters from different backgrounds are part of a single social group (Rouse, 1990 p.60; Gallay, 2007; Roux, 2019). The latter would suggest a constant interaction between three hypothetical groups but without evidence of a co-habitation consisting of a multi-ethnic community.

A second type of community existed on Picure Island. With a majority associated Valloid ware, this group was less permanent and more flexible in their pottery-making practices. They incorporated different paste recipes mostly as a result of encounters with communities producing sponge spicule-tempered and fibre-tempered ceramics. The technological changes implied for this period suggest a closer relationship among potters at Picure or in a neighbouring area, where they must have shared their knowledge in raw material procurement and paste preparation for this innovation to have taken place.

7.3.2 Transitional stage (AD 1200-1400): Pots, beads and roller stamps in the Arauquinoid and Valloid interaction sphere in the Átures Rapids

In this period the ceramic potsherds recovered from Picure site increased almost by half, suggesting a more intense occupation and perhaps population growth. New potsherds found on the island belong to two of the previously registered wares: Coarse Sand and Cauixí wares. However, the Cauixí and Fibre ware, present in the previous stage, is noticeably absent. Throughout this stage, the granitic ware maintained its dominance on the assemblage from this previous period, while the sponge spicule-tempered ware comprised only a fifth of the sample. Given their previous association to Arauquinoid and Valloid ceramic series, this distribution can be interpreted as a consolidation of the Valloid influence in this island, demonstrated by the reduction of the sponge spicule sherds that coincides with the disappearance of the Cauixí and Fibre's Corozal and Nericagua ceramics and the abandonment of Culebra site, upriver in the Cataniapo confluence.

In contrast to the previous occupation of the island, for this period we were able to identify two different components in the rapids. Coarse Sand and Cauixí wares had distinct production chains (see Chapter 6.6.5.9.2.2) and formal and decorative modes that suggest a clearly, well-defined Arauquinoid component present in Picure, while coexisting with the previously established Valloid component. Based on the former, this stage constitutes the first time when there is direct evidence of the presence of Arauquinoid ceramic bearing groups in the island and of their encounters with local Valloid peoples. Although experiments had occurred during their previous encounters in terms of paste recipes, newly reported grog tempering and shared formal and decorative motifs suggest a more stable, enduring contact between Valloid and Arauquinoid ceramic bearing groups.

One of the firsts ques that suggest a more intense interaction can be seen in the various paste recipes within the Cauixí ware. In this stage, Cauixí potsherds presented conspicuous sponge spicules and in rare cases some potsherds had grog inclusions, themselves tempered with sponges and fibres. Even though the latter paste recipe was uncommon, perhaps idiosyncratic, the recycling of siliceous rich potsherds as temper suggest that the potter knew about the content of the broken sherds and decided to use the same composition as the parent fabric, as they would most likely expand accordingly during firing, without risking shrinkage or fracture. Nevertheless, the addition of fibre-tempered grog suggest they were available in the production site, which raises question of their presence in an alleged Cauixí ware production locus, and if we consider their production groups associated to each ware to be independent. On this last matter, either fibre tempered vessels were present at the pottery workshops for Cauixí ware as part of the everyday manufacture (as in Rabo de Cochino), or there were fibre-tempered vessels in sites close to pottery workshops and the potters had access to them as tempering material. Either way, it still implies the simultaneous use of different wares in a shared context, supporting the notion of a period when people from different groups exchanged goods and knowledge on their craft.

Sponge spicule-tempered sherds also exhibited some decoration modes already present in Rabo de Cochino site in the previous stage, such as thin linear incisions, pink/mauve painting and punctation in the body and rim. Cauixí sherds also displayed rare round applique nubbins, punctated strips and thick incisions, which were identified as part of the Coarse Sand ware sherds in the previous stage and would suggest imitation and/or incorporation of Valloid associated decorative techniques. Likewise, Cauixí ware lip treatments, which were flat or round in the previous stage, adopted more uncommon forms such as the bilaterally flat, bilaterally round, internally round and tapered, some of which had already been seen in Coarse Sand sherds from Picure Island in the previous stage. Lastly, vessels forms were mostly unrestricted open bowls for both Cauixí and Coarse Sand wares, although rare restricted vessels, necked-bowls and shallow small bowls were only found in the sponge spicule-tempered ware.

