EMERGENCE OF SOCIAL COMPLEXITY IN THE PRECOLUMBIAN SITE JAVA, SOUTHERN COSTA RICA

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Socioceremonial centers are ubiquitous in the archaeological record around the world, and particularly in southern Central America, the region of interest for the present investigation. This research is about the development of one of those centers in Southern Costa Rica: the site Java, a precolumbian settlement located on a hilltop in the Coto Brus Valley and characterized by the presence of earthen mounds and the abundance of stone sculptures of various types, such as life-sized anthropomorphic figures and stone spheres. Three different perspectives about the origins and role of socioceremonial centers in early complex societies were explored: an elite oriented perspective, a community oriented perspective, and an scalar stress perspective.

An intensive shovel probe survey was conducted at the site in order to determine some of the characteristics of the entire settlement, such as the extension, the population size, the length and the intensity of the occupation, as well as potential differences in status, wealth, and participation in specialized activities across the site. Three stratigraphic units were excavated in order to collect charcoal samples for radiocarbon dating, as well as more detailed stratigraphic information. The radiocarbon dates demonstrated that the most intense occupation of Java occurred during the Late Aguas Buenas period (650 – 850 AD), and the population estimates based on the density of ceramics indicate that there were approximately 390 to 780 people living there during this period. A careful examination of the evidence collected revealed that socioceremonial activities had a prominent place for the general population of Java, not only for those living in the

central sector of the site. In addition, there were very little differences in terms of the quality of the ceramic and lithic assemblages across the site. This indicates that, aside from the possible differences in status inherent to living in a mound structure, there were no clear differences in wealth or participation in specialized activities among the population of Java. From the three proposed perspectives, the evidence supports more strongly a scenario where the socioceremonial center in Java emerges as a response to the scalar stress generated by the population growth of the Late Aguas Buenas period.

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1.0 Introduction

Socioceremonial centers are ubiquitous in the archaeological record around the world, and particularly in southern Central America, the region of interest for the present investigation. This research is about the development of one of those centers in Southern Costa Rica: the site Java, a precolumbian settlement located on a hilltop in the Coto Brus Valley and characterized by the presence of earthen mounds and abundance of stone sculptures of various types, such as life-sized anthropomorphic figures and stone spheres. In spite of the impressiveness of the material culture at the site and the large size of the settlement, only one small research project had been conducted there before the current investigation, around 20 years ago.

Figure 1.1 Part of the hilltop where the site Java is located.

This site stands out in the region because of the size and the material culture mentioned. But it also represents a great opportunity to explore relevant theoretical issues related to the role of socioceremonial centers in small scale societies, such as the associations between socioceremonial activities, social complexity, and hierarchy.

The perspectives about the role of these centers are as diverse as there are centers. Here we will first review those perspectives that consider ceremonial centers as part of the social organization of groups, or even part of the mechanisms for social change. Then, we will consider the importance of cooperation in the emergence of socioceremial centers. This chapter will end with an introduction to the research questions generated from the discussion on socioceremonial centers.

1.1 Perspectives on socioceremonial centers

Socio ceremonial centers appear in many regions of the New World simultaneously with the emergence of social complexity, or even before (Burger and Rosenswig 2012). These are sites with monumental architecture, in some cases non-residential, as well as special items, including stone sculptures, or with a particular style of artistic representations. In sum, these are places with a considerable investment in public works that have no pragmatic use (Trigger 1990), at least in the modern sense. For this reason, these sites are considered ceremonial, ritual, or religious centers.

Archaeologists and cultural anthropologists have proposed many different explanations for the role of these ceremonial centers in the emergence of social complexity. In order to facilitate the discussion, these perspectives have been divided into three categories: elite oriented, scalar stress oriented, and community oriented perspectives. The first two categories contain explanations that present socioceremonial centers as part of projects or institutions that are sometimes conducive to the emergence of social differences and hierarchies. One of the differences between the first and the second categories is that in the elite oriented explanations, socioceremonial centers are aggrandizing projects, while in the scalar stress explanations ceremonial centers are a social necessity and they may or may not facilitate the emergence of hierarchies. In the third category of explanations, the community oriented ones, socioceremonial centers are places where relatively egalitarian communities gather to carry out activities conducive to maintaining their particular kind of social organization. In the following sections, we will review these categories in more detail, and identify their archaeological manifestations.

1.1.1 Elite oriented perspectives

In the first perspective, the construction of socioceremonial centers is one of multiple possible strategies used by aspiring leaders, aggrandizer individuals, or “big men” in their quest to obtain political and/or economic power over their group. In this scenario, aspiring leaders claim connections to divinity, or restrict the access to ritual knowledge, in order to legitimize a hierarchical social organization with them at the top. Other possible strategies are to control the access, trade or exchange of staple or luxury goods, or to coerce the population through the use of military power (Earle 1997). In other words, socioceremonial centers are one of several options available for aspiring leaders to establish their power. Some authors argue that ideological sources of power, which include ceremonies, rituals and belief systems, are weaker or less effective than the other sources (Earle 1997), while for other authors ritual-based authority is actually a more powerful kind of authority because it is “intangible” and “difficult to argue with” (Potter 2000).

This perspective is exemplified in Rick's cynical view about the elites in Chavín de Huantar that he describes as manipulative and calculating:

> "Early authorities were building contexts laden with symbols and populated with ritual that was channeled by tradition, fueled by self-promoting creativity, and aimed at developing paths to authority and power […]Monumental Chavín is not likely to result from random or system-serving actions of emergent authorities nor anything approaching the cohesive or devotional theocratic model mentioned earlier. In the multiple media used or transformed at Chavín—landscape, architecture, decoration, light, sound, drugs—I find evidence of finely tuned manipulation on the part of the site's planners, executors, and orchestrators. This was an attempt to promote a vision of the world at variance with prior experience, a world of differentiated humans of intrinsically different qualities, among them authority" (Rick 2004:86).

In the Mesoamerican region, Olmec monumentality has been interpreted in a similar way: "Because of the specialized and extensive manpower involved in the production of these monuments—including their sculpting and the costly, labor-intensive acquisition of materials—elite individuals likely controlled the practices of official commemoration and the construction of historical narratives inscribed in stone" (Mollenhauer 2014:23). Although there is more space for the agency of different sectors of the population in this interpretation, Mollenhauer also considers that these monuments were necessarily produced by hierarchical groups, commissioned by elite patrons, and that their placement and the destruction or erasure of features was controlled by elites.

As mentioned above, the use of coercive force or warfare is an alternative strategy within this perspective. The participation in warfare can also be an opportunity for aspiring leaders in early complex societies to achieve or consolidate their position. Authors like Elsa Redmond (Redmond 1994a, 1994b) and Mary Helms (Helms 1979, 1993) have proposed that participation in warfare was important for aspiring leaders in tropical complex societies of the New World because active participation in raiding and other bellicose activities allowed them to attain a circumstantial kind of leadership and accumulate social status and material forms of wealth in trophy heads, weapons, tools, ornaments, etc. Even though ceremonial, bellicose and even economic activities are not mutually exclusive, usually one of them is more prominent than the others in the elite oriented cases. Haas, Creamer, and Ruiz, for example, interpret the development of social complexity in the Peruvian region of Norte Chico from an elite oriented perspective (Haas et al. 2004). These authors consider the elite strategies discussed here (economic, military, and ideological control), and they find no evidence of warfare, only potential evidence of economic control, and stronger evidence of control based on ceremonial activities. We will return to an example from Norte Chico from a different perspective in the next section.

Finally, there is a special category of items that are common in small scale societies which are relevant enough in their social organization to earn a place in the archaeological literature from the last two decades: inalienable objects. These are objects are rare, generally do not circulate widely, they are used in ceremonial activities and require special knowledge to produce, among other characteristics (Mills 2004). They are valuable as repositories of knowledge, prestige, and identity but they lack economic exchange value. Because this is such a general category, inalienable objects have been found to facilitate social hierarchies in some cases and impede or defeat them in other cases (Kovacevich and Callaghan 2013; Mills 2004). Relevant to the elite oriented perspective is Mills' observation that inalienable objects that are kept by specific groups are a key element of how social differences are created in cases such as the Ancestral Pueblo people in the Southwest, where inequalities are based on ritual knowledge, rather than in economic wealth.

1.1.2 Scalar stress perspectives

This approach understands ceremonial activities (and their architectural manifestations) as a solution to manage scalar stress, i.e., the issues associated with an increase in the size of a community when it grows beyond a certain threshold, particularly conflict or friction between non-kin individuals. Archaeological studies about the effects of scalar stress in small scale or early complex societies set this threshold somewhere between 100 and 200 individuals (Bandy 2004; Johnson 1982). This means that, as a community reaches a population size in that range, the number of interactions between individuals increases to a degree where anonymity is possible, therefore the mechanisms used in smaller groups to monitor individual's behaviors (reputation, reciprocity) are not enough to maintain a functioning society. At this point, the community will have two options to deal with the scalar stress issue: "(1) The village fissions or (2) institutions and practices emerge—are produced and subsequently reproduced— that manage internal conflict in such a way that fissioning is not necessary" (Bandy 2004:323). These institutions are often called integrative institutions.

Although there are a variety of integrative institutions that deal with scalar stress or generate cohesion, religion or ritual activities have been identified as one of the most common ones. Religion precedes issues of scalar stress, but the role of religious activities is what changes as populations increase in size and nucleate. The Great Kivas in the Southwestern US, have the characteristics of integrative institutions. They appear with the exponential demographic growth of local communities (from tens to more than 100 people). The activities conducted at the Kivas are initially a combination of domestic and ritual activities, but as the population size grows even more, around more than 200 people, the kivas have less evidence of domestic activity, and become exclusively ritual spaces (Adler and Wilshusen 1990). Martín and Sol (2021) explore this idea through three case studies of societies of different scales (Upper Térraba region of Costa Rica, North American Pueblo Southwest, and the Upper Grijalva Basin of the Maya region), and propose that, as the size of the communities reaches the scalar stress threshold, religion takes on a managerial role. As communities in each one of these three cases grow demographically, the number and size of religious facilities correlates better with their population size, and they interpret this as an indication that the sociopolitical organization units correspond with religious congregations.

Returning to the more general perspective, if we focus only on the issue of how communities overcome the friction caused by scalar stress, the type of integrative institution is to some degree irrelevant; what matters is the fact that an integrative institution is created to begin with. However, if we want to understand why different types of integrative institutions emerge in different places, we do need to think beyond the issue of scalar stress, and study the particular conditions of the case in study.

In these contexts where ceremonial activities and institutions are a response to scalar stress, the development of sociopolitical hierarchies is possible but not inevitable. In cases of early complex societies where hierarchies do develop, Berrey et al. (2021) suggest that the spacing of households (therefore the level of interaction between households and individuals) is related to how well integrated the local economy is, and variations in the level of integration tend to correspond with either an economic base of power for aspiring leaders in the case of well-integrated local economies, or a ritual based power in the case of not-so-well-integrated local economies. Although these authors do not deal with the concept of scalar stress in that particular work, their proposal helps us to understand some instances where religion takes on this managerial role. In the context of this discussion on scalar stress, the observation by Berrey et al. would suggest that the difference between cases with economic versus religious integrative institutions is related to the difference in the level of interaction between households (more compact vs relatively dispersed settlement pattern).

The role of warfare also comes into play in cases of scalar stress in two ways. On the one hand, the threat of raiding and violence might be one of the factors that forces a community to stay together even when the scalar stress starts to represent an issue. On the other hand, defense against raiding and violence requires intense intra-group cooperation, and the institutions that emerge to manage that cooperation might end up becoming integrative institutions. The kind of warfare that would characterize a group under scalar stress would be at least partially different from the kind experienced by a group where the construction of ceremonial centers is directed by aggrandizers. On the scalar stress case, warfare would be a community wide concern, and the efforts might be directed towards the collective defense. On the aspiring elite case, the emphasis might be in the achievements in warfare of the aspiring individuals and their representation in material culture (as a form of propaganda).

Inalienable objects, just like in the case of the elite oriented perspective, might play an interesting role in the scalar stress perspective: the existence of these objects, especially when they are scarce, help us to identify potential hierarchies in cases where there are no economic differences but instead inequalities based on restricted access to religious knowledge and ceremonies.

1.1.3 Community oriented perspectives

There are cases where early monumental centers were built by nonhierarchical societies that developed complex organization systems, while staying relatively egalitarian in sociopolitical terms. In these cases, ceremonial centers are places for community building activities, such as the construction of the center itself (Bernardini 2004), or their use as landmarks that accumulate meaning for a population over time (Bender 2002; Thompson and Pluckhahn 2012). From this perspective, socioceremonial centers are built by and for a community, and their construction and use are part of a long-term dynamic, more than a project or a single event (Thompson and Pluckhahn 2012). They might start as places where populations with some degree of mobility gather seasonally, and they might become part of the landscape quite literally (as monuments are built) as a product of repetitive use over generations. Thompson and Pluckhahn use the term "persistent monumental places" to denominate this kind of sites, and they suggest that a short-term perspective in the study of these places results in oversimplified interpretations that link monuments with the emergence of hierarchies, because hierarchies are only a possible end result of a process of "the making and remaking of the socio-political and ritual landscape within the broader social, economic, and environmental sphere" (2012:50). Authors like Scarborough and Lucero (2010) argue that, given the right circumstances, social complexity can exist without the presence of hierarchy at all. They examine different cases of populations from wetlands around the world where water "acts as the principal force in unifying a community and structuring many of its activities", and "absolute hierarchies are thwarted by equalizing ideologies expressed via myths, folktales, and other creeds kept in the forefront by ritual authorities and sacred rules of landscape usage" (Scarborough and Lucero 2010:200). Within this set of explanations, the development of social hierarchies is a process relatively independent, sometimes parallel, to the organization of religious or ritual activities with their supporting infrastructure. In the case of the Hopewell geometric earthworks, for example, there is no permanent occupation at the sites, not even burials within the monuments themselves, but they are massive constructions. Based on the analysis of five sites from the core of the Hopewell area in south-central Ohio, Bernardini (2004) proposes that people gathered at these sites specifically for the construction of the earthworks to connect with large social networks. On the other side of the continent, in the Peruvian region of Norte Chico, the Caral site presents some of the earliest monumental architecture for this region, and a variety of material culture associated with ritual activities, such as flutes, figurines, *Spondylus*, human sacrifices, stelae, carved bones, and plants with no domestic use (e.g., coca) (Stanish 2017:198-206). However, Caral has little to no evidence of permanent occupation, and it is interpreted as a place "where people congregated in prescribed times" (Stanish, 2017: 206) to perform ritual activities possibly associated with astronomical phenomena. In sum, some cases where ceremonial centers are interpreted as places for community building, the populations that built them are characterized by some degree of mobility and these sites become landmarks for populations that return there again and again to commemorate or celebrate rituals. These groups might or might not develop strong social hierarchies.

In the other two perspectives discussed here, the role of warfare is often discussed along that of ceremonial centers. However, this is not the case for the community-oriented perspectives. One reason for this might be about the time scale: ceremonial centers are used over long periods of time that are not comparable to the timing of other processes such as the emergence of hierarchies or small-scale warfare. And the function of ceremonial centers as community building places is farther from bellicose activities than centers as aggrandizer projects are.

Inalienable objects have been discussed in the previous sections as potential indicators of the existence of social inequalities because of their scarcity (individuals associated with the inalienable objects have more prestige and/or authority). However, there are cases in which inalienable objects might be "used to promote communal identities, rather than the individual identities of particular leaders" (Mills 2004: 240). For example, when they are reproduced in the form of replicas, or when parts of the object are circulated among the general population (Kovacevich and Callaghan 2014:3).

1.2 A note on cooperation

The concept of cooperation is key to understand why socioceremonial centers may emerge from such different contexts and have the variety of roles as presented before. Based on game theory, and an extensive examination of the ethnographic and archaeological record, Stanish (2017) states that cooperation is not only possible but very common in stateless complex societies, because people do benefit from cooperating in groups where reputation is important. This author contrasts the relevance of cooperation with that of coercion, which is more emphasized in the aggrandizer focused explanations. Ceremonial centers and activities appear in small scale societies because, although cooperation is a beneficial and efficient way of gathering resources, it requires some sort of mechanism to organize labor and control the free rider problem; in this case rituals that provide the structure and sanctions to deal with those issues. From the cooperation perspective, the development of strong hierarchy is *possible* but not *necessary* to explain the construction of monumental architecture and the aggregation of people around ceremonial centers. The implications of this perspective for understanding socioceremonial centers is that monuments are the materialization of ritual based sociopolitical organization. Another important detail from Stanish's model is that intensive ingroup cooperation can take other forms, apart from the construction or maintenance of ritual facilities, such as raiding.

1.3 Research questions

Through this discussion, we have established that the relationship between monumentality, social complexity, and hierarchies can take different forms, and in some cases the hierarchical element might be even non-existent. However, the two perspectives exposed at the beginning are still useful to structure our understanding of the role of socioceremonial centers in complex societies, as long as we question, instead of assume, what is the place of ceremonial activities in a trajectory of social change, and what kind of trajectory results in what kind of social organization. Aldenderfer (2010) points out that religion is often an enabler of inequalities or resistance to inequalities in small scale societies, but: "The problem, of course, is to determine the circumstances under which religion is traditional or becomes transformative, and how the material aspects of religion reflect (or fail to reflect) societal change and the appearance of more robust and persistent forms of social inequality".

Table 1 is a summary of the three main perspectives discussed here about the relationship between socioceremonial centers and social complexity.

Table 1 Perspectives on socioceremonial centers

Hierarchical organization	**Egalitarian or hierarchical organization**	**Egalitarian organization**
Elite organized and controlled ceremonial centers	**Ceremonial centers as response to scalar stress**	**Community organized and managed ceremonial centers**
Organized by aggrandizers	Organized by community or elites	Organized by community
One of several possible elite strategies. Coercion	Cooperation, ritualization, integration	Cohesion, maintenance of social memory
Intensive/permanent occupation over short periods	Permanent occupation, demographic growth.	(Seasonal) occupation over long periods
Settlement pattern: nucleated	Settlement pattern: nucleated	Settlement pattern: dispersed
Emphasis on monumental objects, individuals	Emphasis on the ceremonies that can integrate populations	Emphasis on landscape modifications
Activities: feasting, ceremonies to legitimate elites' connection to divinity	Activities: rituals that organize acquisition and distribution of communal resources	Activities: commemoration, burials, communal feasting
Warfare: opportunity for accumulation of prestige	Warfare: opportunity for intra group cooperation	
Rare inalienable objects that do not circulate	Rare inalienable objects that may or may not circulate	Inalienable objects that circulate
Other characteristics: wealth accumulation, other economic activities like craft production and exchange	Other forms of cooperation, potential integrative institutions: raiding, landscape modification for cultivation.	Lack of evidence for wealth accumulation. Large scale constructions.
Examples: Chavín de Huantar. Olmec monuments	Examples: Southwest Kivas. Upper Térraba.	Examples: Caral. Hopewell

The three perspectives presented before are relatively ideal models based on specific examples, but they may overlap in two ways: 1. There could be two very similar monumental sites that are the product of different trajectories. As we can see in the chart based on the references used here, monuments tend to emphasize different aspects in different models, but they are not necessarily drastically different. For this reason, a variety of characteristics are fundamental to differentiate between models. 2. A single case might fluctuate between these models through time. As we have discussed, the trajectories of hierarchy development and construction of socioceremonial centers are relatively independent. This means that a mobile, egalitarian group may decide to start building monuments, and continue with their egalitarian lifestyle for a long period, and eventually change their social organization for a hierarchical one and still take advantage of the ceremonial center in a different way. This is in fact the explanation that Pauketat (2000) proposes for how Mississippian monumental mounds are built: commoners accept to participate in their construction because the practice is not that different from traditional, communal activities; but one unanticipated consequence of building those mounds is the consolidation of a system of domination by elites. All of these models or perspectives have in common the importance of cooperation at the community level at the beginning of the process of socioceremonial center construction. What makes the difference between them is the point when they start with this process, in comparison with the point when hierarchies emerge, if they do, and who benefits the most from the existence of that ceremonial center.

The question of what is the role of a ceremonial center in a small scale, early complex society is very open, and some of the more specific questions about centers that can helps us answer this are:

-Was the social organization of the community more hierarchical or more egalitarian?

-Was the ceremonial center a place of seasonal gathering or a permanent settlement?

-Were activities other than ceremonial or religious ones carried out in the center?

We will revisit these questions in the context of the site Java and the Diquís region in the following chapter.

2.0 Regional background

2.1 Geography

The site Java is located at 600 m.a.s.l. in the slopes of the Coto Brus River Valley, which is part of the Térraba Basin in Southern Costa Rica. It is approximately 2 km away from the Coto Brus river, but supplied with water by several nearby streams, and a spring right next to the site.

According to Herrera (2016:25), the climate in the Térraba Basin is characterized by periods of conditional or absolute drought between December and March. The soils begin to recharge moisture after the start of the rains in April, and there is excess water for the rest of the year. Herrera (ibid.) concludes for the Térraba Basin, that the aridity in this area is low and the surplus [in evapotranspiration] is very large. In the case of Java, most of the water streams or quebradas around the site have water all year long; only the smallest streams are relatively dry sometime during that period between December and March.

The main economic activities in the region are agriculture, cattle breeding, and environmental conservation and ecotourism. Figure 2.1 shows the diversity of the landscape in the region, including cultivation fields, pastures, and forest. The main agricultural products are pineapple, coffee, sugar cane, other staple grains, and tubers (Inder 2014). The International Park La Amistad (PILA in Spanish) is the largest conservation area of the country and it is located in this region. Half of the park is located in Costa Rica and the other half is in Panama. Several of the communities in the Coto Brus River Valley are developing eco touristic projects that contribute to the conservation of the park, and, at the same time, generate income for the communities.

Figure 2.1 Typical landscape in the Coto Brus river valley.

2.1.1 Soils and agriculture

There are three types of soils in the zone where the site is located in the Coto Brus river valley: Entisols, Andisols and Ultisols. These soil types are described in Alvarado and Mata (2016) as having poor fertility in comparison with other types in the country, however they also mention a variety of agricultural activities that are conducted in these soils in Costa Rica anyways.

Entisols are very recent soils with little development, therefore they present shallow rooting depth and high risk of flooding. Nevertheless, these soils are currently used for annual crops and cattle raising (Alvarado and Mata 2016:65). Andisols are formed by volcanic ash deposits, and have moderate fertility depending on the area. For example, the Andisols from Southern Costa

Rica have poorer fertility that the Andisols in the Central Valley. Agricultural products such as coffee, sugarcane, vegetables are produced in this type of soil (ibid. 68-70). Ultisols are “the oldest and most weathered soils of Costa Rica” and are considered marginal for contemporary agriculture (ibid. 73). However, according to Alvarado and Mata (2016), if properly managed, these soils can be used for cultivation. Actually, some of the main products from Southern Costa Rica are grown in these soils: pineapple, coffee and Gmelina arborea wood. More importantly, Ultisols might have been used in the past for slash and burn agriculture.

In summary, these soils in and around the site Java might have a lower fertility in comparison with other soil types in the country, especially for modern large scale agriculture standards, but not necessarily for smaller scale agriculture. In fact, Costa Rican soils are “moderately fertile by global standards, but very fertile compared to other tropical conditions” (Alvarado and Mata, 2016:86).

Recent work with lake cores has shed light on the history of agriculture and ancient climate conditions in the region. One of the sites where this kind of research has been conducted is Laguna Zoncho, located nearby the town of San Vito, approximately 15 km away from the site Java. Taylor et al (2013:37), cited in Taylor et al. (2020) and based on stable carbon isotope analyses, identified two periods of agricultural decline in Laguna Zoncho from 1060– 920 cal yr BP and 830–640 cal yr BP that might be linked to dry periods or other climate conditions. The first period corresponds roughly with middle of the Chiriquí archaeological period, and the second one corresponds with the latest Chiriquí period, right before the arrival of the Spaniards. Laguna Zoncho is closer to San Vito, where the Coto Brus river originates but it is probably the nearest area to Java where we have climate data with this level of precision. What we know from the relative ceramic chronology in Java is that it corresponds roughly with the situation in Laguna Zoncho: the main occupation occurred during Aguas Buenas, and there was still some occupation of the site during early Chiriquí, but there is no indication that the site was occupied at all by late Chiriquí. The timeline of archaeological periods and major events in Laguna Zoncho (Figure 2, Taylor et al. 2020) shows the end of agricultural activities around this lake in the first part of the Chiriquí period, around 800 cal yr BP.

2.2 Ethnohistory

The earliest written sources from Southern Central America correspond to the Contact period chronicles, written by the Spaniards who arrived here during the sixteenth century. These documents are mostly letters stored in the Archivo General de Indias, and edited and published by León Fernández (1976). Many of these letters, particularly those written by Juan Vázquez de Coronado [1563, published in Fernández 1976] about his expedition to what is now Southern Costa Rica, mention the presence of chiefs and lords who rule over towns or *palenques* (long houses) and who possess large quantities of gold, and use it rather casually to negotiate deals with other chiefs, or with the Spaniards. In fact, Vázquez de Coronado is told more than once that each chief has exclusive access to a source of placer gold, and while he never gets to see these sources personally, the gold figurines that the chiefs carry are a common topic in his letters. Aside from gold, chiefs have wealth in the form of cacao, corn, and textiles that they also use as gifts in negotiations.

Contact period chronicles in general describe a situation of intense warfare between different *cacicazgos* or chiefdoms. According to these chronicles, chiefs achieved high status and political power from successfully participating in war-related activities, such as raiding and captive taking (Ibarra 1990, 2012). The first Spanish expedition to this territory was led by Juan Vázquez de Coronado in 1563 who traveled from the Costa Rican Central Valley to the Pacific coast, and from there to the South, visiting several *cacicazgos* along the way (Vázquez de Coronado 1976). It is worth describing here in detail one particular episode of this trip that illustrates the context of conflict: Vázquez de Coronado establishes an alliance with the cacique of Quepo, a town in the coast, where this chief provides a group of Indians to participate in the expedition in exchange for the Spaniards rescuing his sister, who had been kidnapped by the cacique of Couto, an inland town further to the south. The Spaniards arrive at Couto after a few days traveling and attempt to enter the town, but they are violently repelled by the Indians living there, and several Spaniards end up badly injured. They describe the settlement of Couto, with at least 65 large multi-family houses (which implies a population of around a thousand people or more), as defensively located between two rivers and surrounded by a palisade with only two entrances – a reflection of the intense violent conflict in the area. According to Juan Dávila (1566) (cited in Fernández 1976), another conquistador that participated in the expedition, there was another settlement across the river, of a slightly smaller size, where the inhabitants of Couto took refuge after their settlement was set on fire. The precise location of Couto in southern Costa Rica has been, and still is, a matter of debate among archeologists and historians, but more importantly, the episode in Couto shows that warfare was intense and frequent enough in this area that the major settlements were fortified, and people were prepared and organized to respond to an attack.

These ethnohistoric documents suggest a hierarchical organization among the indigenous populations of the late precolumbian/contact period in which chiefs had access to high-value wealth items, probably produced through craft specialization, such as gold and textiles; in addition, they control wealth in the form of both staple and special-purpose crops (maize and cacao); finally, they form alliances through warfare and possess captives. Gold is particularly important as a form of wealth because control over placer gold is supposedly exclusive.

2.3 Archaeology

The current territory of Costa Rica includes three main archaeological regions that roughly correspond with geopolitical divisions: Greater Nicoya, Central Valley and Diquís. Although there are some similarities in the trajectories of social change across these three regions, a closer examination of subregions reveals a great deal of variation (Murillo Herrera 2010), especially in the timing of changes and in the levels of sociopolitical hierarchy.

The northern plains, known as the Greater Nicoya archaeological region, was inhabited by small groups of hunter gatherers for most of the pre-Columbian sequence. Villages or population centers, as well as evidence of sociopolitical hierarchy, appear relatively late here in comparison with the other regions, around 900 AD (Lange 1984, 1992). The Central Valley and the Caribbean coast form the Central region, where the first inhabitants were also mobile groups dedicated to hunting and gathering, but after a dramatic increase in population, large, nucleated villages appear and agriculture becomes widespread around 300 AD (Snarskis 1986, 2003). The southern Pacific coast and mountain systems correspond to the Diquís archaeological region, the focus of this study. The earliest groups in this region were small, dispersed, and mobile, but around 300 AD more sedentary settlements and a few regional population centers emerge (Drolet 1983, 1992). Staple foods in pre-Columbian Costa Rica included root crops like bitter manioc, tree crops such as avocados, as well as maize and beans (Snarskis 1981).

The Diquís subregion, where the site Java is located, is part of a larger archaeological region called Great Chiriquí that comprises the Southern Pacific of Costa Rica and Western Panama (see Figure 2.2). The Diquís subregion corresponds to the Costa Rican side of the Great Chiriquí, from the General Valley to the border with Panama. The knowledge about the preceramic period occupations in this region is still scant.

The earliest ceramic period in Great Chiriquí is known in the Costa Rican side as Sinancrá (1500 – 300 BC), and Concepcion phase (300 BC – 400 AD) in the Panamanian side. This period is characterized in general by small and dispersed, but sedentary settlements (Corrales 2000). In fact, there are very few sites know to have an occupation dating to that time in both sides of the region, and in the Costa Rican side those are restricted to the Térraba basin and Diquís delta.

The next period, Aguas Buenas (approximately 300 BC/300 AD – 900 AD) witnesses the emergence of centers across the region, and status differences in some of them. Several Aguas Buenas period centers will be examined in detail in the next section 2.3.1 (See map in Figure 2.2). For now, an overview of the most influential investigations on this period will be presented. The first report of the Aguas Buenas complex was published in 1955 by W. Haberland, who excavated in the site El Tigre and found ceramic types clearly different from the well known, at the time, Chiriquí pottery. This habitational site El Tigre is located in the Hacienda Aguas Buenas, nearby the border town of Cañas Gordas. Although there is no stratigraphic information, Haberland (1955:229-230) concludes that the Aguas Buenas complex should be considered older than the Chiriquí pottery, based on the lack of polychrome sherds and the "often crude form of wares". A decade later, Laurencich and Minelli (1973, 1966) excavated a cemetery in the site El Zoncho, 1 km to the south from the center of San Vito. The site had an Aguas Buenas occupation as well, and they found offerings of fine ceramics in some of the tombs.

In a stratified survey of the Diquís area, Drolet (1983) found that for the Aguas Buenas period, most of the settlements are still small and dispersed, but the site Bolas stands out as a ceremonial center because of the presence of stone spheres and mounds. More recently, Brodie et al. (2016) and Palumbo (2017) conducted a regional survey around Bolas and determined that the site also has evidence of craft production, and that the occupation of Bolas occurred during the late Aguas Buenas period. Another well known center from this period is the site Barriles, in the province of Chiriquí, Panamá. This site presents characteristics similar to Bolas and even Java, like the presence of stone sculptures and mounds, however, according to Palumbo (2018), Barriles has more evidence of ceremonial and feasting activities, while the evidence from Bolas has more emphasis in craft production. Also, both sites present less indication of inequality across the settlement than expected from the architecture and sculptures.

Based on the same survey previously mentioned, Drolet (1983) pointed out that the settlements from the Aguas Buenas period in the Diquís area are located in higher elevations than the settlements from the next period, Chiriquí. This observation has been confirmed by subsequent surveys and excavations in individual sites across the region.

Another Aguas Buenas site, farther to the North, but still in the Diquís subregion, is the site El Cholo in the General valley, with structures previously reported as elite residences, where Herrera (2015) proposes instead that these are accumulations of funerary practices over long periods of hundreds of years.