The appearance of these new decorative modes in Picure in the Cauixí ware suggest an upstream movement of Arauquinoid-related peoples who brought a more diverse decorative and vessel form vocabulary. At the same time, this new component shows evidence of potters adopting new paste preparation techniques, lip treatments and applique adornments from their interactions with local Valloid ceramics-bearing peoples, who previously produced these modes. Appropriations of decorative motifs are commonly reported as part of exchange between contemporary Piapoco, Saliva, Achagua and Guahibo indigenous groups in the area, which adapted their vessel forms and designs according to the ones used by the receiving group within their trade circuit (Vidal, 1989 p.49-52). They are also easier to incorporate since most of the times they do not require to learn a new technique or a specific motor skill, but rather the adaptation of known techniques, such as incising and/or punctation-to create new motifs.

The ceramic materials suggest that the adoption of certain attributes, such as temper and certain decorative techniques, was very limited, present only in rare proportions and only in the sponge spicule-tempered wares. However, this period of expanding networks in the southern portion of the Middle Orinoco coincides with the first appearance in the sequence of beads and roller stamps in Picure's island, which might have involved the participation of various groups in a wider network system. The 26 beads recovered from Picure from this period were found in various shapes and production stages, suggesting there was a workshop on the island. Artefacts found from this stage included chert raw material in different colours, 'blank' beads with a preform but lacking a hole, as well as finished beads with different forms, such as disks, balls and cylinders. Additionally, slender and teardrop-shaped chert pendants were also recovered from this period (see ***Fig.7-3***). Moreover, roller stamps found at Picure Island, modelled with sponge-spicule tempered clay, confirm a more defined Arauquinoid component, while also reinforcing the trade or gift giving activities which are thought to have occurred in Picure during this stage.

Specialised markets oriented towards specific goods were not described in the early writings documenting trading activities in the Orinoco, and even well-known meeting and trading spots in the river such as La Urbana, were recognised in the 16th century for their manufacture of both shell-made *quiripas* and fine pottery plates (Zucchi and Gassón, 2002 p.70). Likewise, ethnographic studies among modern Piapoco indigenous communities, Arawakan speakers located at both sides of the Orinoco between the Meta and the Inírida rivers, reported exchanges of ceramic plates, jars and griddles for beads and *chinchorros* (i.e. hammocks) with Guahibo indigenous independent speaking communities (Vidal, 1989 p.52). Presuming that beads had an exchange value, as the *quiripas* or the latter glass-made *mostacillas* (Boomert, 1987; Gassón, 2000; Gassón, 2014), their appearance, along with cylindrical stamps and multi-component ceramic assemblages with shared modes, suggest that there was probable trading activity in Picure*,* as early as the 13th and 14th centuries.

Figure 7-3. *Beads from Picure Island. This picture includes some samples with various shapes and production stages. Courtesy of Stuart J.L. Laidlaw (RIP), 2018.*

Beyond their alleged trading value, both beads and roller stamps are used for body adornment, assuming stamps were used for body painting and/or for textile imprints. Their presence can be indicative of more complex relations and hierarchical societies with the need to convey symbolic affiliations, on a broad regional level –as part of Arauquinoid and Valloid interaction spheres- and also internally –e.g. class, phratry, gender-. Their appearance strengthens the argument of more intense contacts between groups in the area, in which ceramic vessels could be considered as documenting such encounters rather than emphasizing differences.

7.3.3 Consolidation of a Multi-ethnic Community (AD 1400-1500): Technological Innovation

During the last century before the first Europeans reached this portion of the Orinoco, the occupation of the Átures Rapids area reached its climax, as evidenced by the considerable increase of artefacts and minced pottery potsherds, associated with intense activity and, likely, population growth. However, artefact counts and distributions also revealed it was a fluctuating process, especially in Picure, probably associated with multiple visits and/or stays on the site. Despite of such recurrent occupations, the assemblage recovered from this last century of the late period in each site maintains the same proportions of different wares. In Picure site, the Granitic Family still represents more than half of the samples, while the sponge spicule-tempered sherds represent a quarter of the assemblage and the Mixed Fibre sherds continued as a minority. On the other hand, Rabo de Cochino site had a more equal distribution, with granitic and sponge spicule sherds each with a third of the samples, and Mixed Fibre Family ceramics with less than 7%.

In relation to the previous stages within the Late Occupation period, the materials at Picure had similar proportions, with a clear predominance of Valloid associated ceramics and a small presence of fibre-tempered sherds, which had briefly disappeared during the previous stage. In contrast, Rabo de Cochino site experienced a reduction of sponge spicule-tempered sherds within its assemblage, accompanied by an increase of the granitic potsherds. The latter could be a result of a more pronounced influence by peoples using Valloid ceramics expanding downstream and by the movement of the Arauquinoid peoples towards the west and the north coast (Tarble, 1985 p.60-63).

The three main wares which are present through this stage, which underwent significant changes in their production chain and formal modes, were most likely the result of a more intense and systematic exchange between groups. Technical inventions are not equivalent in Picure and Rabo de Cochino and this also reflects the different occupations registered in both sites, the former being most likely an *entrepôt* for trade and exchange and the latter a domestic habitation site.

The food preparation activity area excavated in Rabo de Cochino site (unit TU-C) provides a 'synchronic window' to evaluate a fairly complete 'kitchen' assemblage and the representation of each ceramic ware within it. The kitchen was identified from the griddles and *aripo* found *in-situ*, placed on top of rock slabs and adjacent *manos*, associated to a concentration of charcoal underneath, which was interpreted as a possible hearth. Firstly, the griddles and *aripo* found on top of the rock slabs belonged to the Cauixí and Fibre and Cauixí wares, respectively. Other forms found in the Cauixí and Fibre ware corresponded to short-necked bowls, fashioned in a similar way as the same forms within the Coarse Sand ware. The latter presented a wider range of unrestricted vessels within the assemblage with respect to the previous period, with restricted and unrestricted moderately deep bowls with strip handles and a large open deep *olla*. Few of the bowls presented decoration on the body, such as modelled applique zoomorphic motifs and punctated modelled round nubbins.

Similar to the previous stage, Cauixí tempered sherds belonged to a wide range of vessel forms and decorative techniques, as well as a poor-quality production. The former is based on the incomplete mixing of the paste, the incomplete merging of coils, the exposed joints and the shaping during wet clay state. Exclusive and unusual forms of this period within this ware worth noting are the *aripos*, the unrestricted large deep *ollas* with and without flat and large handles on the rim, the shallow open bowls and the moderately deep bowls with a tall neck or spout. Both *aripos* and bowls with a spout suggest an increase in the use of vessels for food consumption and serving. Among the decorative techniques applied on the body and rims of potsherds from this ware are thin linear incisions, punctation, punctated modelled applique nubbins and double linear-incised semi-circular knobs.

Despite the array of common vessel forms in all wares, paste recipes and fashioning techniques for each one of them are the same as in the previous stage, keeping them separate as part of different technical traditions. The Coarse Sand and Cauixí and Fibre vessels do not have such a broad functional range as their sponge spicule tempered counterparts, for which they could have been introduced to the assemblage through exchange. Other possible explanations such as them being manufactured by potters from a different community, perhaps some reallocated due to post-marital residence rules, cannot be completely ruled out, considering the distinct productions chains observed in these alien wares. However, ethnographic research shows that more often than not, potters immersed into the host community usually adopt the local practices (Lara, 2016 p.215; Roux et al., 2017 p.330) while keeping certain gestures and motor skills learned in the past (Roux, 2019). This phenomenon was not observed in the kitchen context, where coil placement and merging and shaping techniques remained different for each ware, despite having common vessel forms. The only adopted traits were modelled-punctated round nubbins in the Cauixí ware, used as decoration since earlier times in the granitic sherds.