The most recent archaeological period in the Diquís subregion is Chiriquí (approximately 900 – 1500 AD). For this period, there appears to be demographic growth at the regional level, more population centers appear, and settlements are located in lower elevations closer to rivers and the coast (Drolet, 1983). Drolet (1992) proposes that there are two “industries” of craft production by this period: one dedicated to the manufacture of utilitarian goods, for example in the site Murciélago, and another one in ceremonial centers that produced prestige items, like the sites with stone sculptures and spheres in the Diquís delta.

While the largest Aguas Buenas settlements have been mostly classified as ceremonial or ritual centers until recently, the rise of hierarchy in Chiriquí period sites has been linked to other topics as well. Quilter (2004), for example, proposes that the site Rivas, known for its monumental architecture, with the adjacent cemetery Panteón de la Reina, was an elite ceremonial center used for mortuary practices. Alternatively, other archaeologists have connected the emergence of inequalities to the practice of long-distance exchange (Quilter and Blanco 1995) and craft production (Drolet 1992; Fernández and Quintanilla 2003).

2.3.1 Socioceremonial centers in the Great Chiriquí Region

The Aguas Buenas period (300 BC – AD 800) in the Great Chiriquí region is a period of significant changes in terms of social organization: population centers appear in the area for the first time, along with a variety of new kinds of material culture and architecture.

A considerable proportion of the population still lived in dispersed settlements (Drolet 1983; Palumbo 2009, 2018a; Sol Castillo 2013), maybe even with some degree of mobility, however, another part of the regional population started to live in larger settlements with population densities much higher than previously known for the area.

Not only did the settlements become larger in size, but some of them also had new architectural features, like mounds (for example: Bolas, Barriles) and tombs (for example: El Zoncho, El Cholo). The ceramic assemblages from this period became more elaborate and diverse than in the previous period, and a tradition of stone sculpture initiated, including the stone spheres and life-size anthropomorphic sculptures, among other forms.

The largest Aguas Buenas period settlements have been described as socioceremonial centers, often based on their size and the characteristics of their most visible material culture (sculptures, decorated ceramics, mounds) (Herrera 2015; Hoopes 2005; Quilter 2004). In some cases, not only the characteristics of the material culture, but also data from regional scale survey has provided support to the observation that certain sites stand out as population centers (Drolet 1983; Palumbo 2009, 2018; Sol 2013).

This concept of socioceremonial center has been implicitly or explicitly associated with other concepts like hierarchy, inequality, chiefdom, and social complexity. One of the reasons why these connections have been made, especially with hierarchy, is because of the themes represented in the sculptures. The most famous example is an anthropomorphic sculpture from the site Barriles where an individual is carrying another individual on their shoulders who wears a conical hat and has a disproportionately larger size (Linares and Ranere 1980). This sculpture certainly represents some kind of inequality, and it is tempting to assume the individual on top is a "chief". It has often been interpreted in this way (Corrales 2016; Hoopes 2005) introducing a certain degree of ambiguity in terms of the nature of the evidence for hierarchy: is it only the artistic representation or are there other indications of a distinct elite group or chief?

The issue with this sculpture from Barriles is part of a larger issue within the archaeology of early complex societies that can be called the "checklist approach to chiefdoms." In this approach, chiefdoms are understood as a clearly defined and delimited category of social organization with a set of characteristics that can be check marked in order to determine if something is a chiefdom or not (possibly the most explicit example of this approach being the list in Renfrew 1973). One of the many problems with this approach is that it contains layers of assumptions that are not always made explicit and that have different degrees of support from the material evidence from case to case. Those assumptions include the ideas that chiefdoms are deeply hierarchical, that hierarchy is either sociopolitical or economic in nature, and that special objects and architectural features are evidence of the existence of chiefs or elites that hold that sociopolitical or economic power. Hence, archeologists have identified the appearance of new styles of material culture in the Great Chiriquí with the emergence of social complexity, and more specifically (adding an extra layer of assumption) with the emergence of sociopolitical hierarchy. For example, Hoopes (2005) proposes that the emergence of an "international style" of material culture (ceramics and stone sculptures) indicates the existence of a network of elites at a macroregional scale in Central America with ties to Mesoamerica and the Andes. Another example is presented also in the same article by Hoopes (2005). Although it is from a different part of Costa Rica (Northern Pacific), it is worth mentioning here because it is telling about the pervasiveness of the complexity = hierarchy issue. The site Las Huacas is a cemetery where most of the excavated graves contained prestige goods, they "appear to represent individuals who had equal access to formalized sets of ritual items such as jade pendants, mace heads, and elaborate metates" (Hoopes 2005). As the author himself states, we have evidence of equal access to those goods, and yet, his conclusion is that this must be "a necropolis for high-status individuals from several different villages", instead of concluding, for example, that it means that social differences were not very marked in this particular village.

The disconnection between the concept and the evidence of hierarchy in the Great Chiriquí region is also a matter of scale: a chiefdom is often understood as a sociopolitical unit where a chief or an elite has certain influence or power over a region, but most of these studies are only looking at the most visible characteristics of a single site.

This issue of equaling complexity with hierarchy in the Aguas Buenas period has been identified, and archaeologists in the region have been questioning previous interpretations, and proposing new ways to gather and interpret the archeological evidence of social complexity (Herrera 2016; Palumbo 2018b)

Some of the recent contributions have been in the form of additions to and reevaluations of the evidence available for Aguas Buenas sites previously studied. More attention has been paid to the evidence for hierarchy, but also to the relative importance of activities like craft production, exchange, and feasting in the emergence of social complexity in sites like Barriles, Bolas, and Panteón de la Reina (Broadie, Palumbo and Corrales 2016, Palumbo 2018a, Palumbo 2018b, Sol 2013).

A more radical shift in the understanding of social dynamics during the Aguas Buenas period has been proposed by Herrera (2015, 2016). Based on his work at the Aguas Buenas site El Cholo, and also a reevaluation of the available evidence, Herrera states that the accumulation of prestige goods in ceremonial sites from this period is the product of funerary feasts and community building activities. Furthermore, he proposes that, given the lack of evidence for inequalities from other lines of evidence, mounds and other built structures are “landmarks that hold meaning over multiple generations” instead of “elite mobilized intensive constructions” (Herrera 2016).

In summary, archaeologists in the Great Chiriquí are recognizing that the existence of ceremonial centers is not an automatic indication of sociopolitical hierarchies, and they are starting to explore other possible explanations.

In the next section we will discuss more specifically the evidence available and interpretations proposed for the largest and most well-known socioceremonial centers in the region. The location of these centers is shown in Figure 2.2

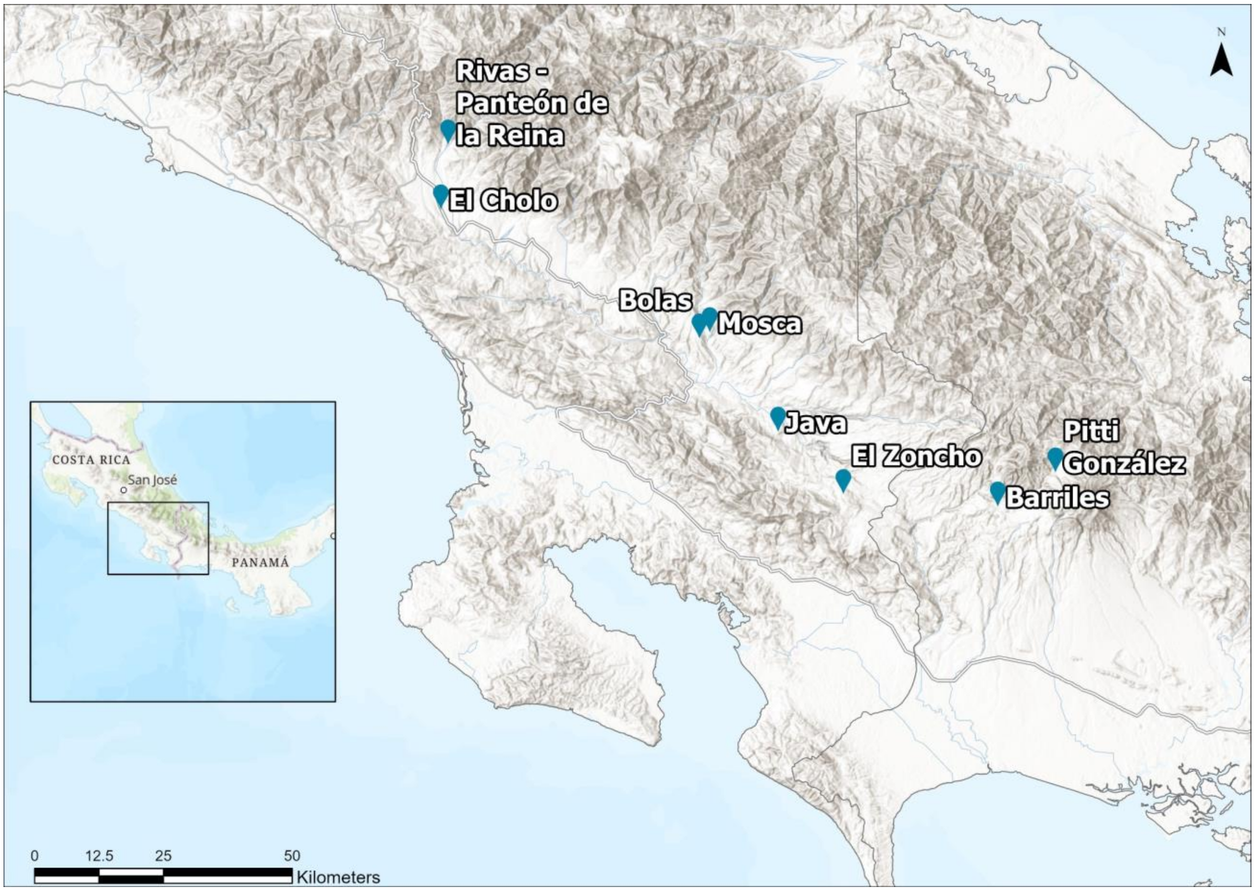

Figure 2.2 Socioceremonial centers in the Great Chiriquí.

2.3.1.1 Barriles

The site Barriles has an area of 32 ha and it was occupied during several precolumbian periods (Palumbo 2009, 2013). The most intense occupation occurred during the Bugaba periods (Early: 300-600 AD, 250 to 500 individuals; Late: 600-900 AD, 500 to 1000 individuals). Barriles is located in the Upper Chirquí Viejo highlands, 1 km away from the Chiriquí Viejo River. Although there are a few sites similar in size in the surrounding area, Barriles is the only site with public architecture, slab-covered tombs, and elaborate stonework, which includes 14 statues (Palumbo, 2013:91). For this reason, Barriles has been considered a ceremonial center since research projects were first conducted at the site (Linares et al. 1975). More recent investigations (Palumbo 2013, 2018) have found that this settlement had a larger proportion of vessels associated with preparation and service of food than other contemporary sites in the area, which is linked to feasting activities. The depiction of high-status individuals in sculptures is the basis to assume that there were marked status differences in this site.

In terms of warfare, Linares et al (1975) suggested that this activity was relevant in the development of this site, however Palumbo (2018) considers that the location of Barriles is not particularly defensive since the site is visible from other surrounding mountain peaks and it is easily accessible from three directions.

2.3.1.2 Pitti González

This site is located in the Cerro Punta basin, 13 km to the northeast of Barriles and it covers an area of 24 ha. The occupation timeline was similar to Barriles but, in contrast with that site, there was no population growth during the Late Bugaba phase at Pitti González. However, stone tool manufacture was a more common activity than in Barriles (Palumbo 2018). This, in addition to the fact that there is no public architecture in this site, supports the idea that Pitti-González was a population center dedicated to craft production and repair. Similarly to Barriles, Palumbo (2013) considers that Pitti-González lacks naturally defensible features.

2.3.1.3 Bolas and Mosca

These sites are located in the middle Térraba basin, approximately 2.5 km apart, with the Cabagra river between them. Both sites have a long sequence of occupation spanning from the

Quebradas to the Chiriquí phases, with the main occupation corresponding to the Late Aguas Buenas phase. According to Palumbo et al (2017), the site Bolas encompasses 117.8 ha with three mound sectors, at least 22 stone spheres, and it had a population of around 3000 people during the late Aguas Buenas period. The site Mosca has an area of 58 ha and, although there are no stone spheres in this site, there is monumental architecture including mounds and terraces, and the population here during the late Aguas Buenas period was up to 500 people. A study focused on prestige-related and craft production artifacts found no differences in decorated ceramics across sectors of Bolas, and slightly higher proportion of stone tools and lithic waste in the mound sectors. Based on these observations and the comparison with Barriles and Pitti-González, Palumbo (2018) suggests that Bolas was a center where craft production activities were more important, but inequalities were very subtle. There is also relatively more monumental architecture in Bolas and Mosca, than in Barriles and Pitti-González. The sites have a strategic position on top of hills, that provides a defensive advantage and would allow the control of traffic of people and goods in the nearby rivers in general.

2.3.1.4 El Zoncho

This site is located in the Fila Brunqueña, a mountain system parallel to the Talamanca range, more specifically, in the upper sector of the Coto Brus River Valley, in San Vito. The site has four sectors that sit on top of a series of small hills around a small lake with the same name (El Zoncho).

The exact extension is unknown, since the methodologies employed in previous research projects were oriented towards other aims (stratigraphy/chronology, subsistence). The best approximation is the number of huacas (deposits of archeological materials, most of them tombs) reported by Laurencich and Minelli (1966): 300 in sector A, 150 in sector C, 20 in sector D, and only 7 in sector B because they were only allowed into a section of this sector by the land owners at the time. Later on, there was a more detailed study of sector B, which has an approximate area of 6 ha (Gómez and Soto 2001; Soto and Gómez 2002). Laurencich and Minelli indicate that this sector B seems to be large, although not as large as sector A. Therefore, our best (very rough) approximation to the extension of the entire site, considering the available information, is 20 ha (sector A: 8 ha, sector B: 6 ha, sector C: 4 ha, sector D: 2 ha). The site was referred to as a cemetery by Laurencich and Minelli, and as a village by Gómez and Soto. It seems like the earliest occupation in the site was closer to the lake and it was a habitational site. Gómez and Soto (2001:161) propose that the population in El Zoncho were practicing agriculture during the Aguas Buenas phase and producing food surplus, which allowed them to develop craft specialization. In terms of social differences, Laurencich and Minelli (1973) observed that there was no social stratification during the Aguas Buenas period reflected in the graves, but there might have been a priestly elite and ceremonial activities, based on the presence of stone sculptures, petroglyphs and ceramics decorated with fish or amphibian motifs, which they link to the sacred nature of the lake for the inhabitants of El Zoncho. The later Chiriquí component of the site corresponds with the cemetery, where Laurencich and Minelli (1966) notice more differences in the distribution of prestige goods between tombs.

2.3.1.5 El Cholo

This site is located in the General River basin, in the northwestern sector of the Diquís region. The architectural core of the site has an extension of approximately 1 ha and corresponds to an Aguas Buenas period occupation (Herrera 2015:87-88). The architecture in the site includes earthen mounds or platforms. The periphery around this architectural core ranges anywhere between 5 and 25 ha (the methodologies employed at the site have been oriented towards problems other than determining the exact extension of the site), and apparently it includes some Chiriquí period occupation.

El Cholo had initially been interpreted as a habitational site (Corrales 2001 cited in Herrera 2015) but Herrera (2015) proposed that the site is instead a "residence for the ancestors", and offers a reinterpretation of several types of evidence: hearths, lithics and ceramic remains commonly associated with food preparation were used in funerary rituals, instead of in feasting activities organized by aspiring elites (which is the most common interpretation). The author based this interpretation in the punctuated character of the depositional events. There is also evidence of exchange or contact with Caribbean and Guanacaste/Nicoya (Northern Pacific) in the ceramics.

2.3.1.6 Panteón de la Reina

The Rivas – Panteón de la Reina complex is a Chiriquí period ceremonial center composed of a cemetery and an adjacent residential cluster. The entire complex has an approximate area of 5 ha and it is located in the Upper General River basin. Quilter (2004) surveyed the site and conducted excavations there during the 1990's. The site was well known among locals as a source of gold artifacts, however, the archaeological excavations resulted in the recovery of a domestic assemblage of ceramic and lithic artifacts. In terms of architecture, the residential sector has a variety of cobblestone features, and the cemetery has several terraces. Quilter (2004:199) identified some of the structures in the site as "specialized ritual facilities for visiting kin groups that used the facilities for a short time to bury their dead on the Panteón". Although the site stands out in the region in terms of architecture, Quilter and Frost (2012): recognize that it was more likely a regional center for the gathering of "relatively equal social groups", rather than an elite residence as previously assumed based on the supposed abundance of gold.

2.3.2 Summary and Research Questions

There is a level of agreement in the regional archaeology at this point on the fact that socioceremonial activities and religious or ritual based authority played an important role in the emergence of social complexity here. Ceremonial activities played a role in the process of centralization of the population that started at some point during the Aguas Buenas period. This centralization is evident in the size of the settlements, which are larger than any other earlier settlement known until now for the Great Chiriquí region. The ceremonial activities are evident in non-utilitarian items such as stone spheres, petroglyphs, anthropomorphic and zoomorphic stone sculptures that express some kind of ideology or world view, and that are present in many of these new population centers. The large size and location in between mounds of many of these stone sculptures indicate that these objects were in public display.

The evidence for social differences based on access to prestige goods, like fine ceramics and foreign artifacts, or craft specialization, are either absent or subtle in many of these sites. From a regional perspective and considering the types of ceramic and lithic artifacts recovered from his regional survey, Drolet (1992) proposed the existence of two manufacture industries: one dedicated to the manufacture of domestic items, and a second one specialized in the production of luxury goods. Although both categories of artifacts can certainly be found in many sites in the region, archaeologists have not found strong evidence of craft specialization at least within Aguas Buenas period sites where the issue has been examined more closely (for example, see Palumbo 2018).

Another variable that has been taken into account to explain the process of centralization in the Aguas Buenas period is the occurrence of warfare. Several archaeologists (Sol 2013, Palumbo 2017, Drolet 1983) have observed that some of the Aguas Buenas centers are located in defensible positions in the landscape. Drolet (1983), for example, reported that the Aguas Buenas sites were mostly in highlands, while later Chiriquí sites were located in lower lands, closer to the coast. And this particular observation of a general pattern has been confirmed again and again (Sánchez 2003, Herrera 2018). One of the implications of this is that earlier sites were in areas that are less accessible, more difficult to move around, and potentially less productive in terms of agriculture. Interestingly, some of the exceptions of Chiriquí sites in highlands are cemeteries like El Zoncho, or Panteón de la Reina.

The interpretations in the regional archaeology may be organized into two models about how social complexity developed in Aguas Buenas centers. These two models roughly correspond with two of the scenarios proposed in the theory chapter.

1.The centralization of the population allowed the development of craft specialization, particularly in the production of stone tools in some cases, or agricultural production in others. Emergence of inequalities, and eventually even hierarches, such as those described in the Contact period chronicles from Costa Rica, were based on the control over the production and the access to prestige goods. This model corresponds with a scenario where the development of socioceremonial centers is promoted by aspiring elites.

2.The most important role of population centers continued to be the hosting of ceremonial, specifically funerary, activities that favored a relatively egalitarian social organization and that emphasized the ties to the land and to the ancestors of the inhabitants or users of these sites. In this case, ceremonial centers were community projects where groups of people would gather seasonally to strengthen their collective sense of identity.

There is a third perspective in the theory chapter that does not quite correspond with the explanations proposed so far for the emergence of ceremonial centers in the Great Chiriquí. That is the scalar stress perspective which views these centers as the manifestation of an integrative institution (ritual activities or religion in this case) that emerges to alleviate the social friction generated by the population growth. Although this perspective has not been considered in depth in this region (with one small exception in Martin and Sol 2021), it is worth to include among the possible explanations for the emergence of the socioceremonial center in Java.

The next question is naturally: how do we identify which one of the three perspectives/scenarios better explains the emergence of the socioceremonial center of Java? To answer this monumental question, we have to start by dividing it into a series of specific research questions that will guide the rest of this dissertation:

- Are aggrandizer individuals or elites visible in the site?
- Was the construction of the site a short-term event or a long-term process?
- Was there permanent occupation of the site? Or was the population mobile?
- What kinds of ceremonial architecture or artifacts were more common in the site?
- Was the group participating in any kind of intense warfare?
- Were other activities carried out in the site along with ritual or ceremonial ones?

3.0 Research design and fieldwork methodology

The general research question addressed in this dissertation is about the role of the socioceremonial center in the emergence of social complexity in the site of Java in Southern Costa Rica. In order to understand such role, this question was decomposed into several, more specific questions that will helps us to distinguish between three possible scenarios: elite oriented, community oriented, and scalar stress (see end of Chapter 2).

To answer these questions, we needed to have a clear picture of some of the characteristics of the entire settlement, such as the extension, the population size, the length and the intensity of the occupation. The original map of Java published in Fonseca and Chávez (2003) was based on the distribution of mounds and stone spheres visible on the surface, and it provided a reference for the extension of the site (see Figure 3.2). These authors proposed that the mounds had residential and funerary functions. The first observation was based on the findings of domestic style ceramics on the mounds, and the funerary function was inferred from the fact that the site is heavily looted, and looting is often associated with sites with burials. We will return to the issue of the function of the mounds in different sections of this dissertation as we review the evidence more in detail. As mentioned before, the limit of the site was traced following the distribution of stone sculptures visible on the surface. However, stone sculptures are not necessarily proportional to the population in a site. Ceramics, on the other hand, are a more commonly used population proxy in this region and elsewhere, for a variety of reasons: they preserve much better than other materials, especially in tropical environments, and they were widely used for domestic and public activities. For this reason, mapping the distribution of ceramics across the site was an essential task for this project.

In addition to being a population proxy, the characteristics of the ceramic assemblage, along with the characteristics of the lithic assemblage, provide information to answer the questions about differences and inequalities across the site, and about a variety of possible activities carried out in Java in the past, like craft production, exchange, feasting. More specifically, we needed to find out if there were any differences in the quality or style of the ceramics and the lithics across the site, or if all the population in Java had access to the same quality and style of artifacts, in order to identify if there were any differences in prestige or wealth. Similarly, the activities mentioned before can be identified in the material assemblage of the site: concentrations of tools or unfinished artifacts would indicate that craft production was differentiated within the site. The presence of artifacts from outside the region would signal that the population of Java was involved in interregional exchange, and if that was the case, the spatial distribution would reveal whether exchange was an exclusive or generalized activity. Finally, single depositional events with high concentrations of serving vessels are generally indications of feasting.

One of the specific research questions (the question about warfare) requires further explanation. The occurrence of warfare or conflict can be measured according to three characteristics of the settlement: boundedness, population density, and defensive features of the landscape. These are not the traditional indicators of violent conflict studied in the archaeology of warfare. Usually, research on warfare is focused on four main lines of evidence that are considered the most direct indications of conflict: skeletal remains, fortifications, weapons and iconography (LeBlanc 1999). The variables proposed here, related to settlement patterns, if considered at all, are often treated as secondary, marginal, or circumstantial evidence of warfare (Maschner and Reedy-Maschner 1998). However, the classic lines of evidence are difficult to study in the neotropics due to preservation and other issues: skeletal remains are rarely found in archaeological contexts, wooden palisades and ditches may leave subsurface evidence detectable through intensive excavation (trenching), but are usually not identifiable on the surface, and weapons in this region such as axes and projectile points are generally not distinguishable from tools for hunting or agricultural work. Iconographic evidence supports the relevance of warfare at a symbolic level, but it is not as useful to determine the intensity of warfare. This poses an enormous issue in Central America if we are limited to these lines of evidence. Instead, we can take advantage of the lines of archaeological evidence that are available in southern Costa Rica, specifically in Java, and the ethnographic and archeological information from other parts of the continent that indicate how these lines of evidence, boundedness, population density, and defensive features of the landscape, are enlightening in the study of warfare. Here, boundedness refers to clearly defined site boundaries (in contrast with a site where the population, as indicated by the density of material, gradually becomes more dispersed moving from the site center to the periphery). Boundedness is often recognized and even expected as a characteristic of fortified sites where walls or palisades define the perimeter of the site (Keeley et al. 2007) and yet, it has not been exploited to its full potential as an indicator of conflict. For southern Costa Rica during the sixteenth century, Vázquez de Coronado (1976 [1563]) describes a series of settlements fortified with wooden palisades. Although the postholes of such palisades could remain in the archaeological record, the structures themselves would not preserve in this region, but the boundedness of occupation should still be visible in the density of materials across space at the archaeological site. The methodology proposed here is designed to define the boundedness of Java. Also, there are site maps from other important population centers in the region that have been produced for different objectives but with similar methodologies and published. These site maps can be used to compare against Java and gain perspective on how compact the settlement is in the regional context. For example, the sites Barriles and Pitti-González, in the Volcán Barú region in Western Panamá, present a highly compact layout during the Early and Late Bugaba periods (AD 300-900), with a sharp transition from shovel probes with many artifacts to shovel probes with very few or no artifacts at all (Palumbo 2009). The sites Bolas and Mosca in the Bolas region in Southern Costa Rica are somewhat less compact than Barriles and Pitti-González, but they are located on defensive hilltops (Palumbo 2017). I consider it likely that their boundedness was produced by a palisade. In contrast, the site Rivas in the General Valley in Southern Costa Rica shows a more dispersed layout and a gradual decrease in the density of artifacts from the center to the edges (Sol 2013). I consider it less likely that this site was fortified. Although the research projects in these sites were focused in other patterns, their results demonstrate the feasibility of using shovel probes to measure site boundedness.

Population density at the level of the settlement is another variable potentially related to the intensity of conflict. During periods of intense conflict, we would expect population density in the centers to increase as people from more dispersed and potentially vulnerable settlements in the periphery immigrated to the relative safety of the center. Roscoe (2016) finds that high population density and nucleation combined worked as a defensive strategy for groups engaged in warfare in contact-era New Guinea, where clearly defined settlements with higher population densities would act as defensive units during attacks (in comparison with zones were population densities were so low that people would prefer to adopt or keep a highly dispersed settlement pattern in order to avoid confrontation). In the case of this research project, focused on a single settlement, comparing one period to the other will give us a relative assessment of change or continuity in the population density. High population density by itself can be a response to several different factors related to subsistence strategies or special ritual, political or economic activities conducted in a center.

Because of this, population density is used here in combination with the other factors (boundedness and landscape) to strengthen the interpretation of conflict intensity.

The third variable that can be linked to the intensity of conflict in Java is the landscape itself. Ethnographic observations from classic examples of groups engaged in endemic conflict point to the importance of landscape in their settlement choices (Redmond 1994b). A variety of studies from different parts of the world focus on the analysis of settlement patterns in contexts of warfare (Borgstede and Mathieu 2007; Demarest et al. 1997; Jones 2006; Maschner and Reedy-Maschner 1998; McCool 2017; Sakaguchi et al. 2010), revealing recurring characteristics of the landscape linked with the defensibility of settlements. Features such as steep slopes and water bodies are advantageous because they make the access to the settlements difficult, while prominent locations are favorable for providing a good view of the surrounding territory. The site of Java occupies a prominent location on top of a hill in the Coto Brus River valley (see Figure 3.1), and the topography around the site is irregular, including smooth hills, steep slopes, and small streams. Thus, during periods of warfare, we would expect the population in Java to occupy more intensively those areas where features enhance the defensibility of the site. A comparison between the distribution of defensive topographic features and the distribution of the population will be the basis to determine if those areas were more intensively occupied.

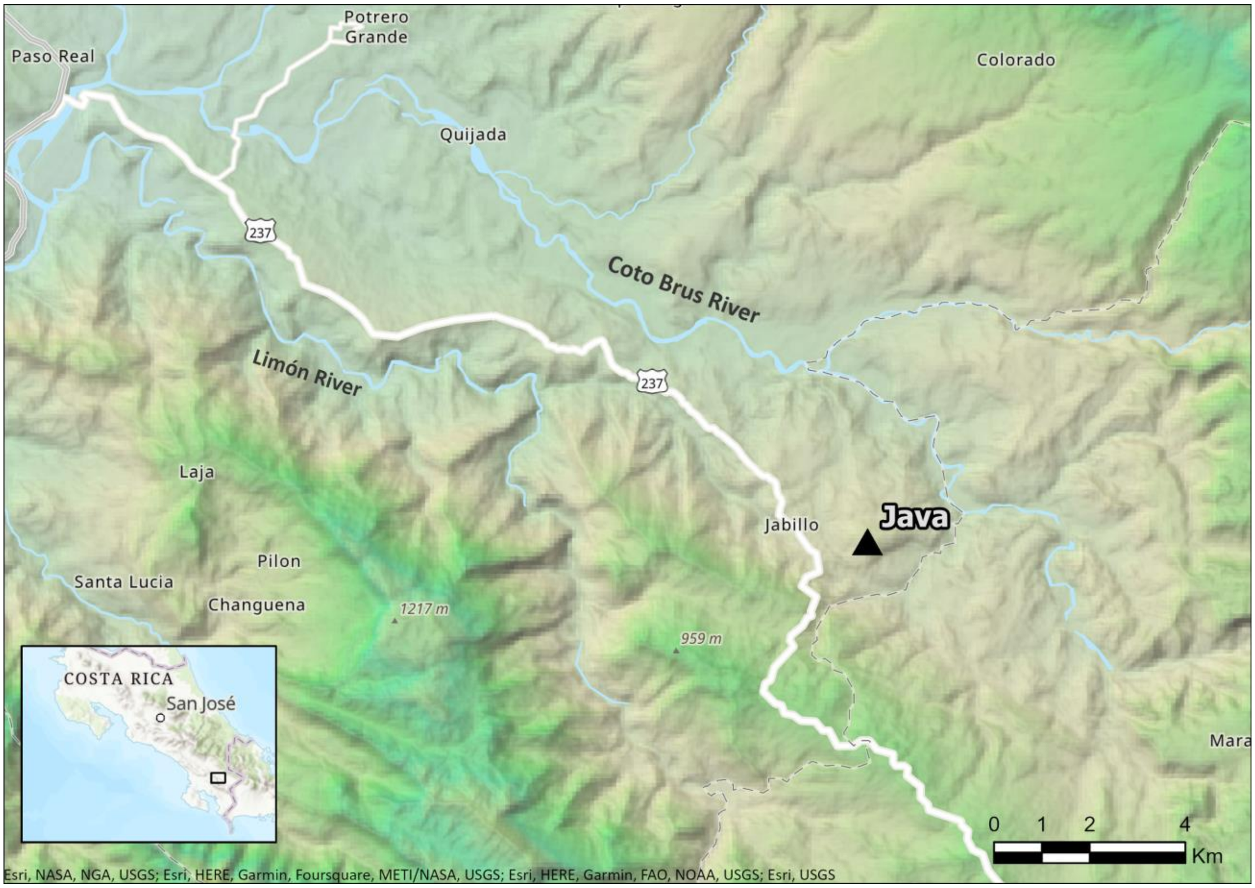

Figure 3.1 Location of the site Java in the Coto Brus River Valley.

Java is located between the Coto Brus River and the steep hills in the southern sector of the valley. The northern sector of the valley has smoother hills. The Coto Brus River has its origin in the southeastern sector, and it merges with the Térraba River in Paso Real, in the northwestern sector.

3.1 Field methods

Considering the scale of the study, and the types of data needed to answer the proposed research questions, a systematic intensive survey of the site of Java was the most adequate field methodology. This methodology has been successfully implemented in several archaeological settlements across the larger region of southern Central America and northern South America

(Berrey and Palumbo 2022; Giraldo 2014; González Fernández 1998; Murillo and Sol 2023; Palumbo 2017). These surveys consist of systematic surface collections and/or shovel probe collections, depending mostly on the conditions of the terrain and vegetation. The direct results from these surveys are datasets that describe the spatial distribution of ceramic, lithic, and sometimes other types of archaeological materials in a site, in a way that patterns can be explored within or between sites. The systematic collection of ceramics allows the use of the area density index (Drennan et al. 2015) to make relative and absolute population estimates. As the name indicates, this index takes into account both the area and the density of ceramic scatters to arrive at a population estimate. This number is then divided by the number of centuries of the occupation in order to obtain the most accurate estimate possible at the moment in a region, a settlement, or a domestic unit.