Although the excavated domestic context (TU-C) from Rabo de Cochino site suggest technological and stylistic boundaries were fairly well maintained until the Late Occupation period, the refuse midden from the same site (TU-A) revealed more common traits shared between different wares. A rare small bowl with Sponge spicules with Granitic grog fabric, found at Rabo de Cochino, indicates pottery makers from both granitic and sponge spicule wares were not as independent and that opportunistic recycling and tempering experimentation could have taken place during this period at this site. Likewise, similarities in lip treatments and decorative techniques, such as externally flat lips and zoomorphic modelled applique motifs in both the Cauixí and Coarse Sand wares, suggest that common formal modes and decoration were also implemented by both traditions. Lastly, the presence of one rare

Coarse Sand roller stamp suggest innovations occur also within the granitic ware, which imitates this sponge spicule-tempered form used for textile and/or body painting, and which were associated with trade and gift giving. This cylindrical stamp appeared along one slender pendant and one jet (i.e. *azabache*), possibly used as body adornments. Neither of them had been registered before on this site and their presence might also suggest other activities took place on Rabo de Cochino, more associated to individual identity and representation.

Even though all wares amplified the range of vessel forms, lip treatments and decorative motifs, their production chains remained the same, indicating that no technological innovations occurred at this site. This conservative and more homogeneous ceramic set is expected within a domestic context, such as the one found in Trench C at Rabo de Cochino. However, the basic cooking ware assemblage from this riverine settlement of the Late Occupation did include imported/exchanged vessels from distinct groups, indicating they were flexible as consumers and, actually, preferred granitic wares based on their growing representation in the assemblage and their better performance. In relation to Cauixí and Fibre tempered vessels, their frequency in the assemblage is too low, suggesting they were obtained as part of a remote circulation sphere. Likewise, the griddles from this ware seem to be the only reconstructed form in this site, for which reason its incorporation in the assemblage could still be related to a functional preference, as suggested during the first stage.

In contrast, Picure site shows the merging of and experimentation by a truly multi-ethnic community. During this Late Occupation period, samples from all three wares registered main transformations in terms of technical innovation. Although such changes were rare within the assemblage, their idiosyncrasy was re-evaluated once we noticed it happened in every ware and beyond the imitation of its decorative motifs. During this last stage, Cauixí ware was made with much larger amounts of sponge spicules, and did not present as many argillaceous inclusions, suggesting a more appropriate hydration and mixing techniques. A few fragments also included granitic grog inclusions, as well as grog tempered with fibre and with sponges. Re-cycling of several types of potsherds indicates they were most likely discarded in a common space from which they were re-used as temper, suggesting there were no separate refuse areas. Grog tempering was not a common practice, based on its low numbers among the analysed sample, and it might have been the result of opportunistic searching for tempering material. However, it is a telling discovery since it suggests a flexible use of temper which did not imply any restriction on type of materials and/or ware, and it agrees with an ever more experimental stage in pottery production during these last years at Picure site. It might also be explained as a more restricted paste recipe since all of the grog tempered sherds found at Picure corresponded to small unrestricted moderately deep bowls, some of which were decorated with applique round nubbins and punctation. These decorated and relatively small forms were most likely associated with food service, food consumption or to contain small quantities of other kind of plants or seeds used for other purposes (e.g. condiments, hallucinogens, medicinal).

Besides a more complex paste preparation stage, sponge spicule-tempered sherds also show additional attachments such as thin-long legs and modelled anthropomorphic and zoomorphic figurines. A similar plastic preference was documented among the Coarse Sand ware at Picure, which maintained their production chain from previous years while adding attachments such as strip handles and thick-short legs. They also have new decorative motifs such as double linear-incised knobs or punctation on the rim, which had already been seen in the Cauixí ware in the previous period, as well as triangular incisions and double-applique round nubbins or '*mamelones*', which are exclusive to this ware. Lastly, both wares present overlapping vessel forms (see Chapter 6.6.5.9.2.3), for which no functional preference could be associated to their use on the site.

Regarding the Cauixí and Fibre plain ware at Picure, the only forms associated to this ware during this period were griddles, few unrestricted and restricted deep vessels and roller stamps. While open and in-sloping vessels presented a similar production chain as their Coarse Sand ware equivalents, the recovered fibre tempered griddles revealed very different fashioning techniques among themselves, for which it is unlikely they originated in a remote and unique pottery-making group. In this regard, the ethnographic data suggests that fashioning stages are usually the most invariable stage in the production sequence of a given pottery group (Gallay, 2007).

The few griddle sherds documented were shaped with both wet and leather hard clay (see Chapter 6.6.5.4), some of them with traces of beating with a circular tool on the surface of the vessel. Beating, used as a shaping technique similar to paddling, was most certainly used to flatten or even out a particular surface previously built with coiling. This technique was also registered in one Coarse Sand ware, an unrestricted deep *olla* with a simple contour, suggesting two possible scenarios. First, it could mean that potters from both the Valloid and Nericagua/Corozal groups were sharing a space, and developing new shared pottery-making technical traditions, such as this percussion technique. On the other hand, it could mean there was a common workshop in which potters were manufacturing both granitic and fibre-tempered vessels using this new percussion technique. This last hypothesis could be possible if: 1) they both shared a common fashioning technique, 2) there was a previous paste tempering experimentation phase registered on the first stage of the Late Occupation at Picure site (presumably done by a single group), and 3) there was an introduction of new vessel forms within the fibre-tempered group which included deep vessels and roller stamps, none of which had been reported before within that ware.

The presence of different fashioning techniques in the Coarse Sand and Cauixí wares is also worth noting since it suggests internal structural variations. The latter could be explained as the product of incoming potters which are trying to adapt, incorporate new modes and techniques and innovate their pottery-making practices. For instance, the Piapoco indigenous communities often present a high internal variation in their ceramic materials which are decorated and have different forms according to their function –i.e. ritual or domestic- or to the recipient's sex, age, role or rank (Vidal, 1989 p.36).

As with the previous stage, Picure site is a multi-component occupation with evidence of technical exchanges between the makers of co-occurring wares.

During this time not only did the people making Arauquinoid related vessels adopted some paste recipe modifications and re-used the other two wares as grog, but also the Valloid and Nericagua/Corozal components showed evidence of adopting new vessel forms and ceramic artefacts, such as roller stamps, and innovated their fashioning techniques. All of these changes imply a knowledge and motor skill transfer that could not be casual but rather the result of systematic encounters and shared learning. Likewise, the adoption of decorative techniques between wares is much more common in these last decades of the Late Occupation period in both archaeological sites; however, these modes are more easily transmittable and emulated, and do not require a difficult motor skill or technical change or innovation.

These multi-ethnic communities in Picure, which shared their pottery making practices and developed certain paste recipes and fashioning techniques, were most likely fuelled by other trading circuits in the area such as the bead exchange. These last ones increased considerably during this final stage, in which a total of 63 micro-lapidary artefacts, including a wider range of pendants and beads, were recovered from the island. The latter came in different shapes such as cylindrical, rectangular, disk, slender and ball beads, as well as ‘blank’ beads in a pre-form shape. The chert material from which the beads were made was abundant on the surface and throughout the excavation units at Picure, for which it is thought these artefacts were made in the island. Other type of artefacts made with the same material such as slender and teardrop pendants and polishers were also found, and similar to the beads, were most likely used as adornments and as part of necklaces or bracelets.

No evidence of shell *quiripas* or glass *mostacillas* was found on our excavations in Picure, as well as porcelain or glazed pottery, typical for the early colonial occupation of the rapids. The latter does not mean Picure Island was not occupied during the colonial period since we did not cover the entire island during our excavations. However, it is significant that early colonial settlements -if they existed on this island of the Átures Rapids- were nowhere near the petroglyphs on Picure’s north coast or the ‘Sacred Rock’, which are of great importance to the contemporary indigenous communities who still travel along the river to fish and to meet and trade, prolonging the river's *entrepôt* character until today.