While an intensive survey of the site would provide crucial information to address the research questions, some stratigraphic excavations were necessary to clarify the chronology of the occupation in the site. And finally, although there was a map of the mounds and sculptures in the entire settlement (Figure 3.2), we also needed a topographical map of the site in order to evaluate the defensive features of the landscape discussed in the section about warfare.

Figure 3.2 Simplified version of the original map of Java by Chávez and Fonseca 2003.

In the case of the settlement of Java, some of the constraints that we had to consider when designing the fieldwork strategy were the heavy looting of the site, the lack of ceramic materials visible on the surface, and the relatively heavy vegetation in some areas given that most of the site is currently being used as a palm plantation or is secondary forest. The first constraint means that, at least in the central sector of the site, the archaeological context was not intact. However, it was evident that the soil excavated by looters was deposited right next to the holes they created, therefore the archaeological materials that remain in place where moved a few meters at the most. Considering that the collection units of the survey are several meters apart (we will discuss the details of the spacing below), the displacement of materials produced by the looting was not a particularly strong concern. Another reason why the looting was not an impediment to accomplish the aim of the survey is that looters are generally interested in good looking, complete artifacts, while in this project all archaeological materials are equally valuable, regardless of their condition or appearance.

The second constraint mentioned was the lack of ceramic materials visible on the surface in Java. This is a constraint for surface collection surveys, but not necessarily for survey in general as the use of shovel probes has proven useful in several of the surveys cited before. However, it was necessary to ensure that the lack of ceramics on the surface was not a sign of lack of ceramics in general in the site. This was accomplished with the pilot project where we implemented the shovel probe survey method in a small section of the site in 2018.

3.2 Fieldwork seasons

3.2.1 Pilot project: testing the survey methodology

In the summer of 2018, during the month of July, a pilot project was carried out in the site of Java. The rainy season in southern Costa Rica starts in April, however the peak of the rains occurs around the months of September and October. This means that around the month of July, it may rain any time after 2 pm in any given day, but the mornings are usually sunny or at least it does not rain. For this reason, our workday started at 7 am, and generally we were able to work for at least 6 hours. The objective of this season was to evaluate the feasibility of a survey in the site, as well as to collect preliminary data that would inform the development of the research project. During the pilot project, we excavated 48 shovel probes spaced, every 10 m in an area of 50 by 100 m, right at the central mound sector of the site. Figure 3.3 shows the location of the collection units/shovel probes. The site limit shown in this figure is still the limit defined by Fonseca and Chávez in 2003, because that was the reference used to design the survey grid. However, this limit was later modified based on the results from the survey. The new limit will be introduced in the next chapter (Results). We worked in teams of two to three people, most of them members of the local communities of La Pita, which is the name of the road where the site is located, and Jabillos, a small town 1 km away from the site, for a total of 8 days. The dimensions of the probes were 50 by 50 cm on the sides, and as deep as necessary to reach sterile soil. The results of the pilot are discussed in detail in Chapter 4, but in summary we found that the proposed methodology was highly successful for the study of the site of Java: most of the shovel probes (40) contained ceramic and/or lithic materials, regardless of how heavily looted was the area, which demonstrated that it was possible to overcome the constraints identified in the early stages of planning, including the issue of the vegetation. In fact, the layout of the palm plantation turned out to be less constraining than initially thought due to two factors: the plantation is almost perfectly symmetrical and the palm roots are relatively shallow. This means that we just had to “align” the survey grid with the plantation to entirely avoid the interference of palm trees with the survey.

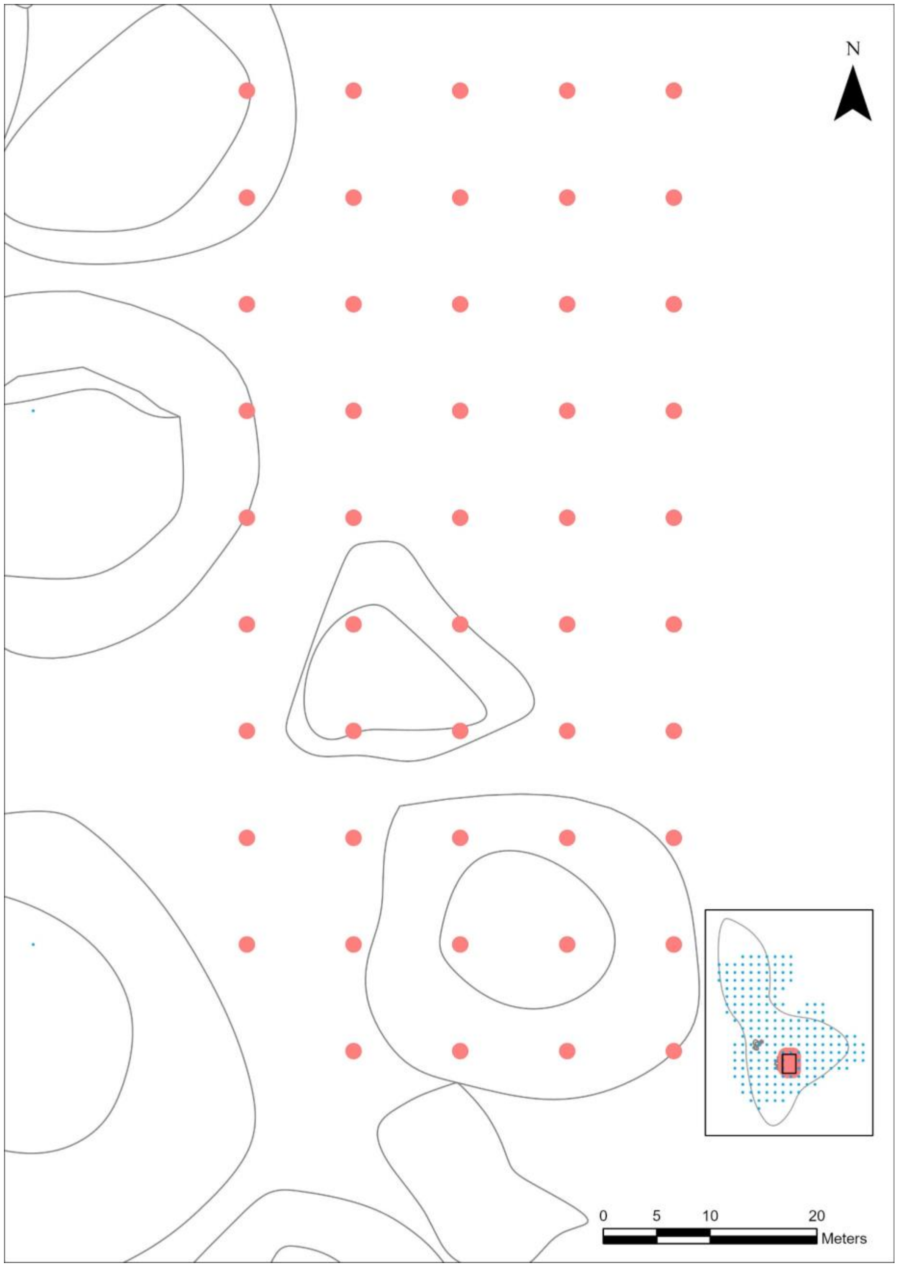

Figure 3.3 Location of units for the pilot project.

The small box shows the location of the pilot project within the entire site of Java. The blue dots represent the units of the main survey. The limit in this figure is still the limit defined by Fonseca and Chávez in 2003.

A basic laboratory space was set up in my house in the town of Pérez Zeledón, about one and half hours from the archaeological site. The materials collected during the pilot project were transported to this space, where they were cleaned and quantified. A preliminary ceramic analysis was conducted, however we were still operating under the assumption that most of the material belonged to the Chiriquí period, as previously reported for the site. As a result, many of the diagnostic ceramics were left unclassified because they did not correspond clearly with the references that we had available for the ceramic analysis. The analysis had to be redone later when the materials from the main survey were analyzed. The ceramic and lithic remains were properly stored in the same laboratory space.

3.2.2 Main fieldwork season: intensive survey and pandemic interruption

The main fieldwork season started in January of 2020. For a variety of logistical and financial reasons, including the lack of lodging around the archaeological site and the lack of external funding specifically for this fieldwork season, most days of fieldwork we had to travel back and forth between my hometown in Pérez Zeledón and the site and we could only work one or two days per week. This turned out to be an advantage for the workers who collaborated in the project because they also needed to attend their own fields, which is their main source of income (agriculture and cattle raising). This way, they were able to take one or two days of work to earn some extra income, while maintaining their regular source of income. The weather in this season was ideal because the relatively dry season in Southern Costa Rica goes from December to March. During these months, rains are occasional, however the temperatures are more elevated. Then, the workday started around 7 am, like during the pilot, but in this case to take advantage of the milder temperatures in the morning. Ideally, we would have started even earlier, however this was not possible due to the commute.

The grid of main survey was aligned with the grid from the pilot project. Figure 3.5 shows the location of all the collection units. Since the grid was designed before conducting the survey on the field, the locations of the shovel probes were determined beforehand. Once on the field, we located the points using both handheld GPS units and tape and compass. If one of those points turned out to fall in a water stream, or if the topography was so steep that it was practically impossible to stand and hold the screen, then the point was marked as inaccessible. We used an standardized form to register all the information about each unit (shovel probe). We worked in two or three teams of two or three people, where one person would dig with the shovel and the other people would screen, collect materials and fill out the forms (see Figure 3.4). Finally, everyone would collaborate to take pictures if necessary and refill the excavation right after finishing. The regular workers included neighbors from the communities of La Pita and Jabillos, as well as members of my own family who participated as volunteers. Occasional workers included colleagues and archaeology friends who generously donated their time for the success of this project.

Figure 3.4 Survey crews excavating shovel probes.

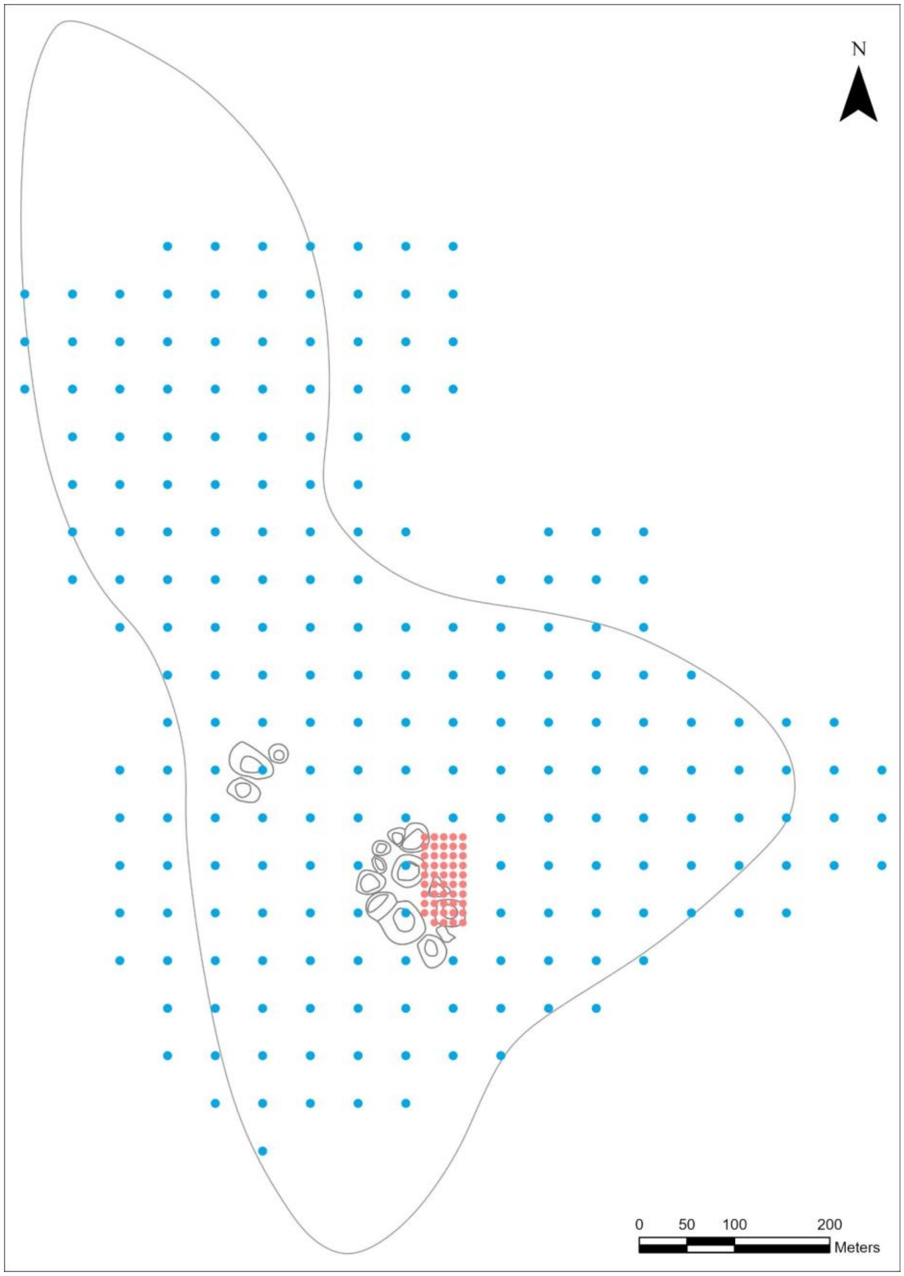

Figure 3.5 Location of all the collection units

including the pilot project in pink and the main survey in blue.

During the pilot project, we found that in most of the units the sterile soil was located between 40 and 60 cm, and the material was generally in the first 30 to 40 cm below the surface. Based on these observations, for the main survey, we decided to reduce the shovel probes to 40 x

40 cm on the sides, and the general rule for depth was 60 cm. However, if sterile soil was closer to the surface, then the unit was finished at that point. And if there were still archaeological remains below the 50 cm then 10 cm more were excavated; if there was still material there, then 10 more cm and so on.

The main survey covered an approximate area of 54 ha, and it took a total of 14 days of work: 12 days before the start of the pandemic and 2 days during the pandemic. By mid-March of 2020, we had completed most of the survey and we were preparing to finish the last stretch. However, like in the rest of the world, a national emergency due to the pandemic was declared in Costa Rica in March 14th, 2020. All but essential businesses were closed in the following week, and we were not able to go back to the field for almost three months. By the end of May, the pandemic situation appeared to improve in Costa Rica and some of the strictest government measures were eased for a short period. Considering that conducting fieldwork in the outdoors in a rural location was a relatively low-risk activity, we were able to go back to the field three more times to excavate some more shovel probes. After this, the situation in Costa Rica started to worsen again, and we decided that, given the circumstances, the data collected that far was enough to conclude the survey and address the research questions.

A long isolation period followed the end of the main survey. All the materials were carried to the laboratory in my house, where I proceeded to confront the task of conducting the ceramic analysis by myself. In the period between the pilot project and the main survey, I had had the opportunity to show some of the ceramic materials to some of my colleagues with extensive experience in the Great Chiriquí. They had suggested that some of the diagnostics sherds might correspond to the Aguas Buenas period, but that it would require closer examination to confirm this. I dedicated the following months to gather all the possible bibliographical references that would be the basis of my ceramic analysis and to examinate them in great detail. This was necessary because we still lack a comprehensive manual for ceramic analysis in the region. In addition, the same ceramic types or modes are given a different name by different authors. One last issue related to the ceramic analysis is that some of the knowledge about ceramic classification in the region has not been published. A good amount of that unpublished knowledge was transmitted from colleagues through WhatsApp conversations and shared files, since we were not able to meet in person due to the pandemic situation. Rather than proposing new ceramic types, I have decided to contribute to the improvement of the regional ceramic typology by including here a section that summarizes what I learned from putting into dialogue the different bibliographic sources and the information shared through conversations with colleagues. This will be the last section of this chapter.

3.2.3 Final fieldwork season: stratigraphic excavations and mapping

We had the opportunity to return to the field during May and June of 2021 with the support of a Lewis and Clark Fund for Exploration and Field Research. The pandemic situation had improved enough in Costa Rica that we were able to work outdoors with a small team of 4 to 6 people. The objectives of this last season were to collect samples for radiocarbon dating and to produce a partial topographic map of the site. For the first objective, we excavated three stratigraphic units in places where we had recorded the occurrence of charcoal during the survey. We worked also in groups of two or three people, where one or two were excavating, either with a shovel or with a trowel. The use of tools depended on the level. For example, we knew that the first 20 cm below the surface generally contained very little to no ceramics and lithics, and this level was the most susceptible to disturbances, therefore we decided to excavate with a shovel those first 20 cm. We excavated in arbitrary levels of 10 cm and collected all the archaeological materials found. Every level was recorded in photos and in a form with all the basic information (measurements, soil characteristics…).

3.3 Ceramic analysis

The first objective of the ceramic analysis was to classify the sherds chronologically. The regional ceramic typology is divided into three main periods: Sinancrá (300 BC – 300 AD), Aguas Buenas (300 – 800 AD), and Chiriquí (800 – 1500 AD). Divisions of these periods or "transitional" phases between them have been proposed for specific subregions, as well as local variations called subphases, traditions, complexes or horizons. For example, there is an ongoing discussion in the regional archaeology about the possibility of diving the Aguas Buenas period into two phases. Felipe Sol (2013) proposes a division of the Aguas Buenas period (300 BC – 800 AD) into an earlier Quebradas phase (400 BC – 200 AD) and a later Aguas Buenas phase (200 – 800 AD). In his survey of the upper General Basin (in the Northwest extreme of the Diquis region) Sol finds that Aguas Buenas single period sites have either Quebradas style types, including Corral Rojo and Quebradas, or other more common Aguas Buenas types like Bugaba Grabado, Guarumal and Cerro Punta Anaranjado. The site NiKira also suggests the possibility of identifying an earlier phase within Aguas Buenas: although it has ceramics typically classified as Aguas Buenas, the radiocarbon samples date the site in the earlier side of the period (130 – 350 AD) and one of the most common Aguas Buenas ceramic types in this zone, Bugaba Grabado, is practically absent from the site. If that division is correct, we would expect to find some kind of patterning difference in the distribution of Early Aguas Buenas and Late Aguas Buenas types in the site. We will return to this point in the section about Time in Chapter 4 (4.3.1).

Most archaeologists in the region classify the ceramics by types, modes or wares, within each period. The types are defined by the shape of the vessel, the surface finish and decorations. Modes, on the other hand, are features that appear in several types or that are not even associated with a specific type, but are characteristic of a period. Wares are broader categories because they associate modes with paste characteristics and surface finishes. Ware as a category has been more used on the Panamanian side of the Great Chiriquí.

In this ceramic analysis, modes and wares have been more useful for the chronological classification than types, because of the preservation conditions of the ceramic materials from the survey. The classification into types is a more common practice in the archaeology of this region, and it represented a challenge for the analysis of this ceramic collection because the sherds are fragmented enough that it was practically impossible to assigned even diagnostic sherds to a particular type. Additionally, only a small fraction of the sherds in this collection has some kind of diagnostic feature. Figure 3.6 shows what a typical sample of sherds from Java looks like, in this case from the shovel probe number 66. Diagnostic features include plastic decorations like applications, engraving, incising, painting, as well as certain rim, support, or handle shapes. In this context, the work of Spang et al. (1980) was especially useful because they describe ceramic wares, vessel forms, and appendages, instead of grouping all these categories into discrete types. The next subsections are a review of the wares, types and modes that were relevant for the ceramic analysis of Java collection, including previous treatments in the literature, and especially useful diagnostic features.

Figure 3.6 Sherds from unit 66.

3.3.1 Early Aguas Buenas period wares, types, and modes

Quebradas

The Quebradas type is relatively coarse and it has two varieties: one of them with incised decoration, and the other one plain. The type is found in many parts of the Diquis region, but in certain areas, it has also been used as a chronological marker of a phase distinguishable from the main Aguas Buenas period called Quebradas (General Valley region).

Abrojo Complex

This is a complex from an Early Aguas Buenas site called NiKira, approximately 40 km to the Southeast from Java. It is characterized by small, globular vessels, with very thin walls and punctuated decoration. Absolute radiocarbon dates from this site indicate that it belongs to the Early phase of the Aguas Buneas period (Herrera and Corrales 2001).

3.3.2 Aguas Buenas period wares, types and modes

Bugaba ware/type

The Bugaba ware is described in detail in Spang et al. (1980), and it has a wide distribution in the region. Two diagnostic features were the most relevant/consistent in this collection: the engraved lines and the negative/fugitive color decoration. In the regional typology, there are two ceramic types with engraving: Bugaba in the Aguas Buenas period, and Papayal in the Chiriqui. The differences between these two are in the motifs and in the technique of the engraving itself. The motifs are not very useful to distinguish types in this case because the fragments are very small. The technique, on the other hand, was useful. While the lines in the Bugaba ware or type are superficial and narrow (0,5 mm or less), in the Papayal type the lines tend to be deeper and wider (Baudez et al. 1993). The negative or fugitive color decoration technique can also be found in both periods, however, what is unique to the Bugaba ware is that the technique was applied in the interior of the vessel that had a red slip. The result was a vessel with two shades of red stripes in the interior.

The Bugaba type or ware belongs definitely to the Aguas Buenas period based on the regional bibliography, but also because of the consistency in the co-occurrence of characteristics associated with Aguas Buenas in the Bugaba sherds from this collection.

Cerro Punta Anaranjado ware/type

Another type that was relatively common in this collection, and that is unambiguously Aguas Buenas according to the references, is Cerro Punta Anaranjado. This is described as a ware in Spang et al. (1980), and also an unusually complete vessel is illustrated by Gómez and Soto (2002) with pictures and drawings. One of the main characteristics of the type in the original description was the orange color of the slip. However, Baudez et al. (1993) found vessels of this type with different tones of red slip, and no orange slip. They classified those as Cerro Punta Anaranjado based on other characteristics, such as the composed shape, the incised decoration and the hollow, conical supports.

Strap handles (mode)

Strap handles appear in both periods, however there are differences in size and shape between periods. In his report form 1955, Haberland mentions the presence of broad strap handles in some of the vessels recovered from the site El Tigre in Hacienda Aguas Buenas near the border between Costa Rica and Panama. The ceramic assemblage from that site was the base for the first descriptions of the Aguas Buenas complex. Haberland (1955) points out the differences between these and the handles found in Chiriquí contexts: “A great difference can also be seen in the handles which in the real Chiriquí complex are in form of twisted ropes where here broad strap handles are widely predominant and twisted rope-handles absent" (1955:229). All the handles in the assemblage from Java are broad, some of them have curved edges, but none of them are twisted.

Supports Mode 22

The Aguas Buenas period supports or legs of tripod vessels tend to have straight walls, and either a conical or cylindrical shape. In the same publication about the Aguas Buenas complex mentioned before, Haberland (1955:229) also notices this difference: "The feet of the [Chiriqui] tripod ware always show an outward curving towards the end whereas the feet encountered in the site are always straight and symmetrically conical". Baudez et al (1993) classify these supports as

Mode 22, a Mode that is associated with several Aguas Buenas types, like Cerro Punta Anaranjado and Bugaba. It was the most common type of support in the ceramic assemblage from Java.

3.3.3 Chiriquí period wares, types and modes

Polychromatic decoration

The polychromatic decoration is restricted to the Chiriqui period in this region (Haberland 1955). The most common type in this category is the Buenos Aires Policromo, but a few other polychromic types have been defined in recent works led by the National Museum in the site Finca 6 (Badilla and Corrales 2012). These decorations include red, black and white/beige painting or thick slip. A few fragments from Java presented decorations in these colors, and although the fragments were too small to determine the exact type, there is no polychromatic decoration known for the Aguas Buenas period.

Ceiba Rojo Café

The type Ceiba Rojo Café grouped initially a variety of wares and decorations that were later on divided into new types. In any case, it is generally identified as Chiriqui period type (Corrales 2000, Baudez et al 1993). There is a decoration that seemed to be constant of the type: incised lines with punctuated decoration on the sides. In this collection that motif is present in only one sherd. However, there were a few more sherds with a peculiar decoration: a cone shaped applique with incisions from the base to the tip of the cone. This exact decoration is illustrated in a publication by Lothrop (1963:61) and it is associated with the incised lines and punctuated decoration characteristic of Ceiba Rojo Café. But in Lothrop´s collection, these sherds are from a level deeper than the Chiriquí phase. In other words, the sherds with the cone and the typical Ceiba Rojo Café decoration in Lothrop's book are from the Aguas Buenas period. This demonstrates that the decoration is not necessarily restricted to the Chiriqui period, and even more considering that most of the diagnostic sherds in the collection from Java are actually Aguas Buenas.

4.0 Results

This chapter is divided into three main sections: results from fieldwork, laboratory analysis, and data analysis. The first section is a summary of all the data recovered during each one of the three stages of fieldwork. In the second section, the results from laboratory analyses are divided by material type (ceramics, lithics, and charcoal). Finally, the third section that deals with the results from data analysis is organized into three topics: time, space, and qualitative variables.

4.1 Results from fieldwork

4.1.1 Pilot project

The fieldwork at the site Java started with a pilot project in 2018 when 49 shovel probes, spaced every 10 m, were excavated in a grid of 40 by 100 m. These units were located in the mounds sector of the site, and they were distributed in 5 transects of 10 units each. One of the grid points was not accessible at the time, since it was in a different property than the rest, and for this reason we excavated 49 instead of 50 units. The shovel probes of the pilot measured 50 by 50 cm on the sides, and they were as deep as necessary to reach sterile soil, which in most cases was between 40 and 60 cm below the surface, and in some cases, it was up to 1 m deep. The archaeological materials were generally in the first 30 to 40 cm below the surface, with some exceptions of material in deeper. We worked in teams of two or three people, where one person would dig with the shovel and the other person would screen the soil, collect materials and fill out the forms. Finally, we would take pictures of the unit if necessary and refill the excavation right after finishing. The pilot project required around six days of work in total.

From all the shovel probes excavated during the pilot project, 40 of them had ceramic sherds and 26 had lithic artifacts. The number of ceramic sherds per unit ranged from 1 to 120, with an average of 26 sherds per unit. The total number of sherds per unit is shown in Figure 4.1 The pilot project produced a total of 1045 ceramic sherds. The distribution patterns and characteristics of the ceramics and lithics will be discussed in the subsequent sections of this chapter.

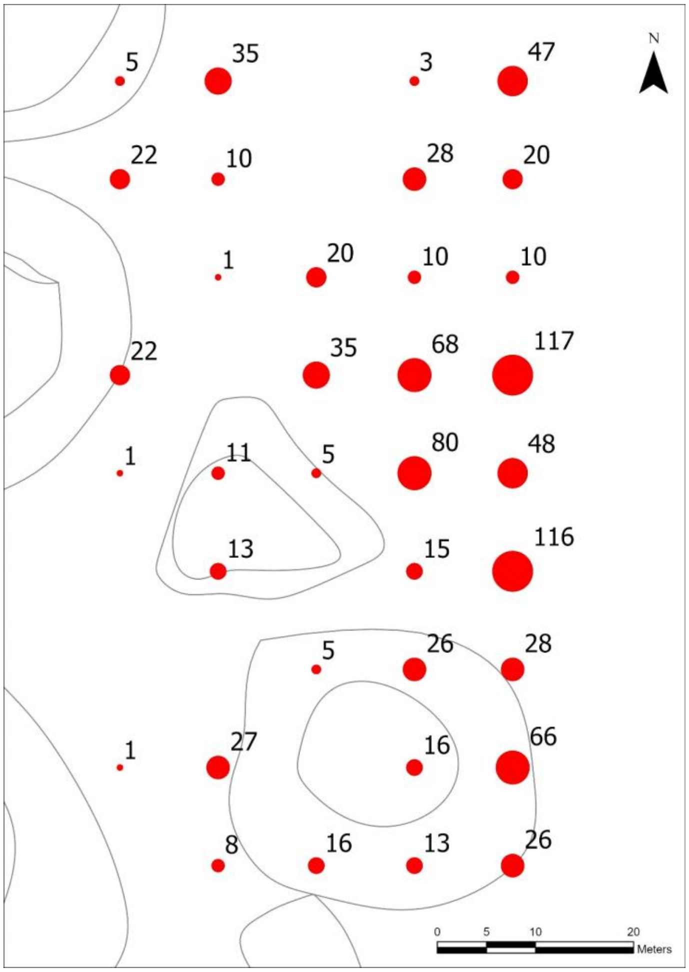

Figure 4.1 Total number of sherds per unit, pilot project.

The size of the circle and the label indicate the number of sherds per unit.

4.1.2 Main survey

The second stage of fieldwork consisted of the intensive survey of the entire site Java in 2020 (Figure 3.5). We had learned from the pilot project the amount of time and resources required for conducting a shovel probe survey at this particular site, and we also found a number of archaeological materials larger than expected. Based on that knowledge acquired from the pilot project, we decided to space the units for the main survey every 50 m and make the shovel probes of 40 by 40 cm on the sides. The general rule for depth was 60 cm. However, if sterile soil was closer to the surface, then the unit was finished at that point. And if there were still archaeological remains below the 50 cm then 10 cm more were excavated; if there was still material there, then 10 more cm and so on. Since this was a systematic survey and the grid was designed before starting the fieldwork, if one of the survey points happened to be in the middle of a water stream or if the topography was so steep that it was practically impossible to screen the soil properly, then the point was marked as inaccessible. We excavated a total of 199 shovel probes in the main survey, and 14 points were marked as inaccessible. The process was similar to the pilot project: the points were located either with GPS or with tape and compass from a known point, one person would excavate and another one or two would screen the soil, collect and label the archaeological materials and fill out the respective forms. We took pictures of the unit when there were unusual features. And every probe was covered again right after finishing. The main survey took approximately 14 days of work, with three to four teams of two or three people depending on the day.

From the 199 shovel probes of the main survey, 106 had ceramic sherds and 28 contained lithic artifacts. Figure 4.2 shows the location of all the collection units, including those that did not produce any ceramic materials, as well as the inaccessible points. In those units with ceramics, the number of sherds per units ranged from 1 to 172, with an average of 19.5 sherds per unit. The number of sherds per unit is represented in Figure 4.3 The main survey produced a total of 2071 ceramic sherds.