7.4 CONCLUDING REMARKS

Since the first explorations of the Orinoco by the incoming Europeans on the second half of the 16th century, there is written evidence of the multiple indigenous groups that inhabited, travelled and traded along its banks. The Átures or Adoles, known as specialised traders who lived in the rapids named after them, were known for exchanging fish, as well as weapons, gunpowder and slaves (Mercado, 1966 p.70; Tapia, 1966 p.205-206). However, empirical evidence of precolonial trading in this area had not been identified, casting doubt on whether this practice was motivated by the arrival of the conquistadors (Zucchi and Gassón, 2002 p.67, 79). Archaeological research conducted previously in the Middle Orinoco and in the surrounding area of the rapids had already hinted on the co-occurrence of multiple ceramic wares, although not as a result of trading but as product of multi-ethnic communities or groups which used the occupation loci alternatively (Zucchi, Tarble and Vaz, 1984; Roosevelt, 1997 p.19; Tarble, 2007 p.190). The co-habitation or common/shared use of certain areas of the river banks, as shown by the ceramic materials, suggested contact or interaction but certainly not trade, for which a more systematic approached was much needed.

The analysis of ceramic artefacts has been used to solve questions on chronology, migration and ethnicity, based on an essentially cultural-historical approach where common morpho-stylistic attributes are made to be equivalent to one particular population and culture in a certain period of time. The aim to reconstruct cultural areas and their probable population migration routes intended to solve a much-heated debate between those who supported an Amazonian (Lathrap, 1970; Roosevelt, 1978; Zucchi, Tarble and Vaz, 1984; Zucchi, 2002) or a North-western Andean origin (Meggers, 1971; Sanoja and Vargas, 1974; Barse, 1989, 1999). Both models of origin and dispersal still co-exist (indeed, compete) based on a complex suite of contradictory dates (DeBoer, 1998; Boomert, 2000), and where research is limited to an area along the main canal, and the lack of systematic regional surveys that could provide single-component sites (presumably better preserved than in non-seasonally flooded areas).

Despite the complicated stratigraphy and few in-depth researched areas along the river, the almost 80 years of archaeological excavations in the Middle Orinoco are combining to form a new narrative, which addresses other discourses beyond the normative diffusion model. While migration debates should still be discussed; the technologies of production and dynamics among the different groups who inhabited this area during the pre-colonial era should be rigorously analysed in order to reconstruct movements of peoples and their material artefacts, their circulation and their intra and inter-group relationships.

By applying a new methodological approach to ceramic analysis concerned with technical traditions, this research thesis aimed to surpass the paste and morpho-stylistic classification, which equated the different recipes and decorative motifs with distinct ethnic communities. By considering a systematic reconstruction of the ceramics' production chain, using both macroscopic and microscopic analytical techniques, as well as a comprehensive modal analysis, we were able to reconstruct a specific technology performed by a face-to-face social group in a certain period of time (Lathrap, 1962, Cruxent and Rouse, 1958). Such technologies are learned and transmitted as a part of a group (Lave and Wanger, 1991; Bril, 2002). Pottery-making groups or workshops can co-exist and overlap within a common space, since they can correspond to internal social units within a single community, such as casts, clans or families (Roux, 2011, 2016, 2019). This approach allows a more nuanced reading of ancient ceramic production systems, circulation and the interaction among their makers and users in the Orinoco river.

New radiocarbon dates and carefully undertaken excavations conducted in three archaeological sites near the Átures Rapids provided the empirical evidence and framework to identify and discuss several distinct pre-colonial occupations, pottery productions and circulation systems in this area. Based on newly recovered data and comparisons with previous research, the present dissertation proposes interpretations and systematic explanations that can account for the co-occurrence of technological traditions through time, their relationships with each other and how they were associated with trade and exchange in an ever-present heterogeneous cultural landscape of the Orinoco, just before the Europeans arrived in the area. This landscape of interacting ethnic diversity was still evidenced during the 18th century, as attested by the many Jesuit ethnohistoric documents (Rivero, 1956 [1736]; Gumilla 1944). Even today, though islands are no longer centres of commerce, they still operate as an *entrepôt* for contraband between Colombia and Venezuela.