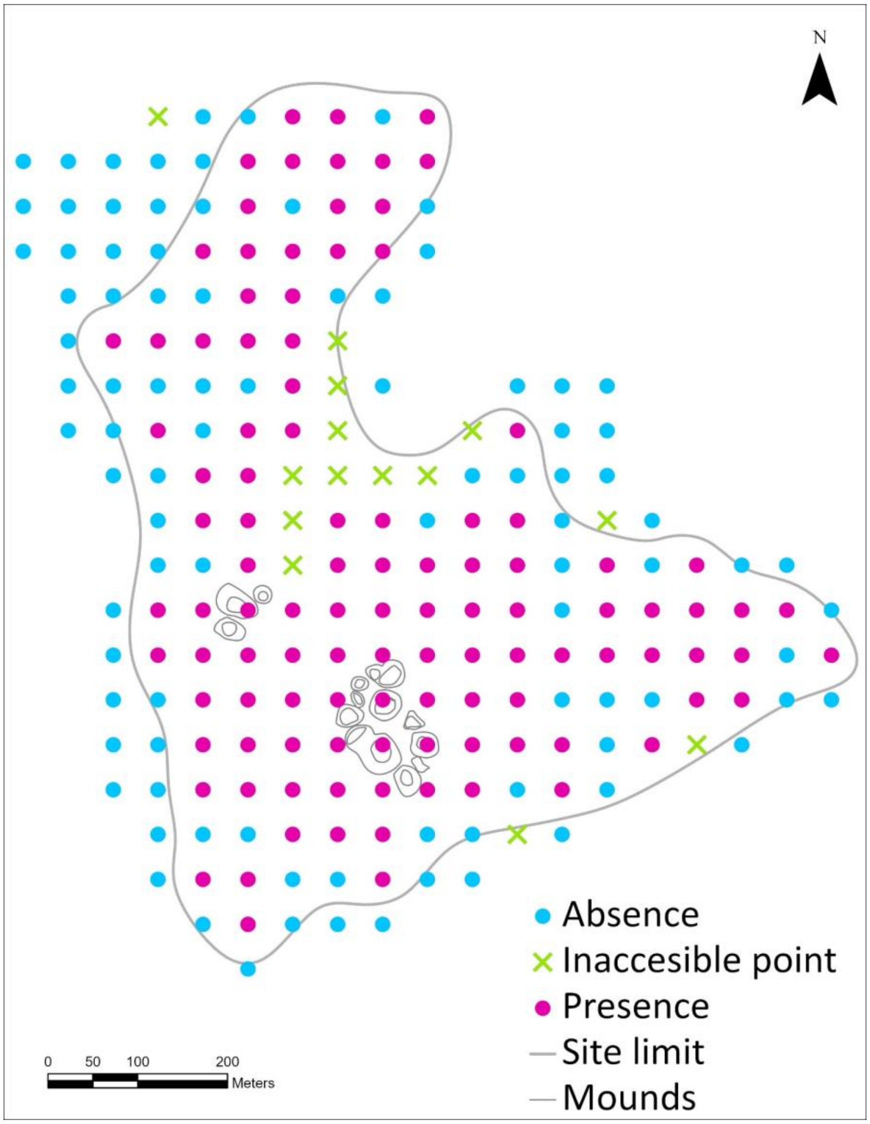

Figure 4.2 Location of all the collection units of the main survey.

The shovel probes that produced ceramic sherds are represented in magenta. The probes with no ceramic sherds are represented in blue. The green Xs represent points that were part of the original survey grid, but turned out to be inaccesible.

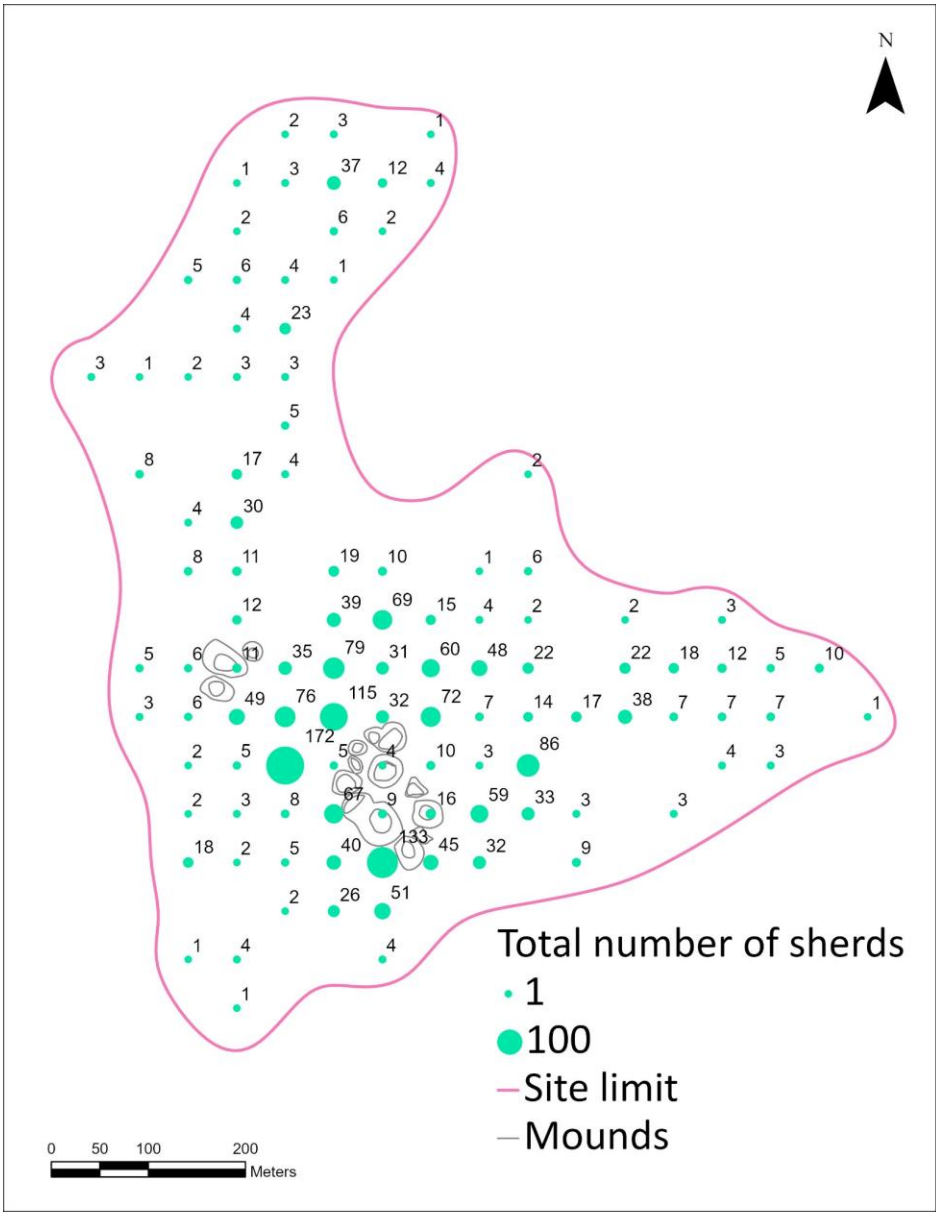

Figure 4.3 Total number of sherds per unit, main survey.

The labels in the upper right of each dot indicate the exact number of sherds per unit.

The third and last stage of fieldwork for this project included the excavation of three stratigraphic units and the topographical mapping of a section of the site. These two activities were carried out in 2021. The aim of these stratigraphic units was to refine the chronological classification of the ceramics and collect samples for radiocarbon dating. For this reason, they were located in places where charcoal had been found in association with archaeological materials during the pilot or the main survey: the first two were within one of the largest mounds of the site (R1), and the third one was on the periphery of the mound area. Figure 4.4 shows the location of the stratigraphic units, as well as the survey units where we found charcoal in the first two fieldwork seasons. Only in the third stratigraphic unit the stratigraphy was as intact as it can be in the site, therefore we can assume that the stratigraphic location of archaeological materials from this unit is more meaningful in terms of temporality. This is partially true for the first two units where the stratigraphy is more complex because the mounds are artificially built structures. The data recovered from each unit is discussed next, and this data will be linked to the results from the survey in the next sections of the chapter.

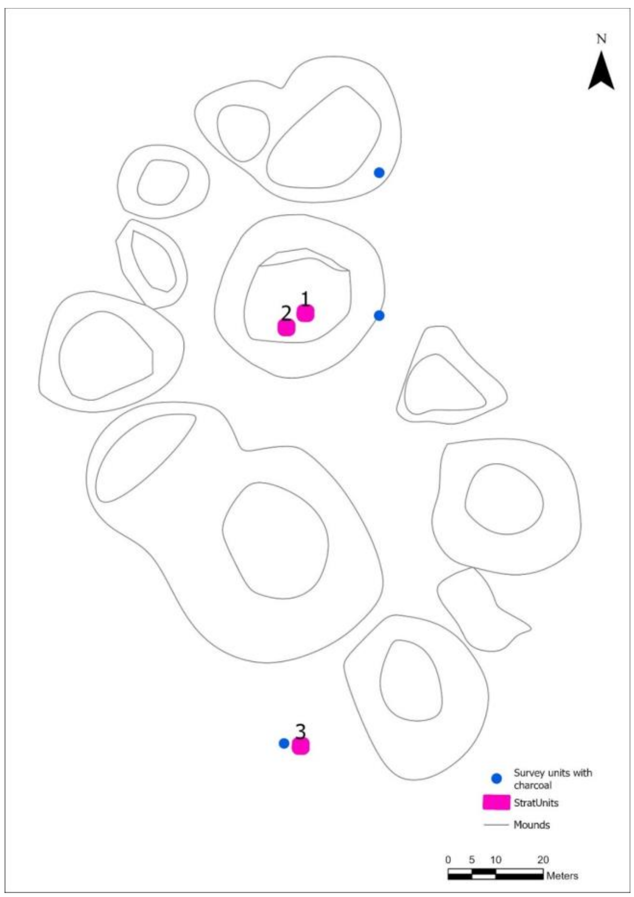

Figure 4.4 Location of stratigraphic units and survey units with charcoal.

These stratigraphic units of 1 m2 were excavated in arbitrary levels of either 10 or 20 cm. A GPS point was recorded in the Southwest corner of each stratigraphic unit. The coordinate system used in the GPS unit was UTM Zone 17N. Units 1 and 2 were both located within one of the largest mounds in the site, right at the center of the mound area, that had been previously designated as Feature 1 (Rasgo in Spanish) or R1 (Fonseca and Chávez 2003). Each unit required around 4 days of work with teams of two or three people.

4.1.3 Stratigraphic Unit 1

This unit was located within one of the largest mounds of the site (R1), in the coordinates 271584E, 986890N. This stratigraphic unit, as well as the other two, was excavated in arbitrary levels of 10 cm. Sometimes two levels were excavated at the same time, meaning that a total of 20 cm were excavated at once. The area of this unit measured 1 m^2 in levels 1 to 13 (from 0 to 130 cm b.s.). The unit was reduced to one fourth of the original area in levels 14 and 15 (130 – 150 cm b.s., on the northeast section of the unit) since the density of the materials decreased drastically around 130 cm b.s. but we still had to reach sterile soil. A total of 500 sherds were collected from this excavation, as well as 11 charcoal samples. Table 2 shows the number of artifacts and samples collected by level in this unit.

Table 2 Stratigraphic Unit 1, ceramic sherds, lithics, and charcoal samples collected.

Stratum	Level	Depth	Ceramic sherds	Lithics	Charcoal samples
1	1-2	0-20 cm bs	33	9	
2	3	20-30 cm bs	36	12	
	4	30-40 cm bs	67	14	
	5	40-50 cm bs	35	4	

	6	50-60 cm bs	39	1	#1
	7	60-70 cm bs	34	4	
3	8	70-80 cm bs	14	2	#5, #6
	9	80-90 cm bs	60	3	
	10-11	90-110 cm bs	129	8	
Charcoal layer	12	110-120 cm bs	25	2	#7, #8, #9, #10, #11
4	13	120-130 cm bs	26	6	#15
	14	130-140 cm bs	1	0	
5	15	140-150 cm bs	0	0	

There are five different strata in this unit. The first and most superficial stratum has approximately 5 cm in depth, and it consists of humus: the soil is silty, dark brown to black and contains organic matter. There was no cultural material within these first 5 cm.

The second stratum measures approximately 50 cm (depth: 5 to 55 cm b. s.). It contains less organic matter than the first one, the color is medium brown and the texture is silty clay. There is an intrusion of yellow soil in the northern part of the unit, but no particular features or artifacts were associated with this intrusion. The density of ceramics in the upper part of this layer is relatively low, with very few decorated sherds, and no fine paste at all. There is an increase in the density of ceramics around 30 cm b.s., where we found a few sherds with fine paste and decorations. The ceramic types found in this stratum include Bugaba Engraved and some typically Aguas Buenas period adornments, like a zoomorphic head. There were several rocks in a pile in this layer, the type of rocks used in the perimeter of the mounds. However, the disorganized arrangement of those rocks, as well as the eclectic characteristics of the ceramic materials, and even the intrusion of yellow soil mentioned before, suggest that this layer was highly disturbed. This was expectable, given the multiple looting holes in the surroundings.

There is a change in the characteristics of the soil at 55 cm b.s that marks the transition to the third stratum: the color of the soil becomes reddish brown; the texture is clay and generally much more compact that in the previous levels. This stratum measures approximately 55 cm (depth: 55 to 110 cm b.s.). The first charcoal sample (#1) was collected from the uppermost section of this stratum (60 cm b.s.), from right under an oval shaped rock. Two more charcoal samples (#5 and #6) were collected from this stratum, at 75 and 80 cm b.s. respectively.

The characteristics of the ceramics change gradually in this stratum: very few fine paste and decorated sherds appear in the upper and lower sections of the layer, none of those in the middle. And the ceramic types are different from the previous stratum as well: here we found Guarumal, Cotito, Corral Rojo, and Bugaba Engraved, as well as Mode 22 supports (all typically Aguas Buenas). The density of the materials decreases between 70 and 80 cm b.s., and increases again towards the bottom of the stratum.

Gray spots appear in the soil around 110 cm b.s., and a thick layer of charcoal (up to 5 cm) appears at 113 cm b.s. Multiple samples of charcoal were collected from and around this layer, including samples #7 and #8, both at 110 cm b.s., as well as samples #9 and #10 at 113 and 115 cm b.s. respectively.

The fourth stratum is right below this charcoal layer, and it measures 10 to 20 cm (depth: from 115 cm b.s. in the uppermost area to 140 cm b.s. in the lowermost area). The soil is medium brown, silty clay. The density of ceramics decreases considerably in this stratum, and only one sherd was recovered from the level 14 (130 – 140 cm b.s.). The ceramic types include Guarumal and Mode 22 supports. The last two charcoal samples in this unit were collected from this stratum: sample #11 was located 118 cm b.s., and sample #15 was attached to a sherd located 120 cm b.s.

The transition to the fifth and last stratum of this unit starts around 130 cm b.s., and by 140 cm b.s., the entire excavated area belongs to this stratum. The soil is yellow and red clay, very compact, and there are no archaeological materials, in other words, this is sterile soil.

The information recovered from this stratigraphic unit allows us to partially reconstruct the sequence of construction and occupation of the mound R1. A thick layer of charcoal located between 110 and 115 cm below the surface of the mound represents a burning episode that very likely marks the beginning of the construction. On the one hand, this depth inside the mound corresponds to the surface level outside the mound, and on the other hand, the tropical rain forest characteristic of the region requires slash and burn, or similar clearing techniques, in order to prepare a terrain for construction and/or cultivation. Taking this observation into account, we can infer that the sequence of occupation in this particular location starts before the construction of the mound: there is evidence of human occupation in the form of ceramics and charcoal fragments below the thick charcoal layer. Above this layer, there is a soil layer of approximately 55 cm that contains a higher density of sherds on the top and the bottom, and a lower density in the middle. This suggests the existence of two construction/occupation episodes, however, the stratigraphy itself is not clear enough to identify this division. At the very top of this layer, 55 cm below the surface of the mound, the soil is more compact, which suggests a more permanent floor. The rest of the soil from 55 to 5 cm below the surface of the mound has a similar density of ceramics, but it has a combination of soils and materials indicating that it was disturbed by looting (this layer might even be filling material from some of the looter holes around). The top 5 cm are recently developed soil, rich in organic material.

4.1.4 Stratigraphic Unit 2

This unit was also located within the mound R1, in the coordinates 271850E, 986887N. The area of this unit was 1 m^2 in levels 1 to 11 (0 – 110 cm b.s.). It was reduced by half in levels 12 to 14 (110 – 140 cm b.s.), and again by half in levels 15 to 17 (140 – 170 cm b.s.), meaning that the last three levels had an area of 50 by 50 cm, corresponding with the southeast section of the unit. The total number of sherds collected from this excavation was 393. Table 3 shows the total number of materials collected in this unit per level. Even though this unit was located within the same mound as Stratigraphic Unit 1, the stratigraphy was different. Only the first stratum of approximately 5 cm was similar to the first unit, since it also corresponded with the humus layer: the soil was dark brown, with abundant organic matter and no archaeological materials.

Table 3 Stratigraphic Unit 2, ceramic sherds, lithics, and charcoal samples collected.

Stratum	Level	Depth	Ceramic sherds	Lithics	Charcoal samples
1	1-2	0-20 cm bs	28	7	
2	3	20-30 cm bs	16	4	
	4	30-40 cm bs	2	0	
	5	40-50 cm bs	36	4	
	6	50-60 cm bs	37	3	#4
	7	60-70 cm bs	46	8	
	8	70-80 cm bs	65	2	
	9	80-90 cm bs	69	6	
	10-11	90-110 cm bs	59	7	
3	12-13	110-130 cm bs	18	2	
	14-15	130-150 cm bs	5	0	
	16-17	150-170 cm bs	11	3	

The second stratum measures between 55 and 105cm (depth: 5 to 115 cm b.s. in the deepest part), the soil is medium to light brown, clay silty. The density of the ceramics increases gradually towards the bottom, and while most of the sherds are non-diagnostic, there are some Bugaba Engraved and Mode 22 support fragments. There are also some river stones in this stratum that might have been part of the structure of the mound, but they are not forming any particular feature here. Only one charcoal sample (#4) was collected from this unit. That sample was located 65 cm b.s. Charcoal was definitely scant in this unit, especially in comparison with Stratigraphic Unit 1.

The soil in the Southeast corner of the unit becomes looser in texture and the color alternates between red and reddish brown, from 60 cm b.s. all the way to the bottom of the unit at 170 cm b.s. The sherds from within this stratum were similar to the sherds from the other sections of the unit.

Below the 80 cm b.s. and all the way to the bottom of the unit (except for the SE corned), the soil is a combination of medium brown clay silty, with yellow and orange clay. The density of ceramics decreases considerably below the 110 cm b.s.

Even when the type of soil is very different from the Stratigraphic unit 1, the density of ceramics across levels is similar. Because the materials were decreasing, the unit was reduced to the Southern half after 110 cm b.s. and again reduced to the Southeast corner after 140 cm b.s. The ceramic type found within this chaotic stratum was Bugaba Engraved, and several strap handles that are not associated with any specific type, but are typically Aguas Buenas period handles.

The stratigraphy of this unit was particularly challenging to interpret. This area was possibly more disturbed by looting that the area of the first stratigraphic unit. For this reason, most of the observations about construction and occupation of the mounds were based on the information obtained from the Stratigraphic Unit 1.

4.1.5 Stratigraphic Unit 3

This unit was located in the southern periphery of the mound sector, in the coordinates 271853E, 986799N. It measured 1 m^2 in levels 1 to 12 (from 0 to 120 cm b.s.) and the deepest level was at 130 cm b.s. This unit had four strata, and it produced a total of 916 sherds. A summary of the materials collected from this unit is shown in Table 4. The first stratum measures 10 cm and corresponds with the layer of humus: the soils is dark brown to black, it contains abundant organic matter, and in this case, it also contains ceramic sherds.

Table 4 Stratigraphic Unit 3, ceramic sherds, lithics, and charcoal samples collected.

Stratum	Level	Depth	Ceramic sherds	Lithics	Charcoal samples
1	1-2	0-20 cm bs	90	9	
2	3-4	20-40 cm bs	128	9	
3	5	40-50 cm bs	137	25	
	6	50-60 cm bs	153	30	
	7	60-70 cm bs	115	23	#12
	8	70-80 cm bs	178	26	#14
4	9	80-90 cm bs	101	20	
	10-11	90-110 cm bs	10	10	
	12	110-120 cm bs	3	1	
	13	120-130 cm bs	2	1	

The second stratum measures approximately 30 cm (depth: 10 to 40 cm b.s.). The soil is medium brown, clay silt. Several river stones might be part of a feature in this layer (see Figure 4.5). The density of ceramics increases gradually towards the lower part. The only sherd that we can say confidently that is from the Chiriqui period appeared within this stratum. It is a sherd that has polychromatic decoration, characteristic of Buenos Aires Policromo and some other Chiriqui types in the region. Some other sherds might be Chiriqui as well, but they are not diagnostic enough. There are also Guarumal and handle fragments associated with Aguas Buenas types.

Figure 4.5 Stratigraphic Unit 3. Depth: 40 cmb.s.

The third stratum measures approximately 40 cm (depth: 40 to 80 cm b.s.). The soil is orange brown, the texture is clay. The ceramic density is higher than in the previous stratum. The types found here are: Cerro Punta Anaranjado, Guarumal, Bugaba Engraved, and some figurines like a zoomorphic head, all characteristic of the Aguas Buenas period ceramics in the region. In the lower section of this stratum, in the limit with the next one, there are Quebradas type sherds. This is a type that belongs to an Early Aguas Buenas or also called Quebradas period in some parts of the Diquís region. Three charcoal samples were collected from this stratum, however one of them was discarded because the quantity of charcoal was extremely small. Sample #12 was located 65 cm b.s., and sample #14 was found at 75 cm b.s. Both samples were associated with what a feature that included a scatter of undiagnostic sherds and rocks.

Finally, the fourth stratum is a combination of red clay and decomposing rocks, it measures around 50 cm (depth: 80 to 130 cm b.s.). The density of the ceramics decreases quickly from the upper to the lower zone of the stratum. Within the first 10 cm of this layer (between 80 and 90 cm b.s.), we found some common Aguas Buenas types, like Guarumal and Mode 22 supports, but also sherds of the Abrojo Complex style, which is an Early Aguas Buenas assemblage.

The stratigraphy of this unit was more straightforward than that of the other two units because it is outside of the mound area. We basically see a steady accumulation of ceramic materials that reflects the general trend observed in the site: a brief Early Aguas Buenas occupation, a much more intense Late Aguas Buenas component, and an almost ephemeral Chiriquí occupation.

4.1.6 Topographic map

The data for the topographic map was recorded using a GPS unit with an external antenna. The points were recorded every 10 m approximately (more or less depending on the landscape). Instead of using a defined grid, we followed the topographical features on the field and recorded data points wherever there was a change in the terrain. We also recorded the location of water streams within the site. Special attention was paid to the location of small, sometimes seasonal, water streams within the site. The resulting map is presented below, in the Space section.

4.2 Results from laboratory analysis

The analysis of the ceramic and lithic materials was conducted right after each one of the three field seasons. A similar type of stylistic analysis was applied to all those materials, but the analytical categories were improved and refined over time. The details of the stylistic classification related to chronology are explained in section 3.3. Ceramic Analysis.

4.2.1 Ceramic analysis: manufacture and function attributes

Although types, modes and wares were a guide or a point of reference for the relative chronological classification, the ceramic analysis of this collection was less concerned with quantifying the number of sherds of a certain type, and more focused on recording and quantifying the occurrence of certain characteristics of the sherds related to their manufacture and potential function. Those characteristics will be described next.

The first characteristic considered in the ceramic analysis was the texture of the paste: those with particles of 0.5 mm or bigger were classified as coarse, while those with smaller or no distinguishable particles were classified as fine. The ceramics from this collection showed little variation in texture, most of the sherds were basically coarse: there were particles of approximately 0.5 to 2 mm, and the texture was porous and loose. Since the texture of the paste was coarse in the majority of the material, only the number of sherds with very fine paste per unit was recorded. Fine here meant a compact, homogeneous paste, with particles of less than 0.5 mm.

The next attribute considered in the ceramic analysis was the color of the paste. Although most of the sherds had a coarse texture, there was more variability in the color of the paste. Considering that the variability in the paste color may correspond to the raw materials as well as to the firing conditions, the number of sherds with different paste color was recorded for each unit, in order to determine if there were chronological or spatial differences in the proportion of different colors.

All the sherds from each unit were also classified according to their thickness: thin (less than 0.5 cm), medium (0.5 to 1 cm), and thick (more than 1 cm). Normally a different variable, vessel shape, is used to evaluate the level of elaboration and the possible function of vessels. However, because of the small size of the sherds, it was practically impossible to determine the shape of the vessels (bowl, jar, plate, …). In this case, thickness was the best approximation to the type of information that is usually inferred from the vessel shape.

Two more variables were quantified: number of sherds with decoration and number of sherds with slip or engobe in a color different from the paste. Decoration includes incising, engraving, modeling, appliques, painting, and other color effects, like negative or fugitive color. These variables also relate to the level of elaboration and potential function of the vessels.

The overall proportion of fine paste, sherds with slip, and decorated sherds in the assemblage was extremely low (less than 4% for each category). The distribution and relationship between these and the other ceramic variables are discussed in detail in the Data Analysis section.

4.2.2 Lithic analysis

The objective of the lithic analysis was to classify the lithic artifacts according to their function. Rather than using other lithic collections from the Diquís region as a point of reference (like we did for the ceramic analysis), this lithic analysis was based in the functional categories proposed by Ranere (1980)for assemblages from the Chiriquí region of Panama. One of the reasons why Ranere’s approach to lithic analysis is useful even in regions different from where he worked is because the lithic artifacts, especially the tools, show much less variation across regions than ceramics. Stylistic variations are more evident in sculptures and other special objects. Another reason why Ranere's lithic analysis is useful is precisely because he focused on function, not only in manufacture and raw materials. As he points out, while the interpretation of technology is a "less speculative aspect of lithic analysis", the "more hazardous" interpretation of function "provides information on site activities available from no other source" (Ranere 1980:124). In order to bridge this gap between the interpretation of technology (How was the tool made? What is it made of?) and the interpretation of function (What was the tool used for?), Ranere carried out experiments where he replicated the manufacturing process, and he conducted microwear analysis of the archaeological materials.

Based on those experiments and analysis, Ranere found that practically all the stone tools recovered from the tropical forest contexts where he worked fell in one of three functional categories: stone work, woodwork, and plant processing. The category of stone work includes tools used to make other tools, and the byproducts of tool production: hammers, anvils, debitage. The category of woodwork contains tools used for a variety of activities such as tree felling, agriculture, and possibly even hide and bone processing: scrapers, axes, knifes. The category of plant processing includes grinding stones, metates, and small inserts (spikes) that were attached to wooden tablets and were used to grate certain tubers like manioc. These categories have been implemented successfully in other regions, including the Reventazón river basin (Sánchez 1987) and San Ramón de Alajuela (Murillo and Sol 2023).

The analysis of the lithic assemblage from Java consisted of the classification of each artifact or fragment into of four categories: stone work, woodwork, plant processing, and ceremonial activities. This last category was added to the analysis because we found fragments of sculptures in some of the shovel probes and stratigraphic units that obviously represent a different kind of activity that the rest of the lithic tools. Table 5 presents the total number of lithic artifacts and fragments collected during each season by category. We will review in detail the distribution of these categories across the site in the subsequent sections. For now, it is important to note that the number of Ceremonial activities lithics in this table is extremely small, but this is the case because this table includes only materials collected from a shovel probe or a stratigraphic unit. The site Java has a large number of sculptures on the surface, which have been previously mapped. We will return to that map in the following sections as well.

Table 5 Total number of lithics per category per field season

	Stone work	Woodwork	Plant processing	Ceremonial activities	**Total**
Pilot project	41	11	9	2	**63**
Main survey	91	6	2	1	**100**
Stratigraphic units	229	14	6	3	**252**
Total	**361**	**31**	**17**	**6**	**415**

4.2.3 Radiocarbon dates

Six of the charcoal samples collected from the stratigraphic units were submitted for radiocarbon dating at the AMS facility in Penn State University. There were at least six distinctive contexts or levels from which more than 12 samples were collected. However, not all of them could be submitted for dating due to budget constraints, aside from the fact that some of the samples were discarded in the Laboratory due to the extremely small content of charcoal in them.

Four of these samples submitted for dating were collected from Stratigraphic Unit 1 and two samples from Stratigraphic Unit 3. Table 6 presents the contextual information of the samples as well as the results from the radiocarbon dating. Figure 4.6 shows the distribution of the calibrated radiocarbon dates produced with OxCal.

Table 6 Radiocarbon dates and their contextual information.

Sample ID	Depth	Context	^{14}C age (BP)	Calibrated date (95.4% probability)
PIT172 (#1)	60 cm b.s.	Stratigraphic Unit 1, Mound 1. This sample was collected from the upper end of the stratum 3 in this unit, from what seems to be a floor due to the compact texture and reddish color of the soil.	1255 ±15	679-823 AD
PIT176 (#6)	80 cm b.s.	Stratigraphic Unit 1, Mound 1. This sample was collected from the lower end of the stratum 3 in this unit.	1255 ±15	679-823 AD
PIT178 (#8)	110 cm b.s.	Stratigraphic Unit 1, Mound 1. This sample was collected from the upper end of a thick layer of charcoal that divides stratums 3 and 4 in this unit.	1330 ±20	652-774 AD
PIT181 (#11)	118 cm b.s.	Stratigraphic Unit 1, Mound 1. This sample was collected from the lower end of a thick layer of charcoal that divides stratums 3 and 4 in this unit.	1290 ±20	667-774 AD
PIT182 (#12)	65 cm b.s.	Stratigraphic Unit 3, periphery of mound sector. This sample was collected from the middle section of the stratum 3 in this unit, in association with a scatter of ceramic sherds and lithic artifacts.	1225 ±15	707-880 AD
PIT183 (#14)	75 cm b.s.	Stratigraphic Unit 3, periphery of mound sector. This sample was collected from the lower end of the stratum 3 in this unit, in association with a group of rocks possibly forming a hearth feature.	1205 ±20	773-885 AD

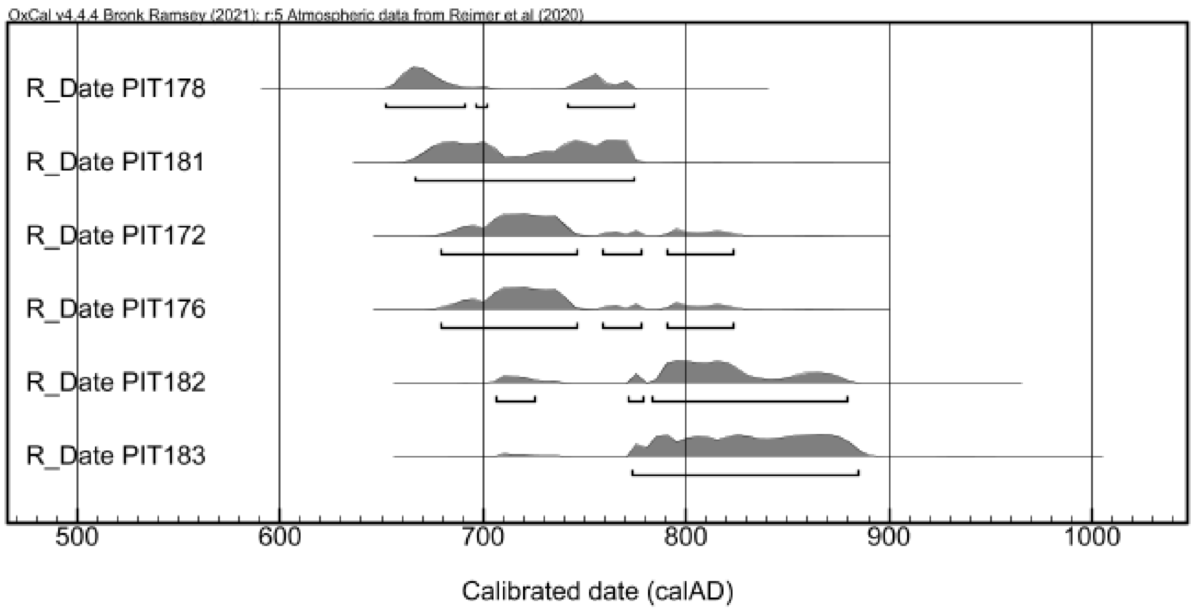

Figure 4.6 OxCal plot of calibrated radiocarbon dates.

4.3 Data analysis

The data obtained from the laboratory analyses is combined in this section to reconstruct the sequence of occupation in Java through time and space. Descriptive as well as exploratory statistics are used to discern patterns in the ceramic assemblage that are relevant for the research questions.

4.3.1 Time

Three lines of evidence have been used to reconstruct the sequence of occupation of Java: diagnostic ceramic sherds, stratigraphic information, and radiocarbon dates. The site Java had been reported as a Chiriqui site (Fonseca and Chavez 2003). But it became evident shortly after starting the ceramic analysis that the site had a substantial Aguas Buenas component. And by the end of the ceramic analysis, it seemed that the earliest occupation of the site dated back to the Early Aguas Buenas period, while the main occupation of the site was in fact Aguas Buenas, with an incipient Chiriqui component. The location of diagnostic sherds from each period is shown in Figure 4.7 The number of diagnostic sherds for the Early Aguas Buenas period and the Chiriquí period was extremely small, generally less than 5 per unit, if there were any at all. Only for the Late Aguas Buenas period we found more than 10 diagnostic sherds in a few units, which happen to be units with a large number of sherds in general. In order to facilitate the comparison between periods, the maps shown in Figure 4.7 simply represent units with presence of at least one diagnostic sherd. However, for this reason, the difference between Late Aguas Buenas and the other two periods is slightly underrepresented. But we can still make important observations at the scale of the settlement, based on the maps. The occupation in Java during the Early Aguas Buenas period was very sparse, and it seems to be restricted to the mound sector, possibly even before it became the mound sector. In the Late Aguas Buenas period the occupation expands from the center towards the eastern and northern sectors. In the Chiriquí period, the occupation decreases again, leaving the eastern sector unoccupied.

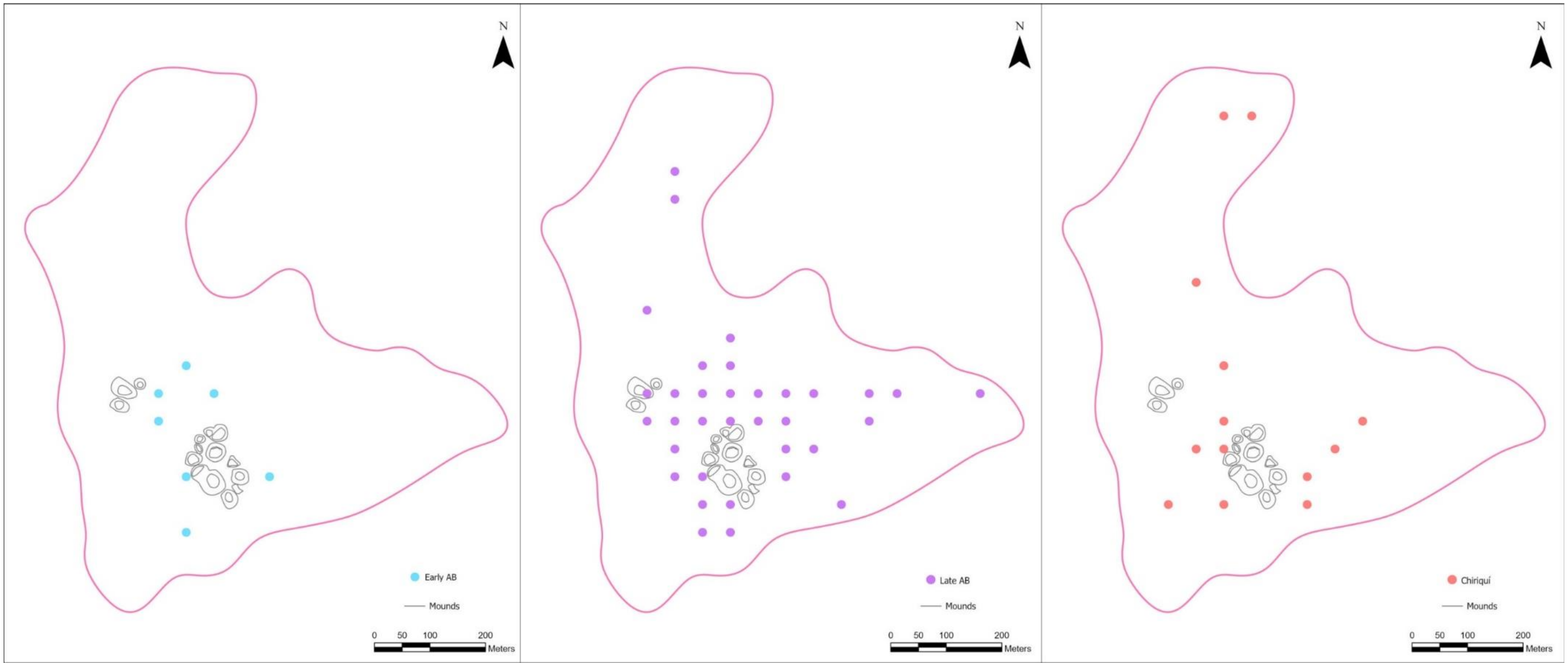

Figure 4.7 Location of diagnostic sherds per period.

From left to right: Early Aguas Buenas, Late Aguas Buenas, Chiriquí.

The information obtained from the survey is reinforced by the data recovered from the stratigraphic units, particularly from unit 3. In the case of the Stratigraphic Units 1 and 2, all the diagnostic sherds from all the levels corresponded to the Late Aguas Buenas period. The Stratigraphic Unit 3 is the only one that produced a few sherds from the Early Aguas Buenas and Chiriquí periods. The number of diagnostic sherds per level in this Unit is presented in Table 7. As we can see, the only Chiriquí period sherd collected from the stratigraphic units was found relatively close to the surface, in level 3-4 (20 to 40 cm b.s.). This was a sherd with a polychromatic decoration, which up until now has only been found in Chiriquí period contexts in the region. On the other hand, the deepest levels with cultural material in the Stratigraphic Unit 3 is where we found sherds that correspond with the Quebradas type and the Abrojo complex style, both characteristic of an Early Aguas Buenas period in parts of the region. This provides strong support for the division of Aguas Buenas into two periods.

Table 7 Number of diagnostic sherds per period per level in Stratigraphic Unit 3.

Level	Total number of sherds	Early Aguas Buenas	Late Aguas Buenas	Chiriquí
1-2	90	0	1	0
3-4	128	0	1	1
5	137	0	4	0
6	153	0	0	0
7	114	0	3	0
8	178	1	3	0
9	101	1	3	0
10-11	10	0	0	0
12	3	0	0	0
13	2	0	0	0

Finally, the six radiocarbon dates confirm that the main occupation in the site of Java occurred during the Late Aguas Buenas period (see Table 6 and Figure 4.7). In fact, the six dates fall within a range of less than 250 years, from 652 AD to 885 AD, even though they were collected from different layers within the mound and outside the mound. The earliest radiocarbon dates correspond to samples #8 and #11, which were collected from the layer of charcoal located approximately 110 cm b.s. within the mound, which likely corresponds with a burning episode as discussed before (see section 4.1.3). This depth corresponds to the surface level right outside the mound, which means that they most likely date the moment of the beginning of the construction of this mound, sometime between 652 AD and 774 AD. Samples #1 and #6 were collected from the stratum right above the charcoal layer, and under an occupation floor within the mound. There is a difference of 20 cm in depth between these two dates, but they turned out to have the same range. Surprisingly, the two most recent dates (samples #12 and #14) range between 707 AD and 880 AD, and 773 AD and 885 AD respectively. This is surprising because these two samples were collected from a very deep context outside the mound area (65 and 75 cm b.s.). This is very deep considering that most shovel probes reached sterile soil around 60 cm b.s. Also, in comparison with the stratigraphic units excavated within the mound, this is much deeper because the surface in those excavations was the current surface of the mound, meaning that 0 cm. b.s. in Stratigraphic Unit 3 roughly corresponded with 110 cm b.s. in Units 1 and 2.

Based only on the radiocarbon dates, we can infer that the sequence of occupation of Java was relatively short but intense. It was only after the mounds were built that the population expanded beyond this central area. The stratigraphic information and the ceramic analysis are consistent with this interpretation, but they also add some details that we would not be able to know from the reduced samples of six radiocarbon dates: the earliest occupation of the site probably occurred in the Early Aguas Buenas period but it was very ephemeral. And it is likely that the site was still occupied at least by the beginning of the Chiriquí period but the population was drastically reduced.

4.3.2 Space

A differential GPS was used to collect 308 data points from Java, which were used to build the Digital Elevation Model shown in Figure 4.8. Due to time constraints, only a section of the site was covered in this topographic survey. This is why in the map the DEM does not fill the area within the site limit. The basic data recorded in each collection point was the elevation, as well as the horizontal coordinates. But we also recorded additional data in some collection points, for example if there was a stream right next to the point, or some characteristics of the terrain. In Figure 4.8, we can see that there are multiple streams in close proximity to the mound sector. The flow in these streams fluctuates seasonally (some of them were partially dry during fieldwork, which happened during the dry season anyway), but they have at least some water yearlong. This map also illustrates the location of a possible mound in the eastern sector of the site. When we collected the data in this area, we noticed that there might be a mound but it was difficult to identify the feature with precision because this sector is heavily looted, and it has been intensively used for agriculture. That being said, this is the highest resolution topographic map that we currently have for the site of Java.

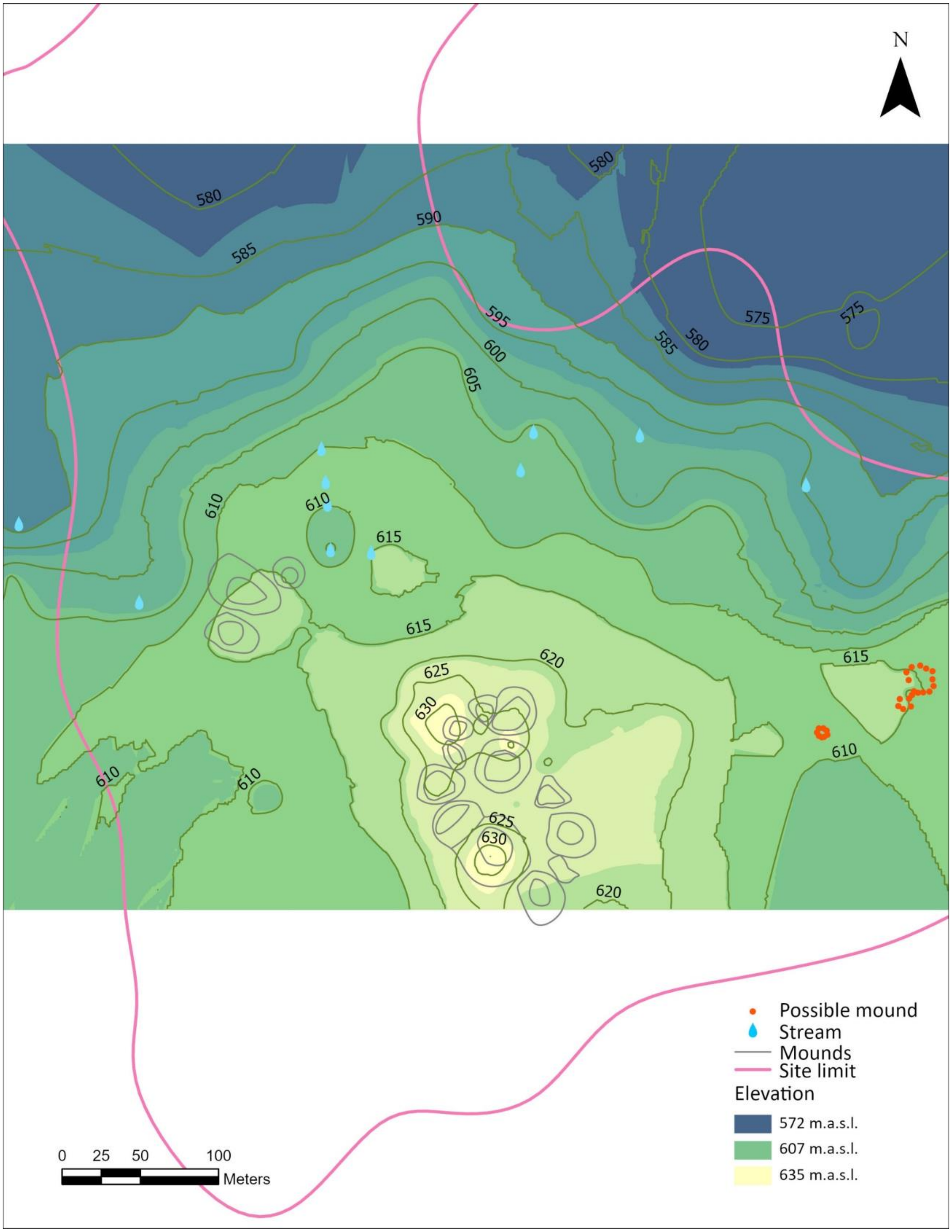

Figure 4.8 DEM of the site of Java, based on data from Differential GPS.

From this point and for the rest of the chapter, the settlement of Java is treated as a single-phase site in the analyses and discussions. Based on the evidence presented on the previous section, the earliest occupation corresponds to the Early Aguas Buenas period and the most recent to the Chiriquí period. However, the occupation during those two periods is either brief or sparse or both, while the most intensive occupation occurred during the main Aguas Buenas period. Out of thousands of ceramic sherds, only a handful of them could be classified as either Early Aguas Buenas or Chiriquí, while more than a hundred could be classified as Aguas Buenas, and the rest were non diagnostic. For this reason, the spatial analyses were applied to the entire assemblage. Otherwise, if the collection was divided into the three periods, two of them (Early Aguas Buenas and Chiriquí) would have shown results that were distorted by the extremely small size of the samples.

The area of the site Java, based on the survey, is approximately 40 ha. That is the area of the polygon that represents the new site limit, which was defined based on the shovel probes with ceramics, as we can see in Figure 4.9. The shovel probes of the main survey were spaced every 50 m; therefore, each probe is a sample from an area of 2500 m2 or 0.25 ha. Considering that the number of probes with ceramic sherds from the main survey were 107, this number of probes represents an area of approximately 27 ha with presence of ceramics. The actual size of the site is larger than that for several reasons. For example, there are “inaccessible points” in the survey grid that might look at first glance like areas without material but in fact correspond with water streams within the site (see Figure 4.2). And there is always the possibility, inherent to random sampling, of hitting the only spot with no archaeological materials in an area otherwise rich in these materials.

The distribution of the ceramic sherds highlights a potential division of the site into three sectors: the main one in the Center/Southwest, and two smaller ones in the Northeast and in the East. These potential sectors will be discussed in further detail in the next section about variability across the site. For now, it is important to notice that even though the site is "narrow" between those areas, there is no gap larger than 50 m in the distribution of all the ceramics found across the site. In other words, every single survey unit with presence of ceramics has at least one more immediate unit with presence of ceramics as well.

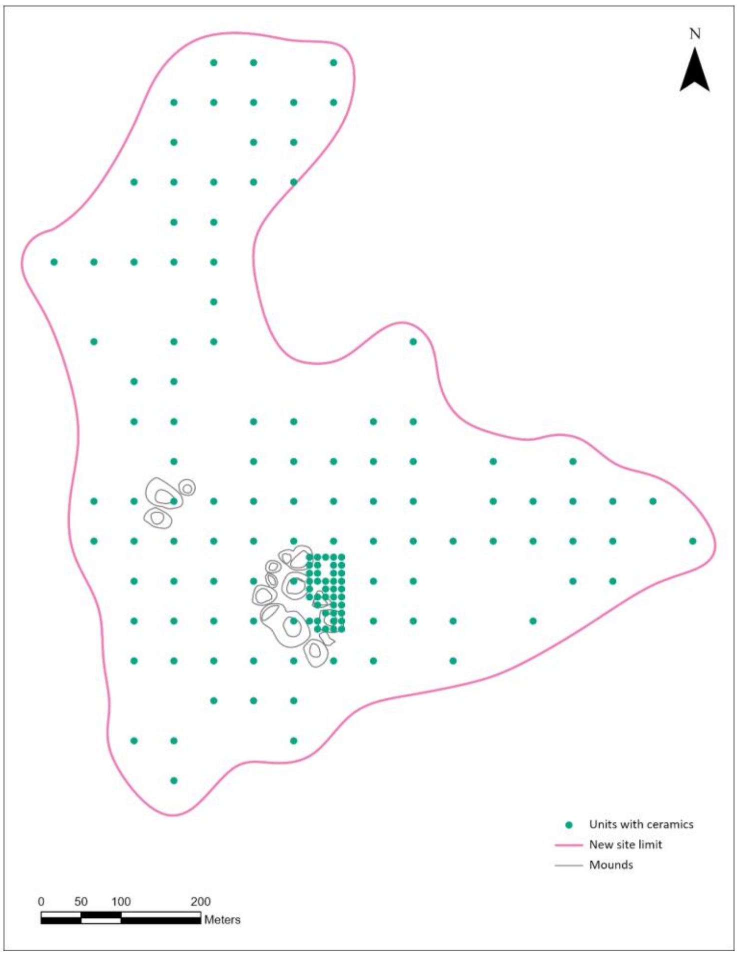

Figure 4.9 Survey units with presence of ceramic sherds and new site limit.

Although the density of ceramics decreases from the center to the outside of the settlement, it is possible to delineate a limit for the site with an error range of 50 m (the space between survey units). As we can see in the presence/absence figure, there are one, two or more units with no materials in almost every direction around the site. If we assume that the occupation is contiguous throughout the site, since there are no gaps larger than 50 m, the actual size of the settlement is approximately 40 ha. This confirms that Java was one of the largest settlements at least during the Aguas Buenas period in the Diquís region, where Aguas Buenas sites tend to be smaller like El Cholo (whose exact size remains unclear but it is somewhere between 5 and 25 ha, according to Herrera, 2015:87), or possibly larger but more dispersed like Bolas (117.9 ha according to Palumbo et al 2017: 10).

The counts of sherds per unit were the basis to produce a density surface of the site. Although still in relative terms, these are representations of the population density across the site, since ceramic sherds are our best proxy for population itself. The gridding method applied was inverse distance to a power, where a grid is created by extrapolating the values of the nodes from the actual data points around each node, and depending on the power used, the values weight more or less depending on their distance to the node. In Figure 4.10, the power used was 0.5 which means that data points that were distant from the nodes had enough weight in the extrapolation to smooth the surface and represent general trends. This surface shows that the highest population densities are concentrated around the mound area, and they quickly decrease towards the outside of this area. In this picture of the general trends, the northern sector almost disappears, because the density is so low there in comparison with the central part of the site, but we can still see a small peak in that northern area clearly separated from the center.

The power used for Figure 4.11 was 3, which means that the closer the data points were to the extrapolated point, the more weight they would have. In other words, local variabilities are highlighted in this surface, instead of general trends. This surface highlights the division between the center and the northern sectors of the site. It had been suggested, based on the distribution of the ceramics, that there might be a third sector on the eastern side of the mound area. However, based on this density surface, it seems that the separation is not as marked as with the northern sector. Even in this second surface that emphasizes the local variability in densities, the eastern zone is possibly an extension of the central mound area, while there is a clear gap between the northern sector and the rest of the settlement.

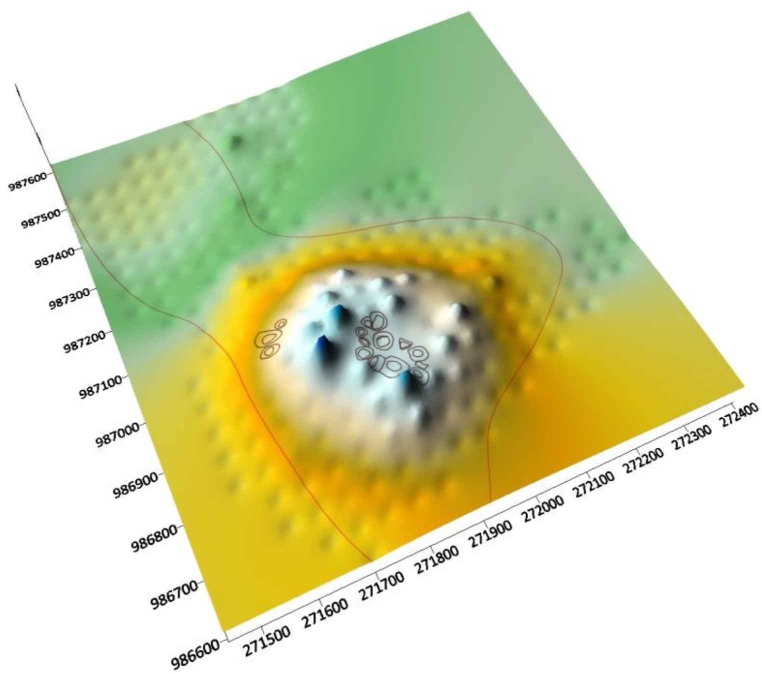

Figure 4.10 Density surface of Java. Power 0.5

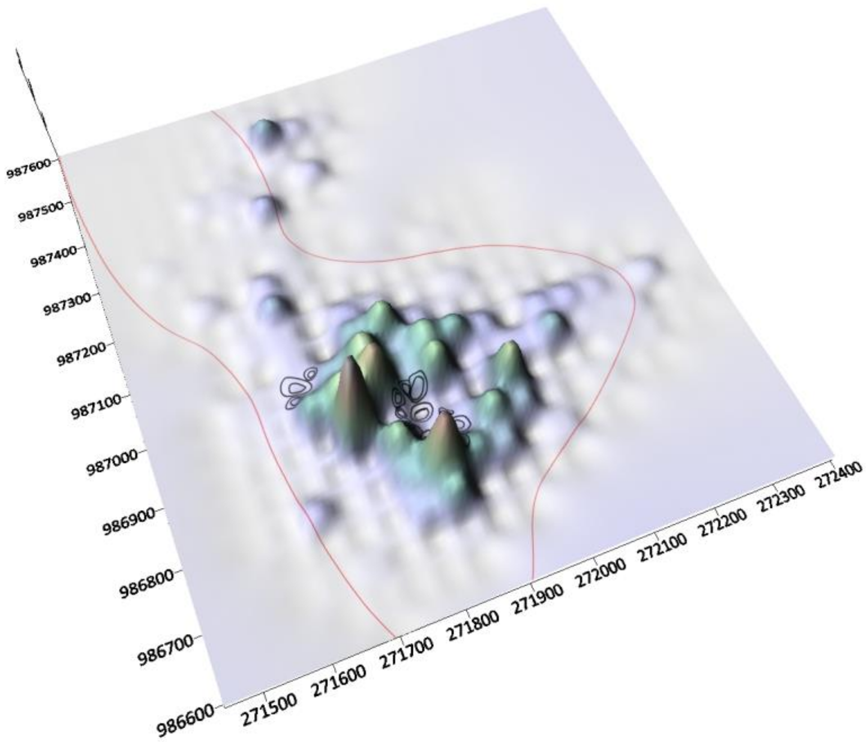

Figure 4.11 Density surface of Java. Power 3

Both surfaces illustrate how the highest densities of materials are right around the mounds, not in top of them. This has important implications for our understanding of the function of the mounds. The mounds had been reported as having both funerary and habitational functions (Fonseca and Chávez 2003). During the survey, some of the shovel probes were excavated inside the mounds and we did find utilitarian sherds in them. However, these density surfaces reveal that the highest densities occur around the mounds, and not even on the edge of the mounds, but at a certain distance from them. This observation complicates the interpretation about the function of the mounds. This will be further discussed in the next chapter.

The number of lithic artifacts is considerably small in comparison with the ceramic sherds recovered from both the shovel probes and the stratigraphic excavations. In the case of the shovel probes, most of the units with lithics had 5 or less, with only two exceptions. Figure 4.12 shows the location of the survey units with lithics. This difference might indicate that lithic tools were less commonly used and manufactured in this site, but it might be also a reflection of the nature of lithic tools here: most of the lithic artifacts recovered are minimally modified stones, rather than highly elaborated artifacts. For this reason, they were sometimes difficult to identify during fieldwork. An effort was made to collect all the possible lithics and sort them during the laboratory analysis, but there is a chance that some stone lithic tools were not collected because they were not identified as artifacts. These observations correspond to relatively small lithic tools or artifacts. Stone sculptures, on the other hand, are abundant and elaborate. The location of all the stone sculptures visible in the surface was mapped by Lara in 2001 and published by Fonseca and Chávez in 2003 (Figure 4.13 was based on their original map). Several of these sculptures are no longer in situ: they were looted or moved somewhere else over the last two decades. But we can make some general observations based on the published map. Two types of sculptures are only found in close proximity to the mounds: stone spheres and *espigas* (pillars in the map). Barriles are also concentrated in the mound area for the most part, but with some exceptions found away from the mounds. Finally, anthropomorphic sculptures and petroglyphs are scattered across the site.

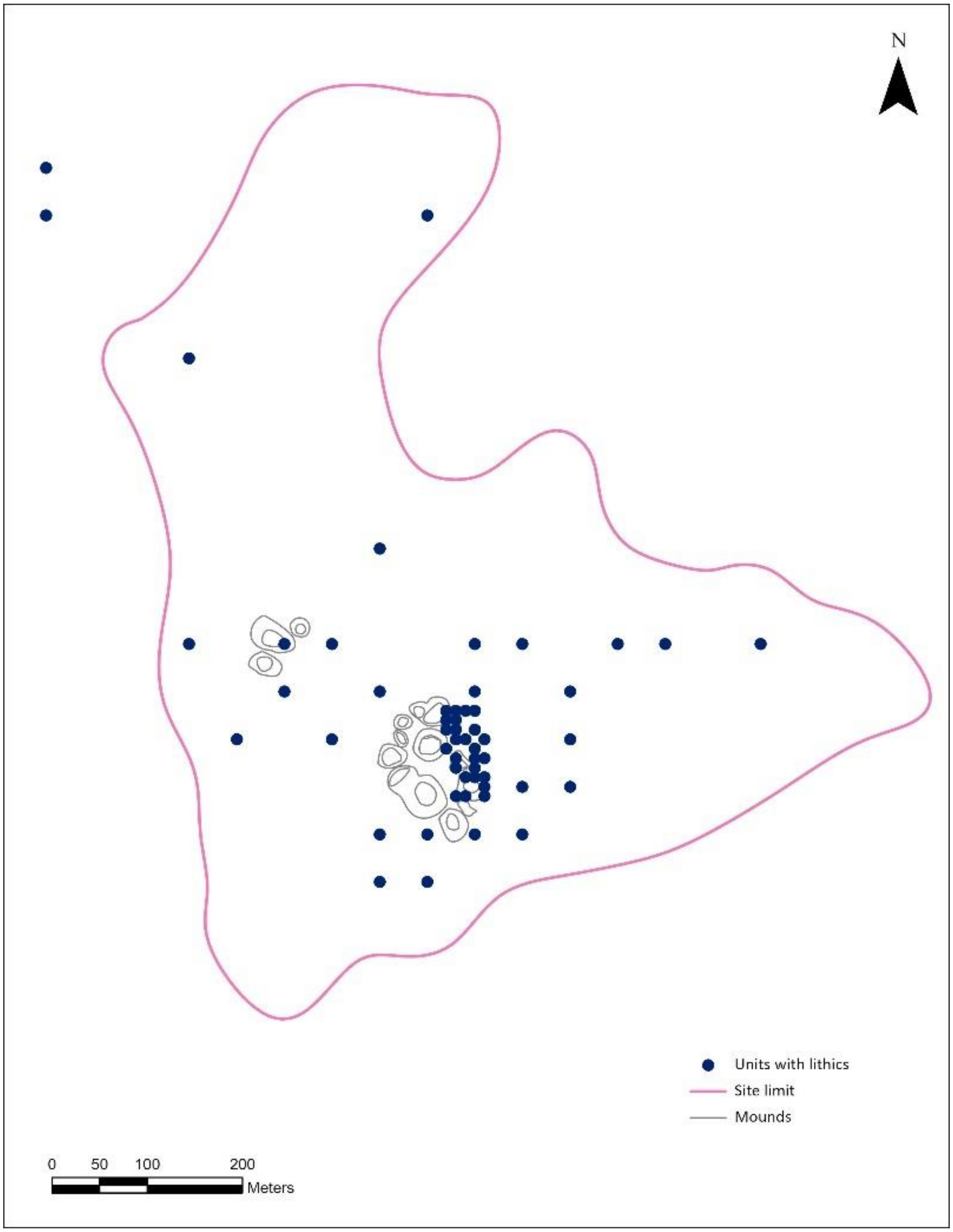

Figure 4.12 Location of survey units with lithics.

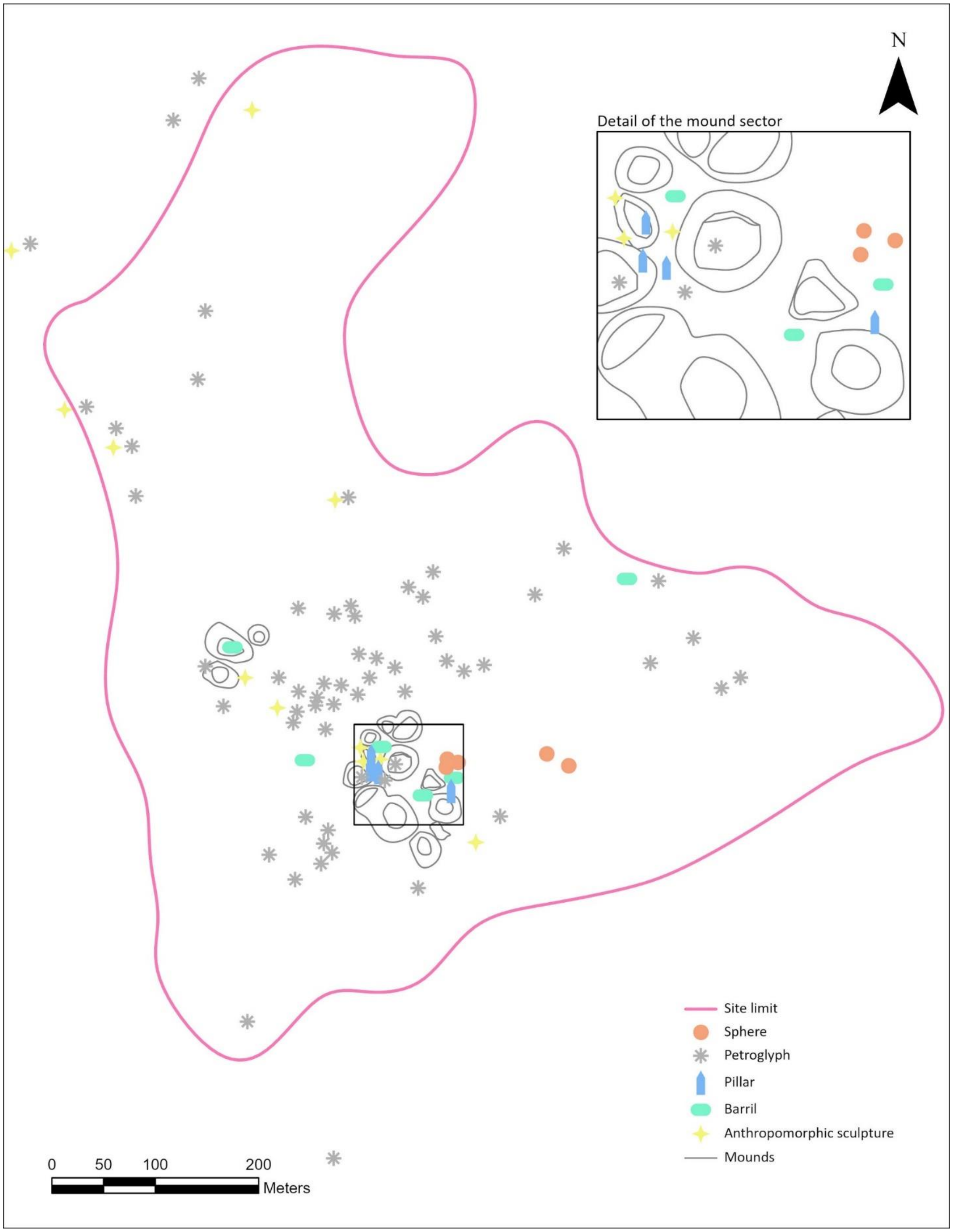

Figure 4.13 Location of stone scultures by type.