The Early Occupation period of this portion of the river revealed a much more recent time frame than initially expected and proposed by Barse (1989), with an early TL date of 100 BC- AD 600. The first explorers (bearing ceramics) of this area were most likely small groups visiting or camping for a short time to fish. During this early period, two different components were identified as co-occurring in both Rabo de Cochino and Picure sites. Both presented independent production chains, vessel forms, formal modes and decorative techniques, indicating that at least two different groups were scouting the river during this period. Both groups shared common vessel shapes, for which their association is not the result of a functional preference. No empirical evidence in terms of ceramic production and decoration was found to argue in favour of an exchange or emulation, suggesting they were not co-habiting or had a constant association. The absence of such relations as inferred from their ceramic vessels does not mean they did not meet and exchange other items of material culture, which points to obvious limitations of ceramic material artefacts to explore the full range of circulation and group interaction during the early occupation period.

Some 5 Km upriver, on the south side of the Átures Rapids, a local independent group occupied small camps in the Cataniapo-Orinoco confluence during the same period. Their plain (i.e. undecorated) and poorly elaborated vessel forms suggest there was a third different group in the area and that the rapids functioned as a border between the Middle and Upper Orinoco. While the early groups north of the rapids were associated with Saladoid/Barrancoid and Cedeñoid series, the remaining groups south of Átures could not be related with a specific ceramic series. As defined by Cruxent and Rouse (1958 p.25), a series agglomerates common styles which are believed to be historically related and to have a common (ancestral) origin. This category, useful to understand macro regional associations between certain archaeological sites, are often straightjacketing and homogenising terms that had prevented the acknowledgment of other groups, such as the early visitors in Culebra, which did not fit this classification.

At the same time that Saladoid/Barrancoid and Cedeñoid affiliated ceramics produced downriver in the rapids disappeared, Culebra site remained occupied until ca. AD 1155. During this time, this independent group adopted some Barrancoid decorative motifs and lip treatments, which marked the opening of the border at the rapids and their late association with a Barrancoid ceramic bearing group or with Barrancoid aesthetics. Although the incorporation of these attributes certainly suggests imitation by interactions or contacts, it does not mean they were both part of a single community in Culebra.

The Late Occupation period starts in cal.AD 1030-1480 and encompasses the most diverse and innovative of all periods. Since the very beginning, both a stable domestic and recurrently occupied settlement in Rabo de Cochino and Picure sites, respectively, show heterogeneous assemblages which are known to be characteristic of these late groups along the river. The presence of different wares in each one did not translate directly into a multi-ethnic community, since the association between them and their representation within the assemblage was analysed to see interactions, exchanges or co-habitation, as well as changing pottery production and circulation systems.

The Late Occupation period earliest stage (cal. AD 1000-1200) saw domestic plural assemblages and paste recipe experimentation within a single community in the Arauquinoid and Valloid interaction spheres. In Rabo de Cochino, the daily cooking ware was mostly composed of sponge-spicule tempered ceramics with poor manufacturing techniques, however, the minor presence of granitic ware and rare fragments of Cauixí and fibre griddles suggest this group consumed these supplementary wares, appealing to their better quality and a functional preference. This site also presented roller stamps, trading and/or gift-giving items, which would support the hypothesis of traded granitic vessels and fibre-tempered griddles. In contrast, Picure's assemblage, with a majority of granitic ware related to the Valloid series, has a common production chain with three different paste recipes, probably made through experimentation from contacts with sponge spicule, fibre and mixed tempering groups. Both cases indicate that the paste recipes are not mutually exclusive, nor do they necessarily correspond to different groups sharing a certain space. Rather, some of these distinct wares might have been used or produced by a single community.

During the second stage of this period (ca. AD 1200-1400), the assemblage of Picure island can be seen as multi-component, with clearly distinct wares associated with the Arauquinoid and Valloid series. The Arauquinoid component is very small within the assemblage but has crucial information to understand types of interaction beyond the initial experimentation with sponge spicule tempered paste recipes registered during the earlier stage. A few Cauixí ceramics incorporated grog from other siliceous rich broken potsherds, which suggest common deposition areas. More frequently, they added decorative and formal modes previously used in granitic vessels which are thought to imitate and appropriate this new vocabulary into their own, product of interactions between the two groups. Although ceramic materials only provided evidence of exchanges in one direction, the finding of roller stamps and beads production in Picure, suggest other trading circuits operating in the rapids as early as 13th-14th century.