4.3.2.1 Absolute population estimates

The estimation of the population of Java in absolute terms follows the logic of the area-density index developed by Dr. Robert Drennan and implemented in multiple of the surveys used as methodological references in this work (See Drennan et al. 2015). This index, as the name indicates, incorporates both the area represented by a scatter of sherds as well as the density of sherds within that scatter to obtain an index of population per unit of collection in a survey. This index is then divided by time (usually number of centuries per archaeological period) and then multiplied by the equivalent of the index in terms of actual number of people. That equivalent is based on supporting archaeological information for the study case, such as household unit size, or ethnographic information. Therefore, the equivalent varies from region to region.

The data collected in Java is different from the data used originally in area density indexes because it was gathered from shovel probes, instead of surface collections. Fortunately, this methodology has also been used in other parts of the Intermediate Area and, based on a regression analysis of a sample of known cases, Berrey (2018) has proposed a formula to convert *time averaged sherd densities* into *time averaged residential densities*. Meaning that if we know what is the density of sherds per unit (shovel probe) divided by the number of centuries, we can convert it into a density of people per unit divided by century.

The formula proposed by Berrey (2018) is:

$$y = 0.295x + 5.141$$

where y is the time averaged residential density, and x is the time averaged sherd density. This equation represents basically the best fit line of a linear regression where one of the variables is sherd density obtained from shovel probes, and the other variable is residential density of the same cases based on "residential architecture or a demographic proxy that is independent from sherd density" (Berry 2018:151). Population estimates are usually presented as ranges, meaning there is a more conservative minimum (usually one third less of the estimate) and a less conservative maximum (usually one third more of the estimate). In this case, Berrey proposes a confidence level instead; he finds that the error ranges around the best fit line fall mostly within 35% of the estimated value for y. In other words, the estimates based on the best fit line in his analysis plus or minus one third of the estimate tend to have a confidence level of 75%

All of this information in combination with the results of the survey was used to estimate the number of people in the site of Java. This involved estimating the density of sherds per square meter excavated, then dividing this number by the number of centuries in the Aguas Buenas Period. In the first iteration, in this step, the number was divided by 6, which is the number of centuries of the Aguas Buenas period in the region. However, in a second iteration this number was changed to 2 centuries, considering the results from the radiocarbon dates from Java. The result of this operation is the time averaged sherds density, which is then introduced in the equation mentioned before in order to obtain the time averaged residential density. One last detail about this estimate is that Berrey's equation assumes that each unit represents one hectare. But the survey of Java had 4 units per hectare, therefore each unit represented 0.25 ha. For this reason, the result of the last step still had to be divided by 4.

The population of Java during the most intense period of occupation was 586 ±195 or between 391 and 781 people, with a 75% confidence level (this estimate is based on a period of 2 centuries).

4.3.3 Variables related to differences, inequalities, and special activities

In this section, we will explore and analyze the distribution patterns of the variables considered in the ceramic and lithic classifications. The first set of variables measure the quality of the ceramics, and these are relevant to identify inequalities in status or wealth: color of the paste, fineness of the paste, presence of decoration, and presence of slip. The last variable of the ceramic analysis provides at least indirect insight into the specific uses of the ceramics, in addition to their quality: thickness of the sherds. Since there is a great deal of variation in the total number of sherds per unit, we will discuss the proportion of sherds where these variables occur within each unit, rather than the absolute numbers of sherds. This approach has the disadvantage of overrepresenting some variables when the total number of sherds in an unit is very small (for example, an unit with 2 sherds, 1 of which is decorated, might show that it had 50% of decorated sherds, which sounds like an incredibly high proportion until we realize there were only 2 sherds in total. To compensate for this issue, the figures in the following sections highlight with different colors only units with 10 or more sherds in total and with the occurrence of each variable. Units with less than 10 sherds, or without the occurrence of the specific variable, are still represented with small gray dots for reference. In addition, after this first exploratory review of the variables, a statistic evaluation of the differences between different sectors of the site will be presented.

The second set of variables are those used in the lithic analysis. As discussed in the section 4.2.2 Lithic analysis, all the lithic artifacts were classified into functional categories: stone work, woodwork, plant processing, and ceremonial activities. For this reason, the variables from the lithic analysis provide more insight into the activities carried out in the site than into inequalities or differences.

The rest of this chapter is dedicated to a detailed review of these variables.

4.3.3.1 Paste color

The color of the paste was one of the variables used to determine if there was an uneven distribution of high- or low-quality wares across the settlement. In the entire ceramic collection from the survey, 70% of the sherds had either red, orange or medium to light brown paste. These colors represent some variability, but they can all be considered relatively well fired wares. On the other hand, 30% of the sherds had gray, black or dark brown paste, which are the colors that result from poor or incomplete firing of the ceramic vessels (Rice 2015:287-290). Figure 4.14 shows that, while most of the units that contained sherds with a dark core had a relatively low proportion of those (less than 20%), a few units had a larger proportion (between 20 and 30%). Those units with larger proportions of gray core sherds are located around the mounds, two of them in close proximity to a mound, and two of them approximately 100 m away from a mound. In this figure, we can also see the rest of the units with ceramics but with extremely few to no sherds with gray core. In terms of the more general pattern, the fact that the units with gray core sherds are located mostly in the center of the settlement is a reflection of the density of sherds in general, which is higher at the center as well, and medium to low in the northern and eastern sectors (as mentioned before, units with less than 10 sherds were excluded from the color-coded representations of proportions because they tend to overrepresent proportions).

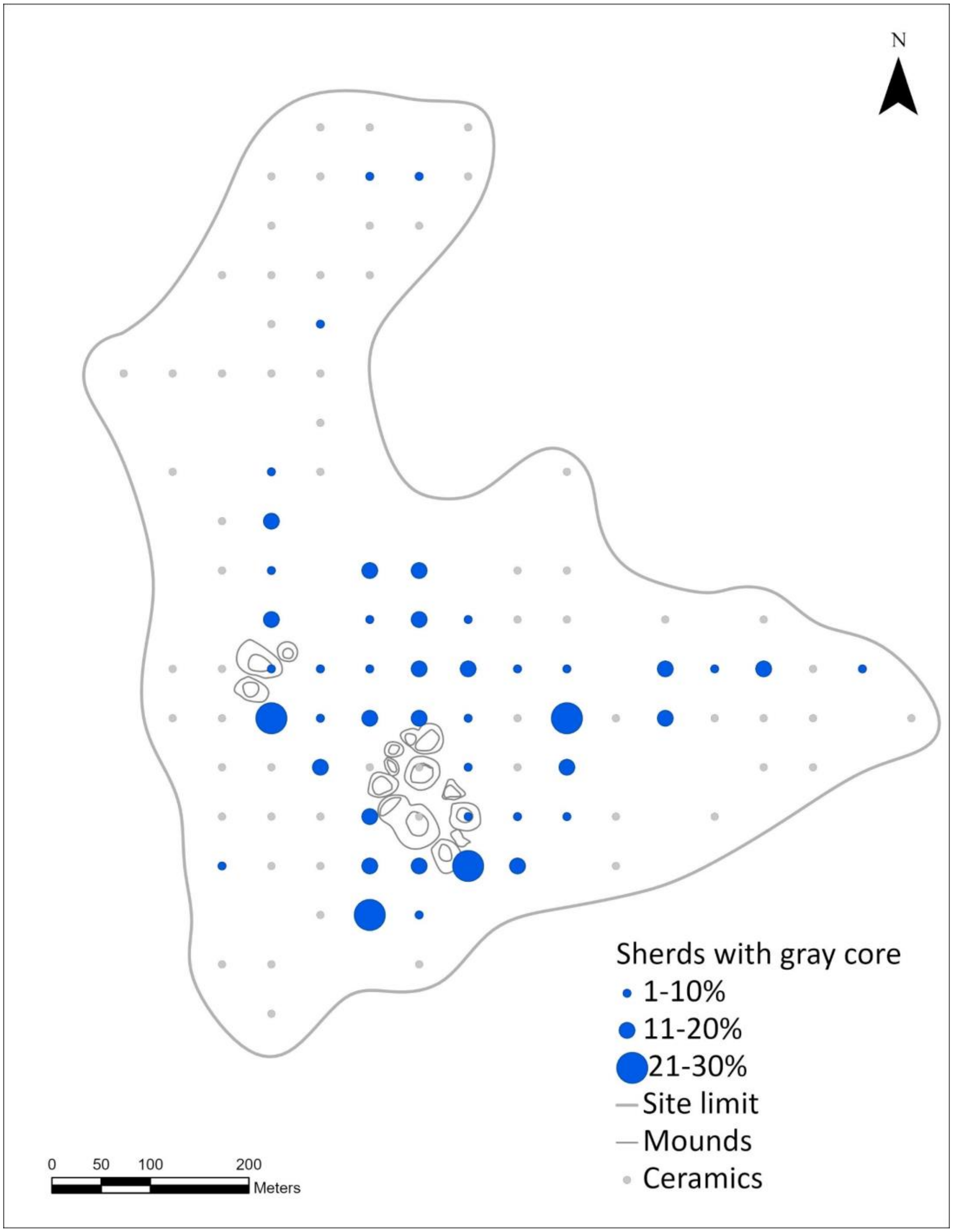

Figure 4.14 Proportion of sherds with gray core per unit.

Light gray dots represent units with ceramics, but without gray core, or units with less than 10 sherds in total.

4.3.3.2 Paste fineness

Another variable related to paste was the fineness. In this case, a fine paste was homogeneous in color, with small to microscopic particle size and compact texture (as opposed to crumbly). A vessel with a fine paste, as defined here, would require more skills to manufacture but it would be more durable too (Rice 2015:306-307). Only 3.74% of the sherds in the entire assemblage from the survey had fine paste. Figure 4.15 shows their distribution. The proportions of sherds with fine paste are consistently low across the site, with a few exceptions: one unit located in the eastern sector of the site has around 30% of fine paste sherds, and three units in the periphery of the mound sector, have between 10 and 20% of fine paste sherds. Interestingly enough, the proportion of fine paste is very low in between the mounds, and the proportions in the northern sector are similar to the central sector (low).

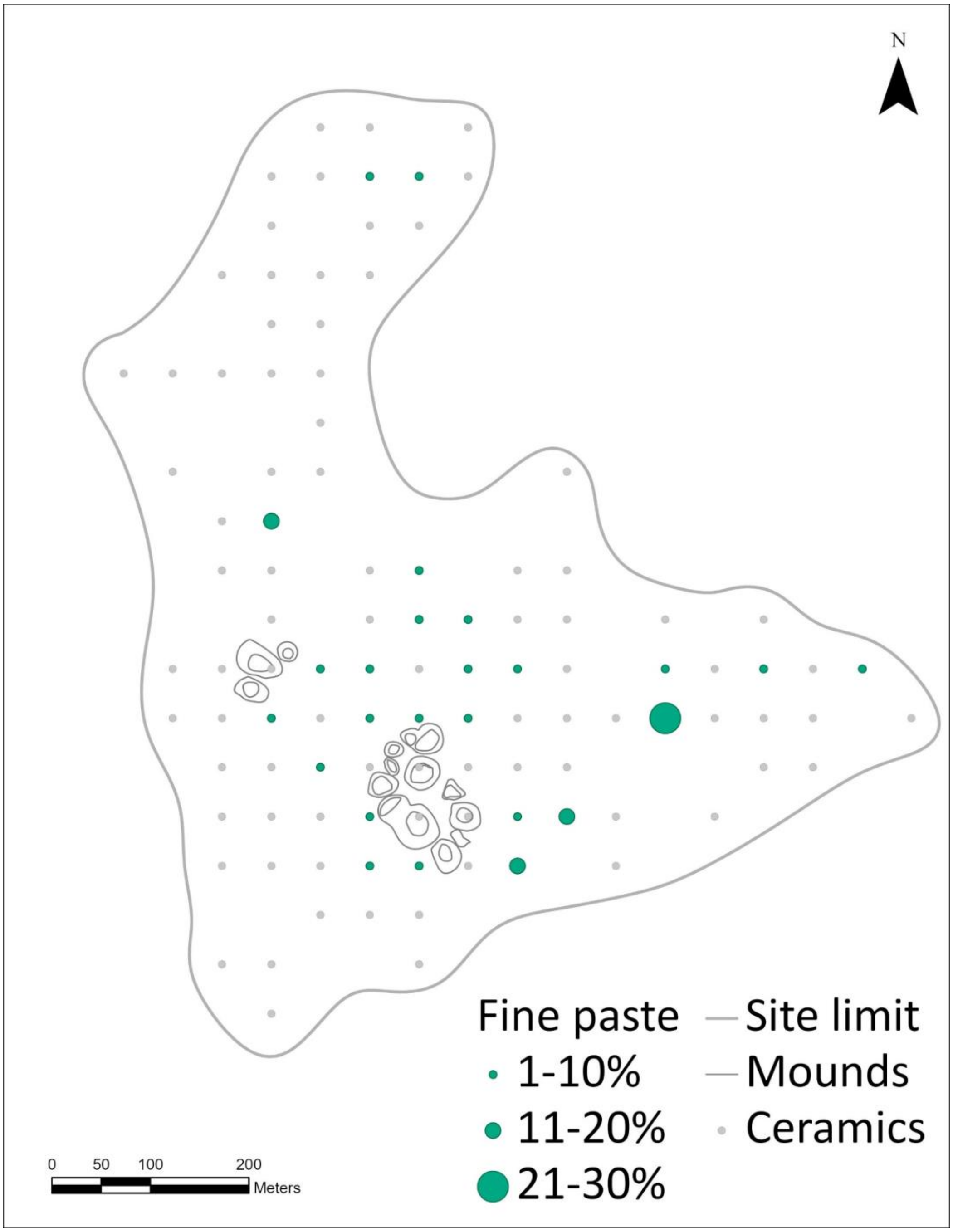

Figure 4.15 Proportion of sherds with fine pasteper unit.

Light gray dots represent units with ceramics, but without fine paste, or units with less than 10 sherds in total.

4.3.3.3 Decorations

The next two variables considered in the ceramic analysis were related to the surface appearance of the sherds. First, sherds were simply classified into decorated or not decorated, and decorations for this category included incising, engraving, painting, appliques and modeling, as well as some color effects achieved through the use of materials other than painting (e.g.; charcoal, beeswax). The proportion of decorated sherds in the entire ceramic assemblage is surprisingly low: 3.64% (even lower than the proportion of fine paste ceramics). Figure 4.16 shows the proportions of decorated sherds across the site. These proportions are consistently small. One unit on the east side of the larger group of mounds stands out in this figure because it has the largest proportion of decorated sherds: 30%. However, this unit has only 10 sherds, which is the arbitrary number where the limit was set for the units that would be represented with color in these figures. Thes leaves the question of how significant is this high proportion. This question will be addressed below in section 4.3.3.7 It is important to note that, unlike the case of the fine paste sherds, there are extremely few to no decorated sherds in the northern sector.

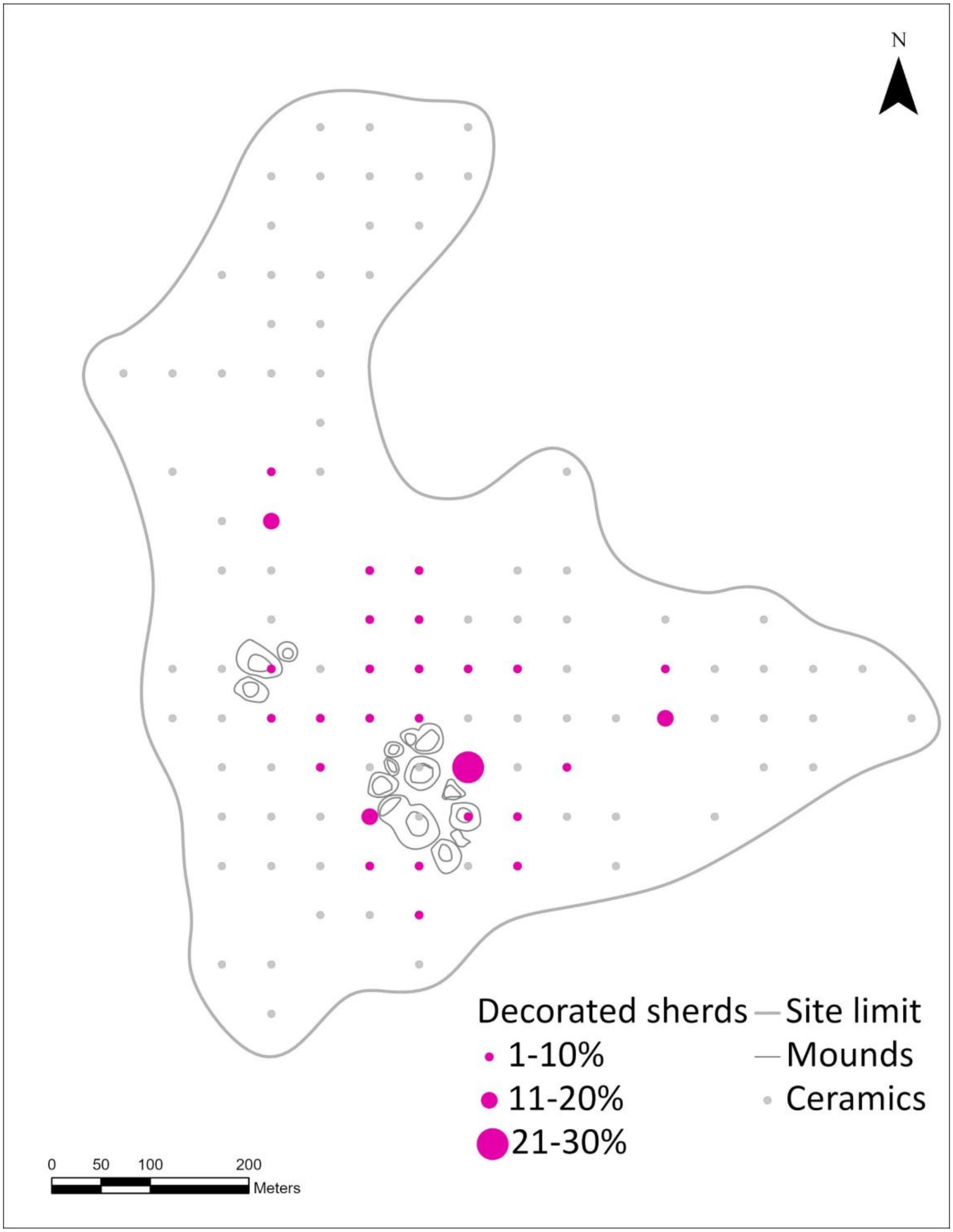

Figure 4.16 Proportion of decorated sherds per unit.

Light gray dots represent units with ceramics, but without decorations, or units with less than 10 sherds in total.

4.3.3.4 Slip or engobe

The second variable related to the surface appearance used in the ceramic analysis was the presence or absence of slip. The slip in ceramics is related to the functionality and quality of the vessel: it helps to make the ceramics less permeable and harder. From the entire ceramic assemblage of the survey, 35.47% of the sherds had a slip. In the case of this variable, shown in Figure 4.17, units with high proportions of sherds with slip are mostly in the central sector of the site, very few of them are in the northern or eastern areas. Aside from this observation, it is difficult to distinguish any other particular pattern, as units with high proportions are both in close proximity to mounds and towards the periphery of the mounds.

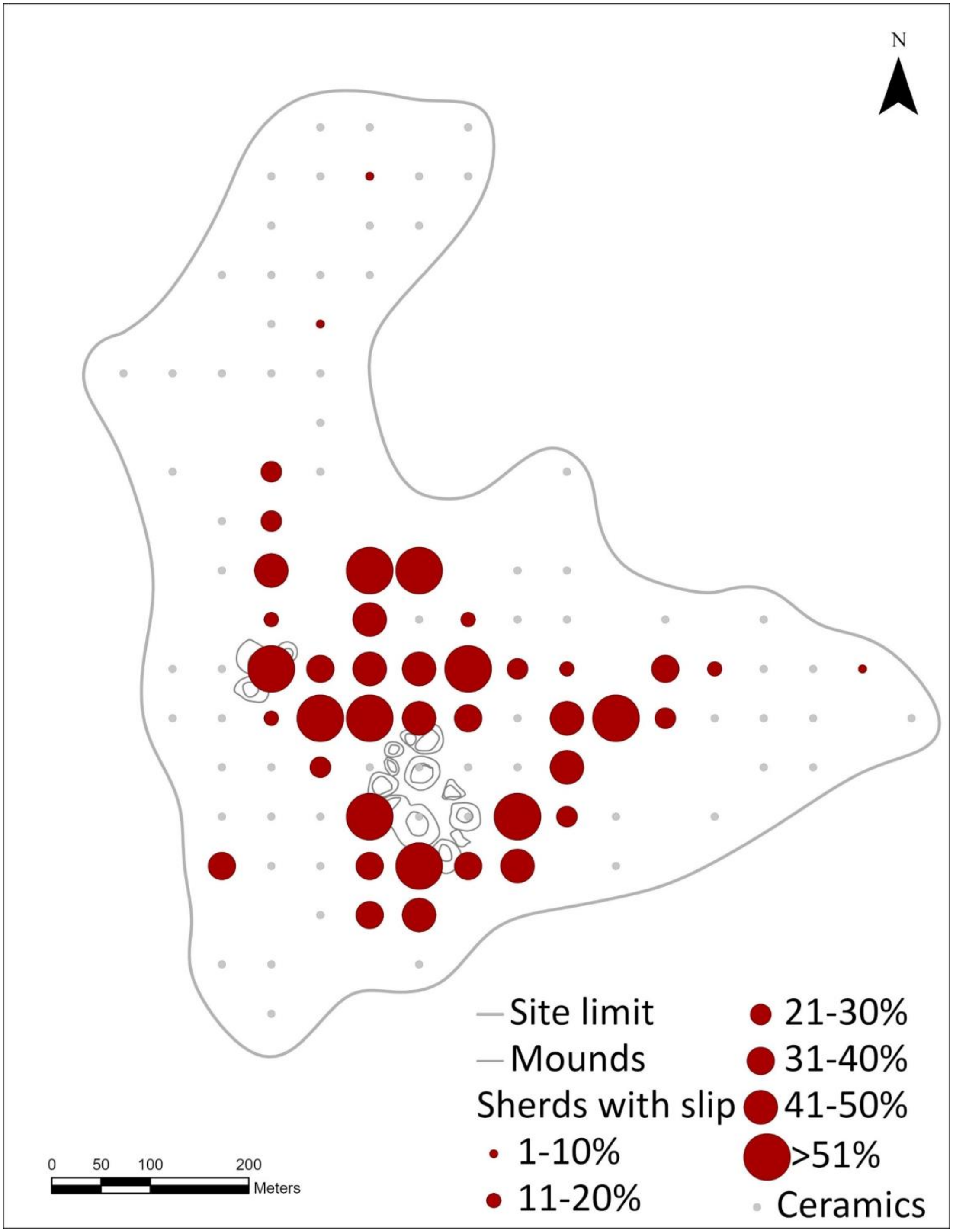

Figure 4.17 Proportion of sherds with slip per unit.

Light gray dots represent units with ceramics, but without slip, or units with less than 10 sherds in total.

4.3.3.5 Thickness

The ceramic sherds were classified according to their thickness into one of three categories: thin (less than 0.5 cm), medium (0.5 – 1 cm) and thick (1.5 cm or more). In general, thin vessels require careful manufacture and handling, and are potentially more useful for serving, while thick vessels may or may not require careful manufacture, and are more useful for cooking. The thin sherds represent 29.69% of the entire assemblage. The distribution of thin sherds is shown in Figure 4.18. The high proportions of thin sherds are located mostly in the periphery of the central mound sector, and in the northern and eastern sectors. Relatively lower proportions occur near and in between the mounds.

The thick sherds are only 6.56% of the assemblage. As we can see in Figure 4.19, thick sherds are more evenly distributed than thin sherds. Their occurrence roughly corresponds again to the general sherd density, with one exception of a unit in the smaller group of mounds that has a relatively high proportion of thick sherds. Aside from that unit, we can hardly distinguish any other pattern in the distribution of thick sherds.

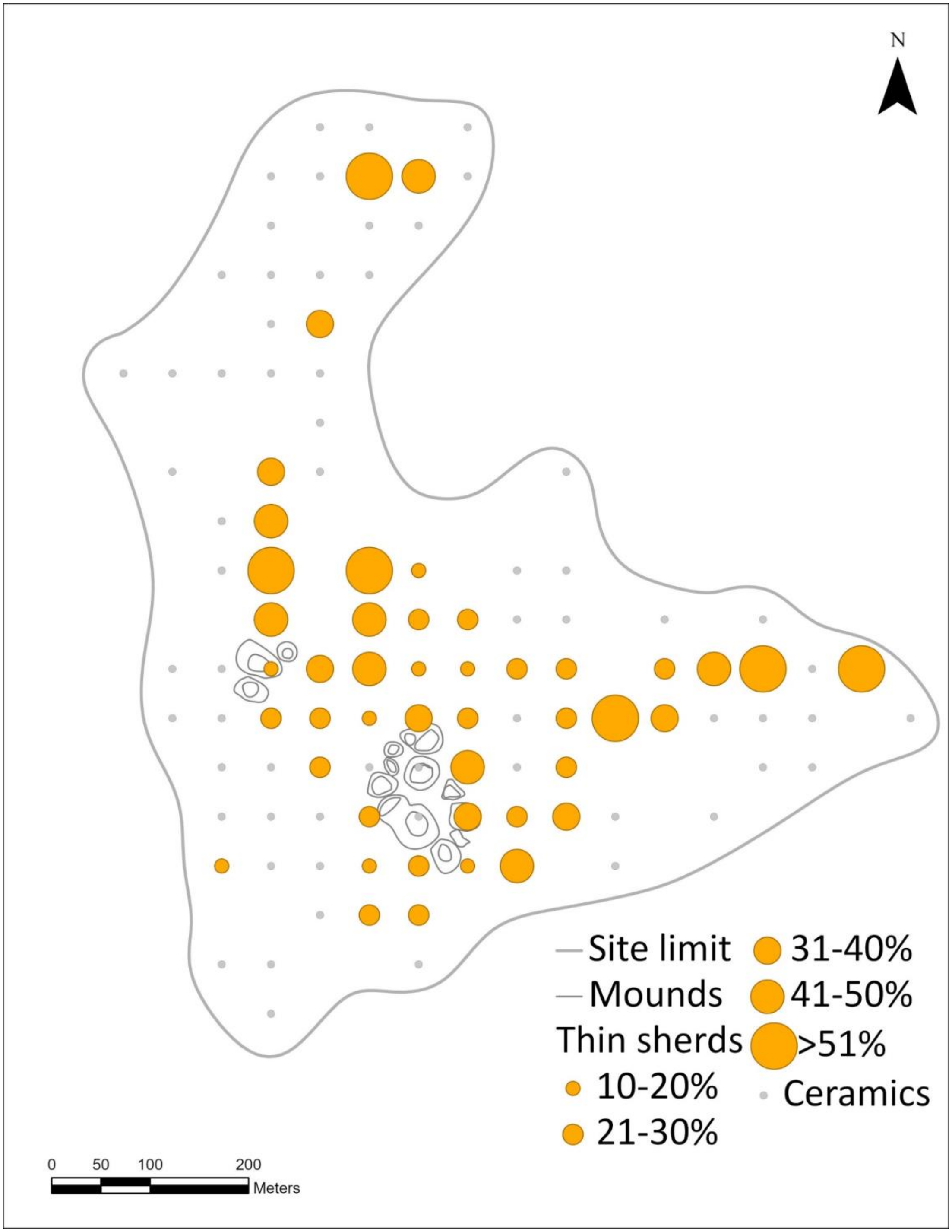

Figure 4.18 Proportion of thin sherds per unit.

Light gray dots represent units with ceramics, but without thin sherds, or units with less than 10 sherds in total.

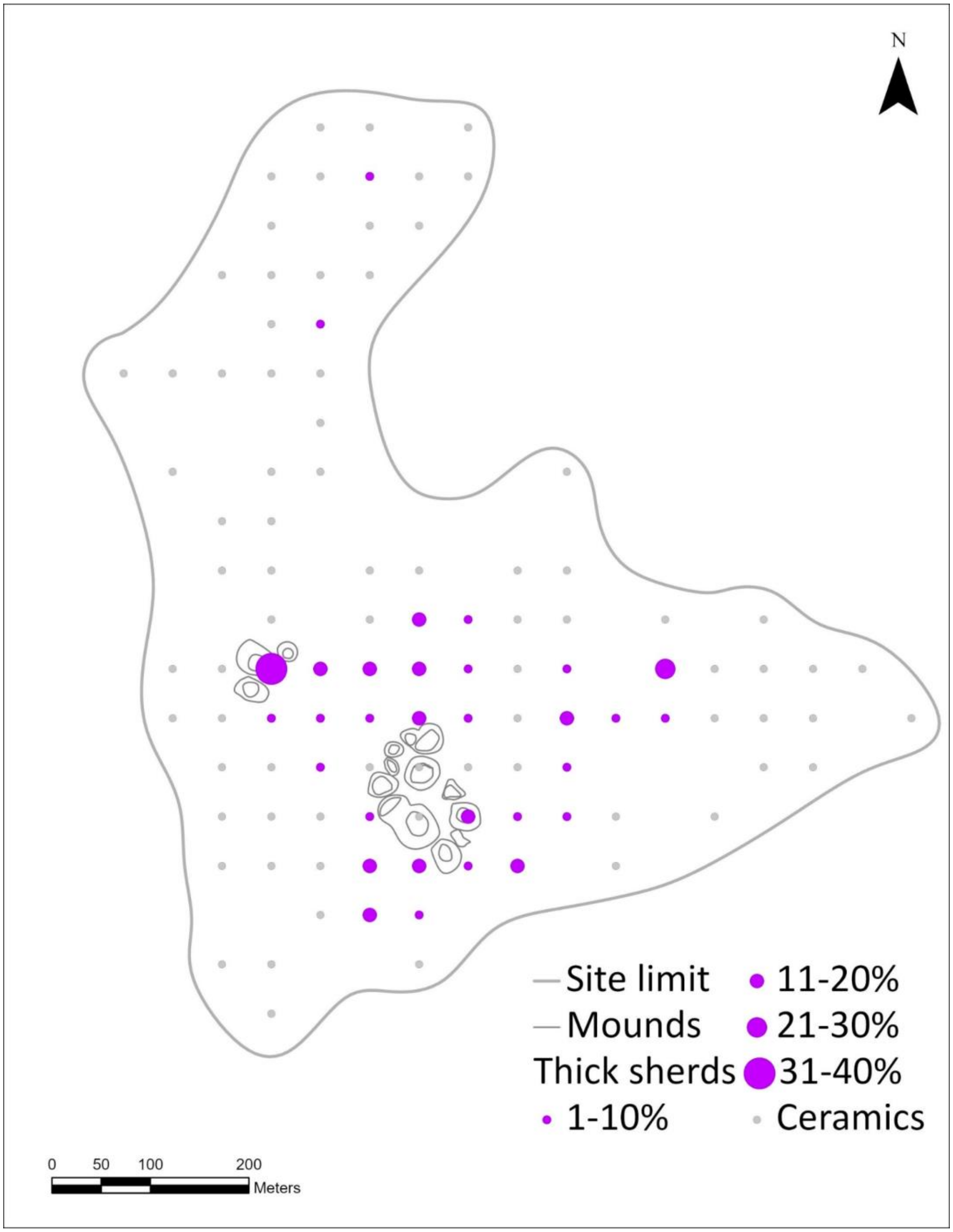

Figure 4.19 Proportion of thick sherds by unit.

Light gray dots represent units with ceramics, but without thick sherds or units with less than 10 sherds in total.

4.3.3.6 Summary of distribution of ceramics variables

Based on the previous discussion of the distribution of characteristics of the ceramics, subtle but nevertheless interesting patterns emerge when we examine those variables in relation to one another.

The most unexpected of these subtle patterns is the higher proportion of thin and fine paste sherds in the periphery of the mounds, rather than at the center, in between mounds. There are two possible explanations for this pattern: either some of the households in the periphery of the mounds were conducting special activities that required thin, fine vessels, therefore had potentially a higher status, or this is still a reflection of the sample size in those peripheral units, even after excluding those with less than 10 sherds. This second possibility will be evaluated in the next section.

The other potentially interesting pattern is that there seem to be some differences between the northern, eastern, and central sectors. On the one side, the decorated and thick sherds seem to be restricted to the central sector, but this sector also has the higher proportions of sherds with gray core (lower quality). On the other hand, as mentioned before, thin and fine paste sherds occur, even in high proportions, both in the northern and in the central sector. This presents an ambiguous scenario because decorated, fine paste, and thin sherds can all be a reflection of higher status and access to better quality of ceramics, and yet their distribution is different in each sector.

In the next section, we will evaluate the differences in the proportions of each variable between sectors, in order to address the issue of the sample size.

4.3.3.7 Differences in ceramic proportions between sectors

The distribution of ceramics suggested a potential division of the settlement into three sectors: northern, central, and eastern. The analysis of distribution of specific variables has revealed subtle differences between those sectors. However, due to the small number of sherds per unit, we were not able to determine in the previous sections whether those differences were meaningful or if they were the product of random noise inherent to small samples. In this section, we will evaluate those differences through the use of a chi-square test. This test is a tool to assign a level of confidence to the differences in proportions of specific variables between the three sectors.

The first step in this analysis was to divide the units into three sectors. This division was based entirely on the density of ceramics across the site: although the units with ceramics are continuous, there are three areas of relatively high density (north, center, and east) with areas of lower density in between. The exact division between these areas was based on the density surfaces presented in section 4.3.2. Figure 4.20 shows the sectors. All the units within each sector were grouped into a single sample for analytical purposes. Table 8 presents the total number of sherds, as well as the percentage of sherds with different variables per sector.

Table 8 Number of sherds per sector.

Sector	Total number of sherds	Decorated sherds	Fine paste	Sherds with slip	Thin sherds	Thick sherds	Sherds with gray core
Northern	162	1.8%	3.6%	11.1%	42.0%	2.5%	12.3%
Central	1870	4.0%	3.6%	38.0%	28.1%	7.0%	12.3%
Eastern	52	0%	9.6%	11.5%	46.1%	1.9%	11.5%

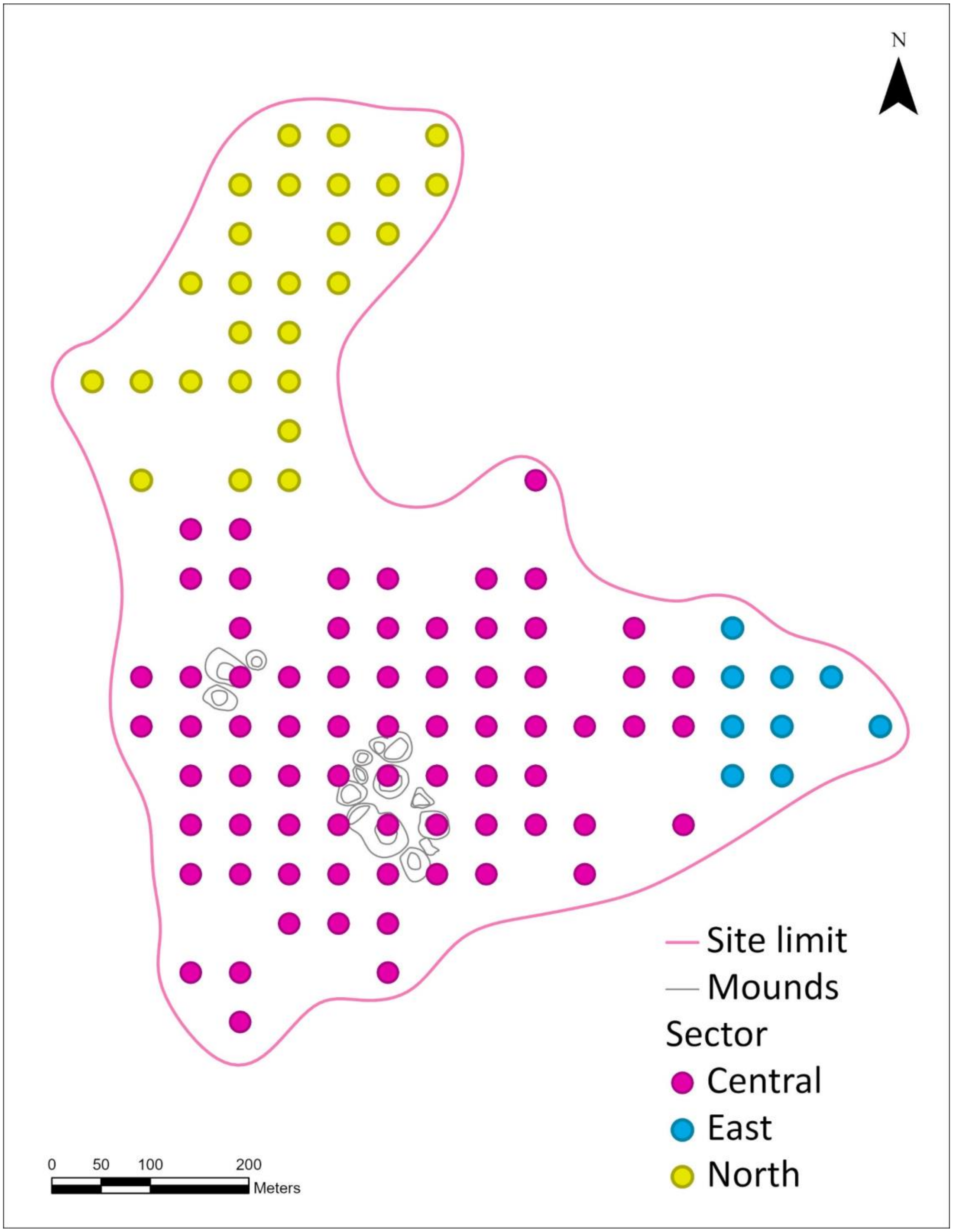

Figure 4.20 Division of the site into three sectors.

Table 9 shows the results from the chi-square test. χ^2 represents the chi-square value, *p* is the significance value, and *V* is the strength value Cramer's V. The statistical significance of the differences in proportions of different variables between sectors is generally high, with the exception of the gray core variable that has a somewhat lower significance. This means that the probabilities that the differences observed are the product of the vagaries of sampling are very low, and the probabilities that these are real differences between the sectors are very high. On the other hand, Cramer's V provides a value for the strength of those differences that ranges from zero (no difference) to one (as large of a difference as possible). As we see in the results, the strength of the differences in proportions between sectors is very weak.

Table 9 Results of the chi-square test for the three sectors.

	χ^2	*p*	*V*
Decorated	4.00	0.13	0.04
Fine paste	5.35	0.06	0.05
Slip	60.44	0.00	0.17
Thin	20.49	0.00	0.09
Thick	6.88	0.03	0.05
Gray core	3.41	0.18	0.04

In general, the differences between sectors are highly significant but very weak. More specifically, there are two variables that stand out in comparison with the other variables considered here: slip and thin have extremely high significance and slightly stronger differences. These are two variables related to the quality of the ceramics, thin walls and slip require more careful manufacture, and thin vessels can be used for serving rather than cooking. Surprisingly, if we look at actual proportions in Table 8, these two variables behave in opposite ways: the percentage of sherds with slip is higher in the central sector and lower in the other two, but the percentage of thin sherds is higher in the northern and eastern sectors and lower in the central sector.

This chi-square test allowed us to put a finer point in the analysis of the differences between sector, but the results point still to an ambiguous scenario, where there are differences between the three sectors of the site, but these differences are not clearly translated into consistent indications of status or wealth accumulation. We will return to this issue one last time in section 4.3.4

4.3.3.8 Stone work

This is the first functional category used in the lithic analysis. Figure 4.21 shows the distribution of artifacts classified into this category. The figures in this and the following sections only show the location and not the number of artifacts per unit because the numbers are extremely small: 5 or less artifacts per unit, with only two exceptions (a unit with 18 artifacts between polishing stones and debitage located outside of the site limit, and a unit with 9 fragments of debitage in the periphery of the mound sector).

Stone work tools are by far the most common type of lithic tool in the site (see following sections). This suggests a possible craft specialization in the site, more specifically in the manufacture of lithic sculptures. However, these stone work tools are not restricted to the mound center of the settlement. Their distribution reflects the density of ceramics across the site. This implies that if there was specialization in the production of lithic artifacts, this was not an exclusive activity, but rather a common activity in which many of the inhabitants of Java were engaging.

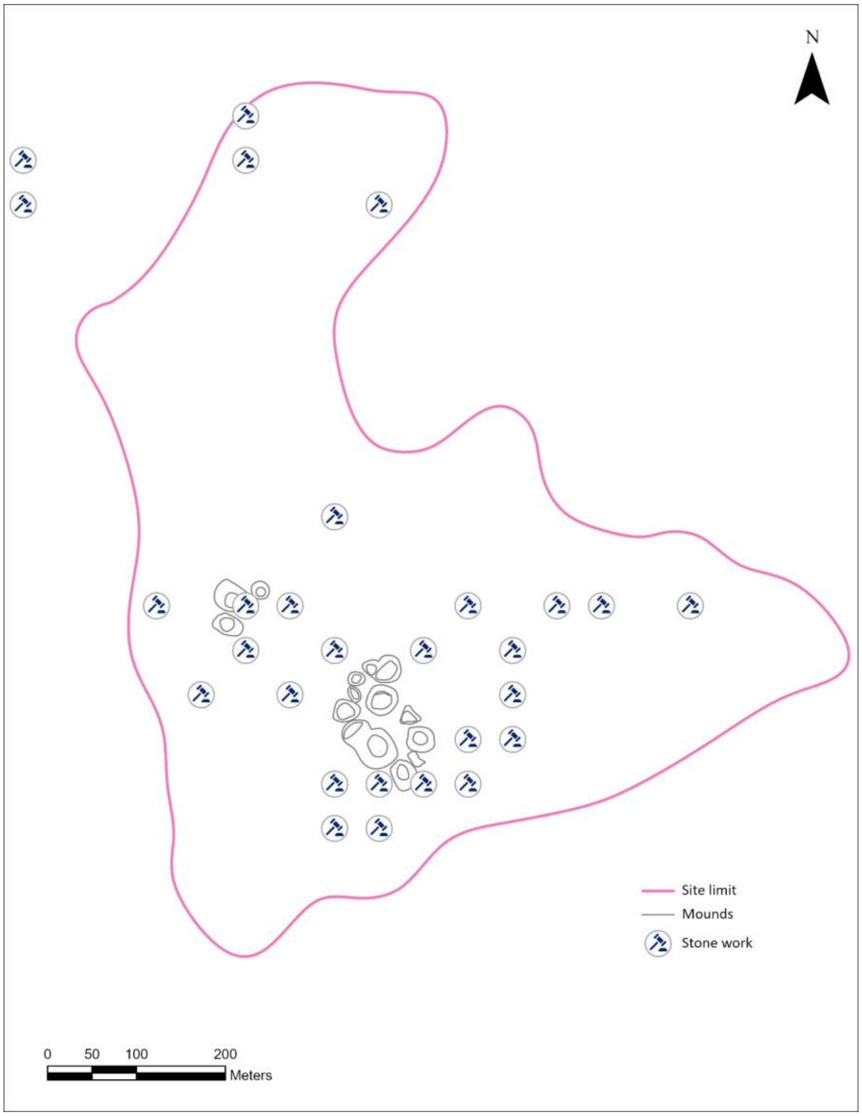

Figure 4.21 Units with lithics used for stone work.

4.3.3.9 Wood work

Only six units contained artifacts used for woodwork (Figure 4.22), and most of them were located in the periphery of the mound area, with one exception to the northwest of the site limit, in the same unit that contained 18 more Stone work artifacts.

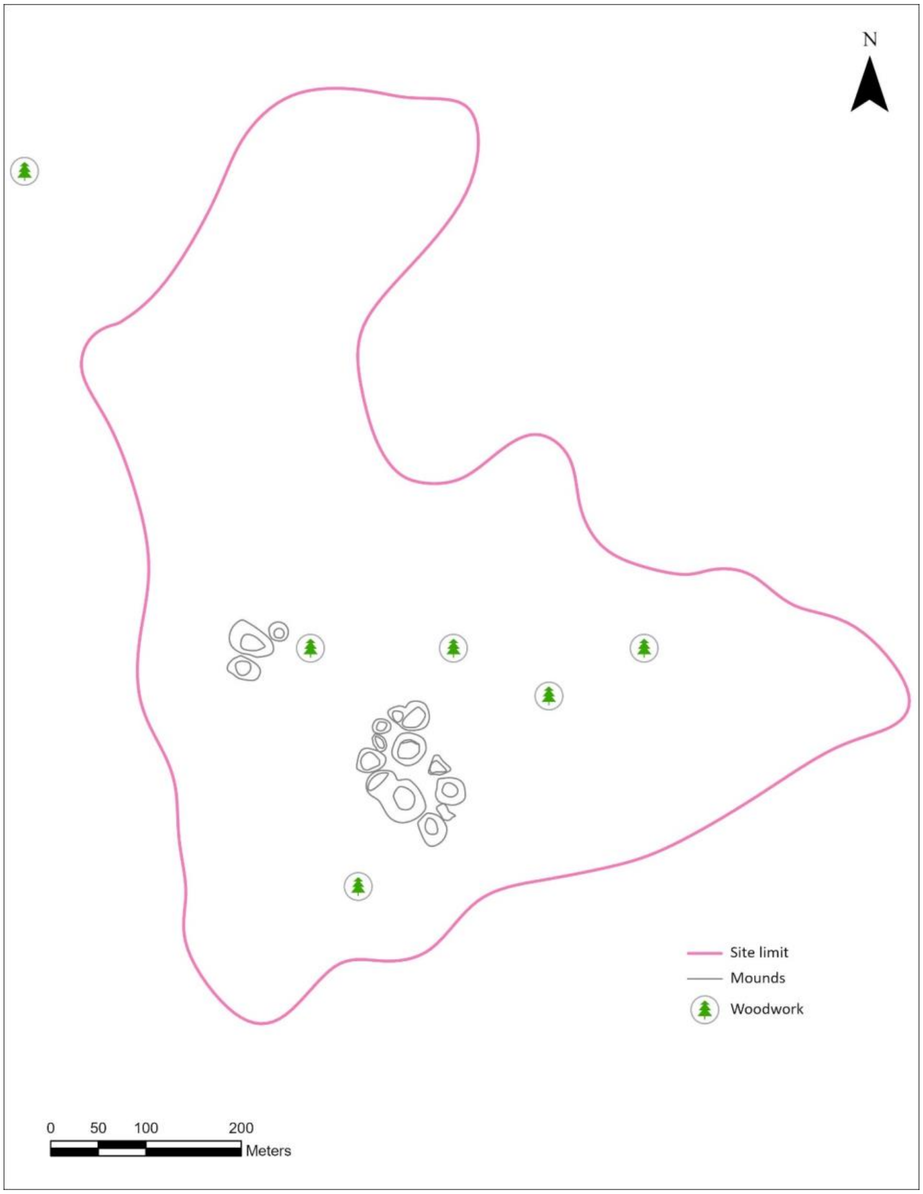

Figure 4.22 Units with lithics used for woodwork.

4.3.3.10 Plant processing

Only two units from the shovel probe survey contained artifacts used for plant processing activities. Their location is shown in Figure 4.23 One of them is in the periphery of the mound area, and the other one is in the zone between the central and the northern sectors of the site.

However, Chávez and Fonseca (2003) mention a total of 35 fragments of metate recovered during their work in the site. Unfortunately, the specific location of those metates is not on the records.

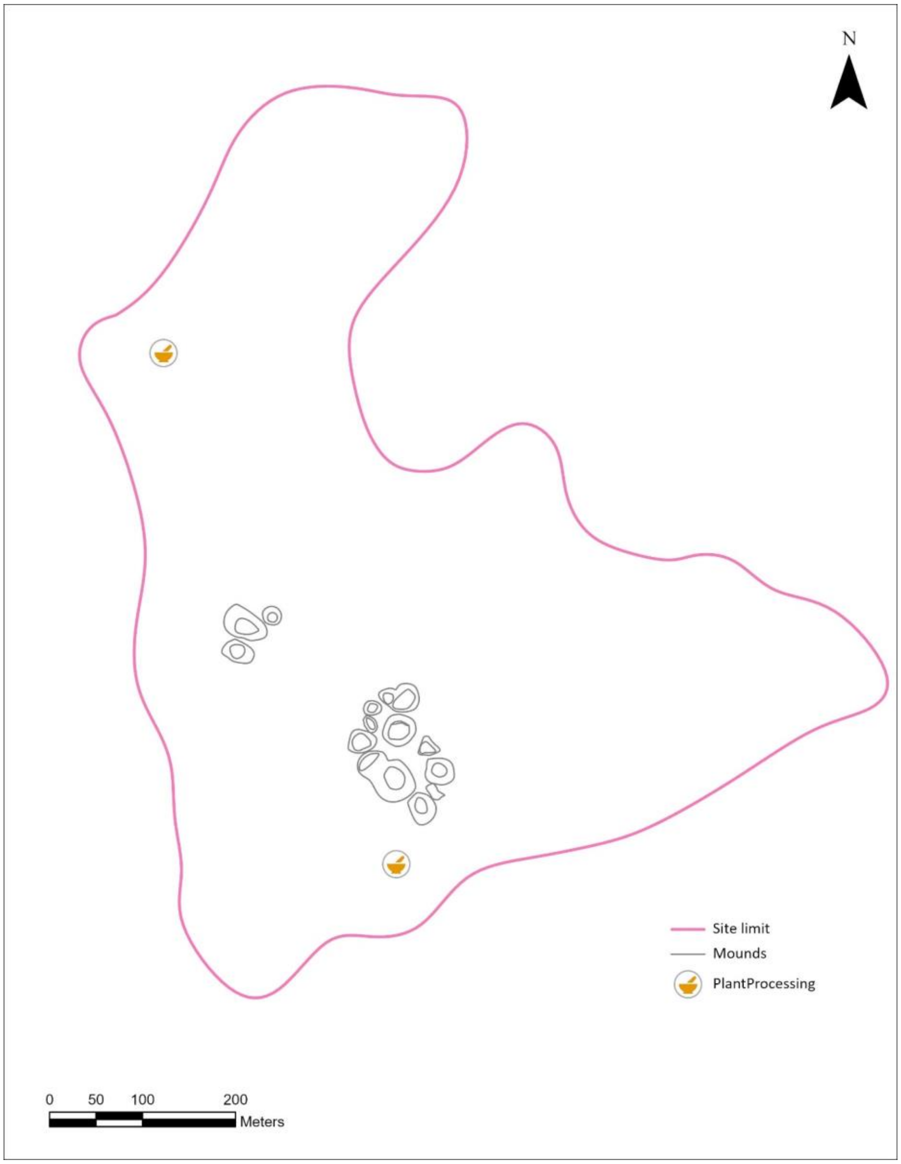

Figure 4.23 Units with lithcs used for plant processing.

4.3.3.11 Ceremonial activities

Finally, only one unit from the survey contained a fragment of an artifact used more likely for ceremonial activities: an unidentified sculpture. Figure 4.24 shows the location of this unit with a special symbol, but it also shows the location of the rest of the sculptures in the site. As mentioned before, those sculptures were visible in the surface, and they were mapped during the first research project conducted in Java around 20 years ago. We can observe in this map that sculptures and petroglyphs were even more common around the site than any kind of stone tool discussed before.

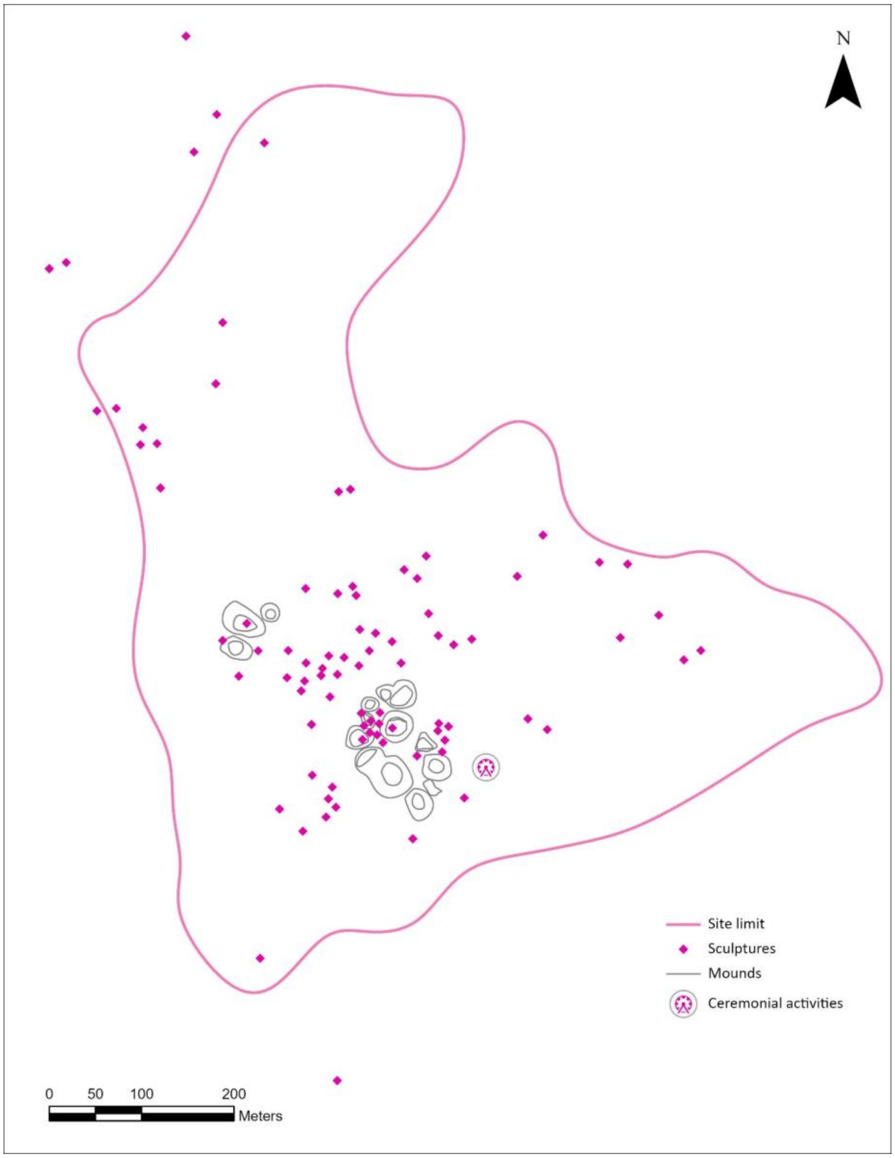

Figure 4.24 Unit with lithcis used for ceremonial activites.

4.3.3.12 Summary of distribution of lithics variables

The distribution of different kinds of lithic artifacts reveals that some activities were more common than others in the settlement if Java: there is very little evidence of plant processing and woodwork tools, but there is abundant evidence of stonework tools and items related to ceremonial activities. Regardless of the relative abundance, all the types of stone tools are dispersed across the site. In other works, there is no evidence to consider the production and use of stone tools an activity restricted to/exclusive of a sector or a group in Java.

4.3.4 Multidimensional scaling

In the previous section, we were able to distinguish some differences across the site in the way that the ceramic variables are distributed. In this section, we combine all the information about the characteristics of the ceramic assemblage with two more variables in order to assess the similarities between units, regardless of their geographic location, and potentially the occurrence of patterns that were not evident in the distribution maps previously discussed. This is accomplished through multidimensional scaling, which consists in calculating a similarity score between each unit and every other unit in the dataset, and then assigning coordinates in a given number of dimensions to each case in a way that their distance in space fits as closely as possible to their similarity or dissimilarity. These similarity scores were produced in SIMS and they were based on all the variables considered so far for the ceramics: period, paste color, fine paste, decorations, slip, thickness. Units with only one or two sherds were omitted from the multidimensional scaling because those tend to introduce noise in the analysis since they have either extremely high or extremely low proportions of each variable. Once they similarities matrix was ready, the multidimensional scaling was produced in SYSTAT.

The resulting plot is shown in Figure 4.25 This is a very simple two-dimensional plot where each circle represents a survey unit with three or more sherds. The distance between circles is inversely proportional to their similarity, taking into account all the characteristics of their ceramic sample. Basically, there is no clustering or patterning in the distribution of points, which in this case means that the ceramic assemblage from the survey is considerably uniform. There is variation, because the points are still scatter, rather than concentrated in a single place, but that variation is not patterned enough to form clusters or dimensional patters. During the data analysis phase, many iterations of multidimensional scaling were run (with more variables, less variables, more dimensions), however the result was always more or less the same. For this reason, I decided to include here only this plot with no labels or details of how different variables distribute within the plot, because this is the best representation of the results from the multidimensional scaling.

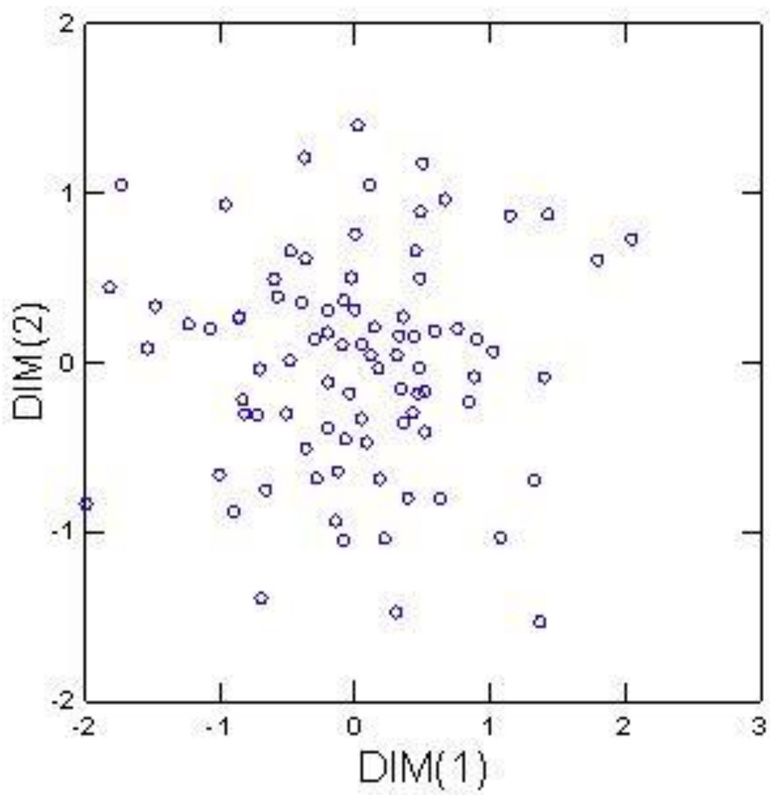

Figure 4.25 Multidimensional scaling based on the characteristics of the ceramic assemblage per survey unit.

4.4 Summary of the results

The settlement of Java was intensely occupied during the Aguas Buenas period (300 – 800 AD), and there were possibly less intense occupations before and after that, during the Early Aguas Buenas (300 BC – 300 AD) and the Chiriquí (800 – 1500 AD) periods.

The Early Aguas Buenas occupation was concentrated around the central zone of the site, where the mounds are. During the Late Aguas Buenas period, the population expands well beyond the mound area, and there is even a new separated sector of the settlement in the northern area. By the Chiriquí phase, the population contracts again to occupy only the central mound sector of the settlement.

The qualitative characteristics of the ceramics are relatively similar across the site. The distribution of variables like decorated sherds, fine paste, and paste color, shows a pattern that is proportional to the ceramic density in general. The multidimensional scaling analysis showed that there is practically no pattern in the differences at the unit level. The chi-quare test showed that there are slight differences between the central, northern, and eastern sector that turned out to be statistically significant but weak: most of those differences are of less than 10%. The exceptions were the proportion of sherds with slip, which is more noticeably higher at the center of the site, and the proportion of thin sherds, which is higher in the northern and eastern sectors. Finally, the distribution of stone sculptures and petroglyphs shows that only two types of sculptures seem to be restricted to the central sector: stone spheres and *espigas*. Anthropomorphic sculptures, petroglyphs, and barriles are found in various places around the site. This information indicates that, aside from the presence of the earthen mounds (possibly residential structures), the central sector of the site was similar to the rest.

5.0 Discussion and conclusions

Social complexity and hierarchy have been used as interchangeable concepts to characterize late precolumbian societies in Southern Costa Rica, and Central America. However, recent studies have questioned the correspondence of these two concepts and proposed that the emergence of social hierarchies is a process independent from the emergence of social complexity.

The objective of this project is to understand the emergence of social complexity in the site Java. This site is unique in the region in terms of size and material culture, and it provides an exceptional opportunity to contribute to a broader conversation in archaeology about the role of socio ceremonial centers and warfare in the emergence of social complexity. For a long time, archaeologists have associated signs of complexity, such as large population sizes and monumental architecture, with the existence of sociopolitical hierarchies and possibly other activities. However, the variability found in this and in other regions has opened the door to consider other possible scenarios where social complexity is not intrinsically associated with political hierarchies.

Three possible scenarios were discussed in the first chapter of this dissertation: one where socioceremonial centers are elite projects, another one where these centers are community projects, and another one where they are a response to scalar stress.

In order to understand which scenario explains better the emergence of the center at Java, we needed to know the characteristics of the settlement. A previous research project in the site collected a considerable amount of information in some areas, but we still lacked knowledge of other important areas. We had a map of sculptures and a general idea of the ceramic materials from excavations. But we knew very little about the distribution of the population within the site and the variability across the site. We conducted an intensive survey of the entire site, and recovered ceramic and lithic materials. Based on the results from that survey, now we can characterize the settlement.

In this chapter, we will we analyze the results of the project in light of the three proposed models. In the first part, we will review each one of the specific questions that emerged from the models, and then we will summarize the results in order to understand which one of the three models corresponds with or explains better the case of the site Java.

5.1 Are aggrandizer individuals or an elite visible in the site?

The concept of elite, as used here, refers to a group of individuals who differ from the rest of the community and who are in a superior position in terms of prestige and/or access to resources such as material wealth, knowledge, or exchange networks. Aggrandizers are specifically associated with wealth accumulation. Although these privileges are often associated, that is not always the case. Earle (1997), for example, makes a distinction between power based on wealth, and power based on rituals or prestige. Both of these are finally ways in which elites distance themselves from the general population, but they have different material manifestations. This is why exclusivity is the key concept. Although the definition of elite proposed here is very general, it is important because some categories of archaeological remains like fine ceramics, monumental architecture, elaborate sculptures, have been automatically associated in the regional literature with the presence of elites (see section 2.3). However, these materials or features are indications of elites only when the access to them is somehow restricted to a portion of the community.

Returning to the case of Java, we will now review how this question is answered by different lines of evidence in the site.