Finally, between ca. AD 1400-1500, vessel forms from the Arauquinoid, Valloid and Corozal/Nericagua affiliated ceramic series found in both archaeological sites show common paste recipes with grog tempering, as well as shared decorative motifs, vessel forms and fashioning techniques. While Rabo de Cochino domestic site is more conservative in terms of only adopting decoration and lip treatments from other wares, the Picure assemblage suggest a more intense interaction, which produced innovation and required the transmission of new motor skills. New vessel forms and roller stamps, as well as rare new shaping techniques, were reported in Picure, suggesting co-habitation and shared learning, which likely occurred to encourage such changes. If the previous scenario is accepted, Picure could be the site where a multi-ethnic community existed, exchanging knowledge, goods and innovating in pottery manufacture techniques. Beads, pendants and roller stamps made in all different wares are also conspicuous in this later stage in this island, supporting a more intense trading before the arrival of the Europeans.

Throughout this last stage, and as in the Late Occupation of Culebra, decorative motifs are commonly found in various wares, suggesting they were easily incorporated. Their shared use reflects contacts and imitations but cannot be directly translated into trading or co-habitation since most of the times its application does not require a continuous or systematic learning process. Likewise, decorated potsherds correspond often to less than 2% of the assemblage, suggesting most of the sherds did not adopt new attributes during this late stage and that more structural changes, such as the ones described for Picure for the fashioning stage or new vessel forms, should be more significant to discuss multi-ethnic communities. Likewise, the different production chains revealed within the fibre-tempered griddles during this last stage suggest internal differences, which could be associated with pottery workshops, families or phratries, suggesting a more complex pottery-production system.

Considering that none of the studied sites in this project were single component sites or single pottery workshops, the plural and multi-component analysed assemblages recovered are appropriately reflective of a ‘*style of consumption*’. Following Tarble Scaramelli´s concept (2006 p.143) developed for colonial sites in the Middle Orinoco, the communities in this area did not seem to use most of the produced ceramic materials to express social affiliations or shared identities (Wobst, 1977; Wiesner, 1980; Schortman, 1989), but rather used a more isochrestic style (Sackett, 1977, 1990) approach, where formal variation and technical performance are more relevant than the iconological or communicational properties of the materials involved. Although decorative motifs do allow to affiliate the materials to larger macro-regional identities, the diversity of motifs recorded in a reduced number of vessels suggest that such associations were not as relevant as the functional aspect. Likewise, the common motifs which were exchanged between different wares indicates that decoration was flexible, easily incorporated and one of the first elements exchanged due to interaction between different groups.

While the analysis here presented refined the chronology of the area and their association with the wider Orinoco basin region, it also identified trading and interaction processes as early as the 11th century between riverine communities who inhabited this portion of the river, way before the arrival of the Europeans. It also allowed to recognize a dynamic cultural landscape in pre-colonial times in which both single and multi-ethnic communities made and consumed wares produced beyond their own technical tradition and were most likely obtained as products of trade and innovation. However, a more detailed ceramic production and circulation analysis requires the excavation of better-preserved sites, desirably pottery workshop and/or single component sites to be able to compare and confirm our hypothesis.

Based on our research, riverine settlements around the Átures Rapids reflect the encounter of various groups, which met to trade and even lived together in pre-colonial times. The recovered assemblages proved that everyday cooking wares included ceramics produced by distinct groups and reflect encounters, experimentation, exchange and innovation processes; thus, challenging the normative reading of the past in terms of successive communities and cultural areas. Despite predominant wares and their possible association with broader macro-regional identities and territorialities, their common deposition patterns demonstrate that several areas in the banks and the rapids acted as a meeting spot, making this portion of the Orinoco River a strategic area since the beginning of the Christian era and until today.

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