The most visible features in Java, commonly associated with the presence of elites, are the earthen mounds. Mounds were often associated with elites because it was assumed that monumental architecture requires a political authority or chief who coordinates and monitors the construction, and that people participate in the construction only when compelled by said authority. However, it has now been demonstrated (for example, DeMarrais et al. 1996; Piscitelli 2017) that monumental construction can be the result of cooperation and collective action in communities where there might or might not be a political authority figure. In Java, the mounds present evidence of domestic activities and are located in the central sector of the site, which is also the sector with the highest population density in the site. Even though it is reasonable to consider that living in or nearby a mound might be an indication of prestige, the reality is that most people in Java lived in this area, which means that this sector was not only for a small exclusive group.

The distribution of stone sculptures and petroglyphs presents a picture similar to the one presented by the mounds: the majority of stone sculptures are located in the most populated sector. However, there are some differences in the distribution of certain types of sculptures. On the one hand, anthropomorphic sculptures, as well as petroglyphs, are dispersed across the entire site, which further supports the idea that these objects were not exclusively for an elite group in Java. On the other hand, only five barriles (drum-shaped stone cylinders), five stone spheres, and three espigas (spike shaped pillars) were found in Java (versus tens of anthropomorphic sculptures and petroglyphs), and most of them were clustered in the mound sector, either within or immediately next to some mound. This means that the potentially more exclusive objects were these spheres and espigas, and to a lesser extent the barriles, all of which are more abstract than the anthropomorphic sculptures, but more elaborate than the petroglyphs. These types of stone sculptures are found in several other Aguas Buenas sites in the Great Chiriquí region, and they will be discussed in more detail in section 5.4 For now, the implication of this pattern in the distribution of some stone sculptures is that if there was an elite group in Java, their status was based on their relationship with a religious or ideological system. Whether that relationship was just participation, hosting, or even control of the access to that system, we are not currently in the position to determine.

The characteristics of the ceramic and lithic assemblage were discussed at length in the previous chapter, and the main conclusion relevant to this issue is that the differences between sectors in terms of the quality and elaboration of materials were subtle, if there were any at all. Decorated and fine sherds occur in very low proportions, within units and between units, and their distribution corresponds with the general density of materials. The lithic artifacts are very crude, probably multipurpose tools. Only one polished stone axe has been found in Java, and it was randomly found by one of the neighbors while working on their cultivation field in the eastern sector of the site.

All the elements discussed so far for this question are pointing more or less in the same direction: there might have been an elite with ceremonial or religious based power. A wealth-based elite or group of aggrandizers were not visible in the site Java. There is still a chance that this sort of elite group existed, but the differences between them and the rest of the community were not strong enough to show in the archaeological record, or their differences were based on elements that left little to no trace in the material culture. One of the possible traces of a ceremonial elite are the special types of stone sculptures that are only found at the core of the site (barriles, espigas, and spheres). These sculptures are special because they are scarce and because they have no practical use, but they are relatively elaborate. If these sculptures were a sign of an elite group inhabiting the core of the site Java, that would mean that this elite's power was ideological in nature, rather than economic. While it is hard to answer if there was an elite, we can instead ask, was an elite necessary to the emergence of the center at Java? Or is there an unequivocal sign of elites? The answer to these questions is no.

5.2 Was the construction of the site a short-term event or a long-term process?

Two lines of evidence indicate that this was a relatively short-term event, especially considering that, within the context of the archaeological periods in the Diquís region, long-term process means at least several centuries. The first line of evidence is the stratigraphy. The site Java is relatively shallow. The deepest shovel proves were around 1 m deep, and those were mostly within the mounds (outside of the mounds, the deepest ones were around 70 cm deep. The excavation of the shovel probes was finished 10 cm below the point where the last cultural materials were found. And there were sectors where the cultural materials were not deeper than 30 cm below surface. The stratigraphic units revealed that practically all the cultural materials were within a single stratum, except in the units within the mound where there were two or three artificial layers. More than a slow accumulation of materials, the stratigraphy within the mound shows that there were two to three construction events. In section 5.4 of this chapter, we will discuss labor estimates which indicate that the construction of the mounds could have been a relatively short-term project.

The second line of evidence relevant to this question is the radiocarbon dates. Individually, they only tell us the date of a particular event. However, the six dates correspond to samples collected from different places and different layers within the mounds, and yet they all fall within a range of 250 years. There is a slight difference between the dates from the mound and those from outside the mound: the dates collected from the periphery of the mound are slightly more recent than those from the mound. This indicates that the mounds were built and occupied first, and from there the population expanded over time.

5.3 Was there permanent occupation of the site? Or was the occupation seasonal?

Sites with monumental architecture in the Great Chiriquí region have been implicitly or explicitly associated with sedentary lifestyles. In fact, the Aguas Buenas period has been characterized as a period of expansion of "early agriculturalist populations" who lived in permanent villages, some of which were socioceremonial centers (Drolet 1983). However, the idea of permanent occupation of these centers has been challenged recently by Herrera (2016), who proposes that some of these sites, such as El Cholo, were used seasonally or only for special occasions or ceremonies. This is based on the observation that El Cholo presents isolated depositional events, rather than a steady accumulation of remains, as well as on the idea that people in this region might have migrated seasonally between different ecological zones even during the Aguas Buenas period.

While the idea of seasonal occupations of socioceremonial centers is recent in the archaeology of Southern Costa Rica, there are several examples of centers in other parts of the continent where communities gather seasonally for ceremonial activities, which might include the construction of the center itself. These are the examples described in the "community oriented" perspective. For the other two perspectives discussed here, "elite oriented" and "scalar stress", permanent occupation of the settlements is necessary, since both perspectives are about dynamics that emerge from large groups of people living and interacting in the same settlement on a daily basis.

If the site Java was used seasonally, we would expect to find only or mostly the remains of ceremonial activities, and we would expect to see discrete construction and depositional events in the stratigraphy. On the other hand, if the occupation was permanent, we would expect to observe a continuous accumulation of remains related to both ceremonial and domestic activities, as well as other signs of sedentary occupation.

The stratigraphy of the site Java is relatively shallow. In areas outside of the mounds, the cultural materials are generally between 20 and 70 cm below surface. More importantly, the archaeological materials are dispersed along the vertical axis in the stratigraphic units as well as in the shovel probes, meaning that there are no clearly differentiated depositional events. Aside from the stratigraphy, the horizontal continuity of the material and the large extension of the site also show that the occupation in Java was intensive and continuous. In fact, the absolute population estimates for the site indicate that the density was 21.1 people per ha, for a total population between 391 and 781 people. This translates approximately 4 families per ha, which is a relatively high density of occupation for the region. The radiocarbon dates from Java reinforce these previous observations because they are restricted to a period of less than three centuries, meaning that most of the archaeological materials were generated in a relatively short period.

The elements discussed so far indicate an intensive occupation, but there are other characteristics of the site that provide evidence specifically of a permanent or sedentary occupation in Java. The first one is the presence of monumental architecture, possibly with a habitational function, specifically the mounds. From the results of the survey, as well as the previous report on the site (Fonseca and Chávez 2003), we know that the mounds contained evidence of domestic activities in the form of utilitarian ceramics and charcoal fragments.

Another indication of the level of investment in permanent structures is the presence of bahareque in several places across the site. This construction material consists of a mix of mud, grass, and sometimes even sherds or other kinds of waste. The mix is used to fill structures made out of wood or canes, which is then fired in order to make it durable. Bahareque had already been reported in Java by Fonseca and Chávez (2003), and we found fragments in several of the shovel probes excavated as part of the pilot project.

Finally, the site Java has evidence of agriculture, which generally requires permanent occupation. This evidence includes stone tools such as metates and grinding stones that are used to process a variety of cultivated foods such as maize and manioc. Fonseca and Chávez (2003:51) report 35 metates (or fragments of metates) and 9 grinding stones. During the survey, we found at least 3 fragments of metates and around 11 fragments or complete grinding stones.

In summary, several lines of evidence, including stratigraphy, architecture, and ceramic and lithic artifacts, indicate that the occupation of the site Java was permanent and intensive. At least most of the population of Java not only participated in the ceremonial activities, but also inhabited the settlement permanently.

5.4 What kinds of ceremonial architecture or artifacts were more common in the site?

This question refers specifically to what is being emphasized in the ceremonial features and artifacts: individuals, the community, or the landscape. These three categories correspond roughly with the three models proposed to understand the role of socioceremonial centers, but this is one of the topics where the three models have a considerable amount of overlap. Therefore, we will explore the characteristics of those features and artifacts, as well as what their emphasis is, with the understanding that this is not a clear-cut division.

The most common kind of artifact or feature (depending on the size) associated with ceremonial activities in Java is by far the stone sculptures, which include anthropomorphic sculptures, spheres, barriles, and petroglyphs. The discussion here is based on the descriptions provided by Fonseca and Chávez (2003) who recorded the location of the sculptures they found in a map, collected and transported some of them to the Archaeology Lab of the University of Costa Rica. In general, the size of the sculptures indicate that they were public in nature: the anthropomorphic ones are almost life sized, the spheres have a diameter of approximately 1 m, and the petroglyphs were mostly in rocks that are large enough to be non-portable.

Most of these anthropomorphic sculptures were incomplete or fragmented when they were collected in 2001 by Fonseca and Chávez, however, they resemble those from the site Barriles in Panama, specifically the sculptures that represent an individual carrying another person in their shoulders. Aside from the general shape and size, some of the examples from Java share stylistic details with those from Barriles, such as hats or hairstyles on the individuals being carried by another. These sculptures highlight individuals in a very literal sense. In Java, we only have examples of single individuals (there is no evidence of one carrying another one like in Barriles), but they present some ornamentations that are unique to each sculpture, which gives them a sort of individuality.

Sculptures similar to those from Java are found in other sites, however, only in Java we find all the categories in a single site: spheres, petroglyphs, barriles, espigas, anthropomorphic sculptures, in addition to the mounds. The site Barriles has barriles, anthropomorphic sculptures, petroglyphs; the site Bolas has spheres and petroglyphs. Stone spheres have not been found in the Panamanian side of the Great Chiriquí. And barriles are not common on the Costa Rican side. A few barriles have been reported in the site Monterrey (Corrales 2001) which is located on the other side of the Coto Brus river. And two more barriles were reported in the area of Golfito, in a coastal site called Costa Purruja (Hoopes 1990).

The barriles are an interesting case because even though all of the sites where they have been found are several kilometers apart, the similarities between these sculptures are striking: most of them present a height of around 50 cm, and they have either zoomorphic or abstract designs on the flat ends. The zoomorphic designs include monkeys and turtles, possibly amphibians. It is also interesting that these sculptures are found along with stone spheres, but not just in any site: the range of distribution of spheres is much larger than the distribution of barriles. The site Bolas, for example, takes its name from the sheer number of stone spheres in and around the site, however the architecture is rather underwhelming compared to other similar sized sites in the region, and there are no barriles reported in Bolas. Another important similarity between stone sculptures in different sites of the Great Chiriquí is that they are often found fragmented, which for some archaeologists means that they were purposefully destroyed or partially destroyed. Given the similarities in style of stone sculptures in the sites mentioned in this section, it has been proposed that they could be pilgrimage sites (Hoopes 2007), however, in the case of Java there is a lack of other indications of regional links, such as nonlocal ceramics.

The stone sculptures in Java probably represent a type of inalienable object: they are objects with ceremonial purposes that required special knowledge to produce. Petroglyphs were not scarce at all, but the other types of sculptures were relatively scarce. Considering their size, it is very unlikely that sculptures circulated widely. On the one hand, their relative scarcity (in proportion to the population size) corresponds with the elite oriented scenario in which inalienable objects are sources of prestige. But on the other hand, similar sculptures are found in different sectors of Java and even in other Aguas Buenas settlements in the region. This means that some of these sculptures could be replicas that promote communal identities, instead of individual identities.

In terms of architecture, the site Java presents 16 mound features, some of which had burials according to Fonseca and Chávez (2003) but they also have remains of domestic activities (ceramics). Practically all of these mounds have been looted, and the site is well known among locals because of the richness of its tombs. It is important to clarify that local people refer to almost any subsurface archaeological find as a “tomb”, based probably on the assumption that if the objects are not on the surface, they were intentionally interred. Then, although not everything that they call a tomb is in fact a tomb, many of those findings were probably tombs because they did recover complete artifacts, which is very difficult to find in this region in contexts other than burials.

In addition to the burials, the construction of the mounds themselves was a monumental project that required at the minimum some coordination. One if the questions of interest here is whether the construction of the mounds was a collaborative project driven by the community, or if people were forced in some way to build them for someone else.

In the site of Java, 16 mound features were recorded by Fonseca and Chávez (2003). The diameters from north to south and east to west at the base and the top of these features, as well as the height, were measured by Lara (2001). Based on those measurements we can calculate the approximate volume of each mound (Table 10). Technically, the mounds have a trapezoidal shape; however, their volume was calculated using the formula for a cylindrical shape because the measurements taken in 2001 have a degree of imprecision due to the looting and natural decay of the mounds. Therefore, the calculation of the volume was simplified by first estimating an average of the area of the mounds, and then multiplying this by the height. This way of estimating the volume of the mounds might have resulted in an overestimation because of the trapezoidal shape, but it might have also resulted in an underestimation because the mounds have suffered some erosion and intensive looting, as mentioned before. This means that, in spite of the potential sources of error for this calculation, we can be confident that this is our best possible approximation to the original volume of the mounds.

Table 10 Estimated volume for each mound in Java.

Mound ID	Average diameter	Height in m	Average area in m^2	Approximate volume in m^3
2	34.5	3.15	934.3463	2943.1907
1	27.75	2.19	604.4991	1323.8529
14	30.37	1.66	724.0345	1201.8972
12	22.87	1.5	410.584	615.87595
8	25.12	1.39	495.3463	688.53136
13	44.85	1.26	1579.045	1989.5969
15	15.37	1.08	185.446	200.28164
4	23.25	1.03	424.3416	437.07181
3	22.12	1.02	384.0961	391.77803
6	13.5	0.84	143.0663	120.17565
7	13.5	0.83	143.0663	118.74499
11	12.75	0.81	127.6116	103.36537
9	17.25	0.77	233.5866	179.86165
10	22.5	0.63	397.4063	250.36594
5	12	0.62	113.04	70.0848
16	7.5	0.31	44.15625	13.688438

Based on the previous estimation, the total volume of dirt in the 16 mounds is 10648.36 m3. In order to convert this number into an estimate of the labor needed for the construction, we use the parameters provided by Bernardini (2004), which are partly based on digging experiments by Erasmus in 1965 and on ethnographic observations. Bernardini (2004: 344-345) proposes that, for this kind of public project in middle range societies, each person who participates provides between 25 to 50 days of labor per year and the workday is around five hours long (after five hours the productivity "drops markedly"). In terms of the labor required specifically for building earthen mounds, Bernardini (2004:340) finds that excavating and transporting the dirt 50 m takes an average of 1.5 person/hours per m3. This author also provides estimates of this average when the transportation is less than 50 m, but we are using the more conservative distance of 50 m for Java because it is difficult to tell where exactly the dirt comes from. However, in the excavations within the mounds, there were sherds in practically all of the levels, which indicates that the dirt was probably taken from the areas already inhabited around the mounds. Another element taken into account for the labor estimate is the population size of Java, which is 586 ±195 or between 391 and 781 people (the details of the absolute population estimate are explained in section 4.3.2.1). From this population, the number of people that actually provides community labor is general estimated at 1 out every family of 5, i.e., 1/5 of the total population.

Considering all the parameters previously described, the total number of workdays per person required to build all the mounds in Java is around 27.25 Before we discuss the implications of this number, there are two more important observations about this estimate. First, several of the mounds in Java take advantage of the uneven terrain, which means that we might be again overestimating the labor required to build them because some of the volume of these mounds was already there. Second, the stratigraphic excavations within one of the mounds revealed at least two layers of occupation of the mound, which translates into two construction episodes. From that, we can put a finer point in the labor estimate with the observation that those 27.25 workdays were most likely divided into two construction seasons when each person had to provide less than 14 days of labor.

The main implication of this estimate is that the construction of the mounds was not necessarily a heavy burden for the population of Java. This is consistent with the observations from the site Dí' Crí' (P-690 Dc), another Aguas Buenas site in the region. For that site located in the Chánguena River basin, immediately to the south of the Coto Brus River valley, Sánchez (2013) provides a crude estimation of the time required to build the mounds, which have a style similar to the mounds in Java. The estimates provided by Sánchez are based on Atkinson's (1955) number for the amount of dirt that an individual can carry in one hour of work: 0.02 m3. For the case of Dí' Crí', Sánchez explores different scenarios considering variations in population levels and time investment (300 to 100 people, 8 to 4 hours of work per day). Even the most conservative scenario indicates that it would take no more than two years to build the 10 mounds in Dí' Crí'.

On the other hand, there is still the possibility that a small portion of the population was exploited for the construction of the mounds, especially when we consider the recurring theme of captives and violence in the stone sculptures of the region. In other words, the question of under what conditions were these mounds built is not entirely answered by the estimation of the labor investment that they required. For this, we can then return to the issue of what were the mounds used for. As mentioned before, there is no clear indication that the inhabitants of these mounds were wealthier than the rest of the community. If there was any difference from the rest of the community, it is the presence of particular kinds of stone sculptures such as spheres and barriles within the mound area.

The scenario that is more strongly supported by the evidence is one where the construction of the mounds required just a few days of labor from each family in the community, and the mounds were used by the community for ceremonial activities, or associated with individuals who held higher prestige based on their participation in such ceremonial activities.

5.5 Was the group participating in any kind of intense warfare?

Warfare plays a role in two of the scenarios proposed to explain the emergence of socioceremonial centers. In the elite oriented scenario, participation in warfare can be an elite strategy to accumulate prestige and justify their position, in which case the symbolism around warriorhood and violence in general is as important, or possibly even more, than the violent actions themselves. In the scalar stress scenario, the occurrence of warfare is an opportunity for intragroup cooperation. The organization required for defending a community under the threat of external violence can turn into an integrative institution in this scenario. These two possible roles of warfare are not necessarily opposites; in fact, they may coexist in complex societies because they correspond to different dimensions of warfare. Arkush (2022:20) identifies these two realms as the *severity* of conflict, on the one hand, and the *idea* of war, on the other hand. The severity of conflict is evidenced in violent trauma and defensive settlement patterns, while the idea of war is expressed in "warlike themes in art and ceremony." This observation is crucial to move beyond the common debate about how "real" was the violence represented on bellicose iconography. The way we move beyond this debate is by acknowledging that warfare has both a practical and a symbolic dimension, and we can study these dimensions through different lines of evidence.

The idea of warfare is represented in the Diquís region in anthropomorphic stone sculptures that depict individuals holding weapons and/or trophy heads. Trophy heads are also represented in metates and ceramic decorations. Although iconographic evidence is difficult to interpret without other kinds of supporting evidence, such as written records, these sculptures are representational enough to confidently argue that they portray violent actions and topics. It is still reasonable to interpret these individuals as warriors. However, based on ethnographic evidence of modern indigenous populations in the Chibcha macro region, Hoopes (2007) proposes that these sculptures might represent healers whose duties include head hunting, rather than full time warriors. In any case, there is general agreement that the sculptures are an indication that violent conflict was a relevant enough theme to invest resources into objects for public display (these sculptures are almost life sized and generally found in public spaces).

These considerations about the representation of war in the Diquís region provide contextual information, however, none of the anthropomorphic sculptures or metates from Java were complete at the time when they were documented. Some of them were unfinished, and some of them were fragmented. While we might not be able to know if there were warriors with trophy heads in the sculptures of Java, they present similarities in style to other sculptures of this kind in the region. One last important point about anthropomorphic sculptures in Java is that, regardless of who they represented, they were not restricted to the central mound area of the site, they were distributed across the entire site. In terms of the scenarios proposed before, the evidence for warfare as an elite strategy for the accumulation of prestige is weak and ambiguous. We will now review the evidence for the intensity of warfare in Java.

In the introduction to Chapter 3, we discussed some of the methodological issues that complicate the study of warfare in the tropics from a more traditional perspective, and proposed three characteristics of a settlement that can be studied to assess the intensity of conflict: boundedness, demographic density, and defensive features of the landscape.

Boundedness was described in Chapter 3 as “clearly defined site boundaries (in contrast with a site where the population, as indicated by the density of material, gradually becomes more dispersed moving from the site center to the periphery)”. Following this definition, the settlement of Java is relatively bounded: while the population is more nucleated in the mound area, and more dispersed in the periphery, the settlement still has a clear limit. Based on the findings from the survey, we can trace a limit to the distribution of ceramic materials around most of the settlement. Part of the reasons why boundedness is related to the intensity of conflict is because fortified sites are by definition bounded sites. In this case, the central sector of the settlement located in the hilltop is the most clearly delimited, and it is the area with the highest sherd density. Therefore, if there was a defensive structure in Java, such as a palisade, it was most likely around the central sector.

The second variable proposed in Chapter 3 is population density: “During periods of intense conflict, we would expect population density in the centers to increase as people from more dispersed and potentially vulnerable settlements in the periphery immigrated to the relative safety of the center”. In the case of Java, the population density increases drastically during the Late Aguas Buenas period, in comparison with the Early Aguas Buenas period. However, we would need to know more about demographic changes at the regional level in order to determine if that change in the population density of Java corresponds to the nucleation or to the increase of the regional population.

The third and last variable related to the intensity of conflict is the landscape itself: “during periods of warfare, we would expect the population in Java to occupy more intensively those areas where features enhance the defensibility of the site”. Those features include steep slopes and water bodies that make the access to the settlements difficult, and prominent locations that provide a good view of the surrounding territory. With respect to the view, Java is located in a prominent hill with a spectacular view of the Coto Brus River valley. The topographic map produced with data from the differential GPS, in combination with the demographic data obtained through the survey (see Figure 5.1), we can observe that the population of Java was mostly concentrated on the highest point of the hill, which is surrounded by several small and medium water streams in the North, and a steep slope in the West as well as the South. These slopes were not captured very clearly in the topographic map, due to the limitations in the data collection. The population does extend towards the North, but the architectural structures are concentrated in this central area.

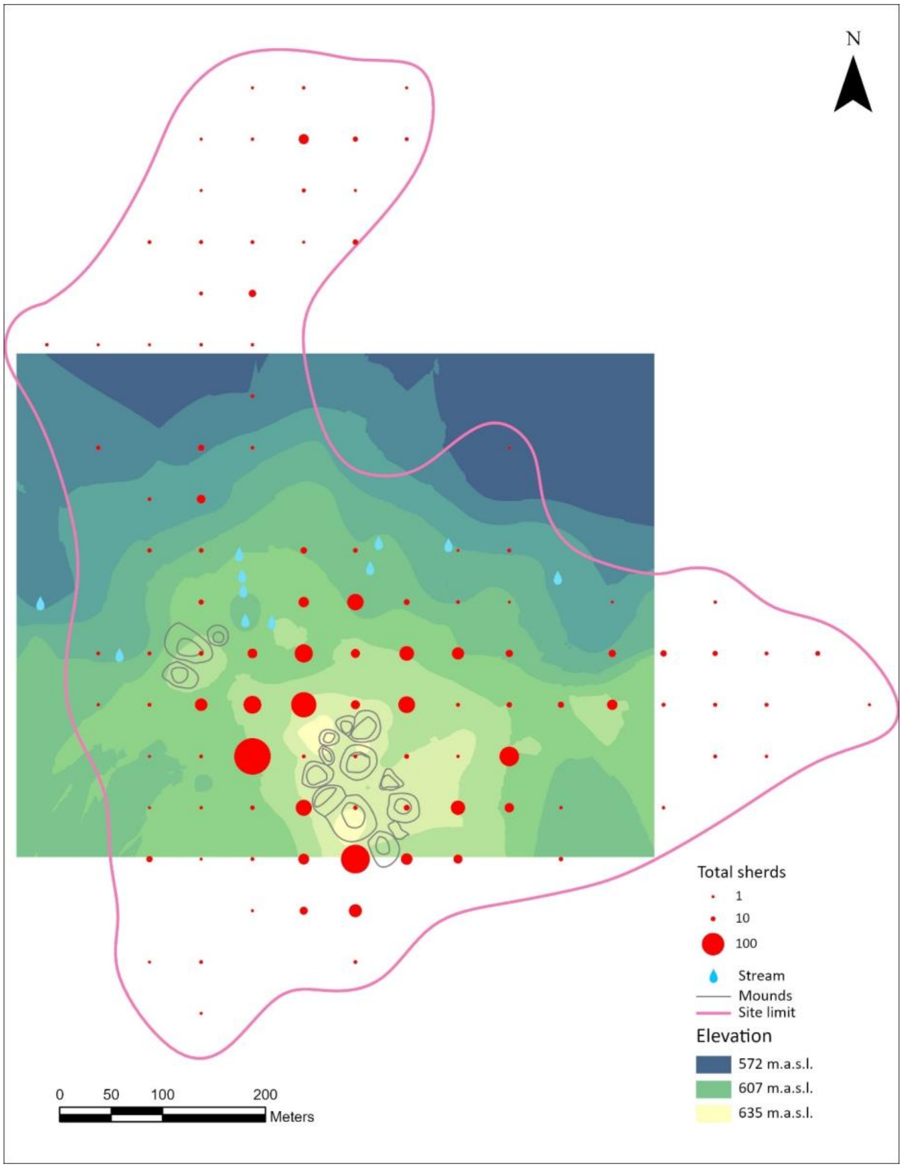

Figure 5.1 Topographic map of Java with total number of sherds per survey unit.

In summary, these three lines of evidence in conjunction are consistent with the idea that the population of Java was at least under the threat of violence, and defensibility could have been a consideration for deciding the placement of the settlement.

5.6 Were other activities carried out in the site along with ritual or ceremonial ones?

In this section, we will review the evidence for a variety of activities that play a secondary role in the different scenarios that explain the emergence of socioceremonial centers. The first one is craft production, which includes manufacture of tools and special objects. The analysis of the lithic assemblage revealed that most of the lithic artifacts in Java are associated with stone work: hammerstones, polishing stones, cores, flakes, and lithic debitage in general. Additionally, some of the sculptures and metates reported by Fonseca and Chávez (2003) were unfinished, which indicates that these sculptures were possibly being made in Java. As we discussed in section 4.3.3.8, the distribution of stone tools indicates that the manufacture and use of stone artifacts was not restricted to any particular sector of the site. Then, while there might have been some specialization in the production of stone sculptures, this activity was not monopolized.

The ceramic assemblage, on the other hand, does not provide evidence of any special activity, other than everyday cooking and serving of food. Two of the activities that we had expected to identify in the ceramic assemblage were feasting and exchange. However, as we discussed at length in Chapter 4, the ceramic assemblage is quite simple: the amount of fine paste, decorated, and thin sherds usually associated with special events is extremely small, even in comparison with other Aguas Buenas sites like Bolas (Palumbo et al. 2017). And there is no indication whatsoever of the presence of foreign ceramics in Java.

Finally, in previous sections of this chapter we have discussed the construction of the mounds in the context of the amount of labor that they require and the type of architecture that they represent. However, it is important to remember there that mound construction was possibly a communal effort, and an especial activity by itself.

5.7 Summary

From the three scenarios proposed here to explain the emergence of the socioceremonial center of Java, the scalar stress scenario is the most strongly supported by the evidence. The demographic estimates indicate that the population of Java grew well beyond 150 people in the Late Aguas Buenas period, and the settlement became fairly compact, which implies a considerable increase in the level of social friction. Yet during this period of around 250 years, people built earthen mounds, produced a large quantity of stone sculptures, and lived their everyday lives at the settlement of Java. The quantity of stone sculptures, as well as their resemblance to sculptures found in other socioceremonial sites of the region, show that ceremonial activities had a prominent place in this society, and they were possibly a source of inequalities, although those inequalities did not translate into wealth differences. In addition, the population of Java was possibly under the threat of violence, which may have been another reason why they concentrated in the site.

At this point, it is important to note that the divisions between the three models are, to some extent, artificial. They represent one way to organize the variability in conceptualization about socioceremonial centers and social complexity. For this reason, we also have to acknowledge that each answer to the questions in the previous sections points in a slightly different direction, and, there is some evidence that supports the other two scenarios as well, but not as strongly as the scalar stress scenario.

In the case of the elite oriented perspective, the concentration of stone spheres, barriles, and espigas in the mound sector could indicate the existence of an elite. However, this elite was not differentiated from the rest of the population through other variables.

Another variable that points more clearly towards a scalar stress scenario, rather than an elite oriented, is the nature of warfare or how it manifests in this site: the settlement presents defensive characteristics that indicate a concern with the practical implications of violence. And although warfare and violence are common themes represented in the sculptures in the region, this is not the case for the sculptures from Java that were complete enough to identify their theme. These sculptures represent abstract motifs, zoomorphic figures, or individuals but without evidence of weapons or trophy heads.

Finally, the community-oriented scenario is the least supported by the evidence. While the lack of differentiation in ceramic materials across the site and the landscape modifications could be consistent with theis scenario, there are also features completely inconsistent: the construction of the site is a relatively short-term process, and the occupation during the Late Aguas Buenas was permanent or sedentary.

5.8 The site Java in comparative perspective

One of the most fundamental questions that this research project seeks to answer is a two-part question about social inequalities: what was the nature of social inequalities in the community of Java and how strong were those inequalities? These questions have been explored in other early complex societies, and they are at the basis of Drennan et al. (2010) discussion about degrees and kinds of inequalities. In the previous sections, we reviewed the evidence related to the nature or kind of inequalities in the settlement of Java. In this section, we will take a comparative approach to better understand the degrees of inequalities in Java. This way, we will be able to identify where in the spectrum of early complex societies this particular case is.

One kind of inequality, possibly the first one that comes to mind when we think of social inequalities, is that based on economic differences or material wealth. Evidence of these differences can be found in burials, but also in domestic assemblages. Some of the clearest examples of wealth-based inequalities in the archaeological record of Central America are found in Central Panama, in the sites Conte and El Caño. Both of these sites contain individuals buried with rich offerings, including abundant gold, copper, bone, stone, and ceramic artifacts (Drennan et al. 2010; Hearne and Sharer 1992; Mayo and Mayo 2013). It is important to note here that there are other, less rich burials in these sites, which further supports the observation that there were economic based hierarchies in place. On the other side of the spectrum in terms of wealth accumulation, we have the societies from the Alto Magdalena in Colombia which show very little differentiation of this kind. In spite of the monumental character of the tombs in this area, the offerings were not particularly wealthy. In the case of Java, it is uncertain whether the earthen mounds contained burials or not; however, the ceramic assemblage presents very little indications of wealth accumulation: one the one hand, the proportion of high quality, fine, and/or decorated ceramics is very low across the site, and there are very little to no differences in their distribution within the site. Also, the entirety of the archaeological materials found during the survey were either ceramics or lithics, there were no special materials found in other sites such as gold, copper, or even foreign ceramics. This observation is also supported by the testimonies of local (reformed) looters who often expressed their frustration about the fact that they were never able to find the cacique of the site, meaning that, while they did find ceramic vessels and stone sculptures, they never found any particularly rich huaca (local word for archaeological deposits).

There are other kinds of inequalities that are based on prestige accumulation, rather than wealth accumulation. Prestige differences may be based on differential participation in special activities, such as ceremonial activities. The sites Conte and El Caño present evidence of ceremonial activities in the form of anthropomorphic, zoomorphic, and other types of stone sculptures, some of which have been interpreted as representing funerary rituals (Mayo and Mayo 2013: 5). This indicates that the ceremonial activities, and the prestige possibly associated with them, were linked to wealth-based differences in these societies from Central Panama. In the Alto Magdalena case, the monumentality of the tombs and the stone sculptures that accompany them indicate a social hierarchy based on prestige accumulation, rather than in wealth accumulation. In comparison with these two cases, Java presents, on the one hand, very weak to no evidence of wealth-based differences. On the other hand, the presence of monumental architecture in the form of residential mounds, as well as the concentration of certain types of stone sculptures in the mound area, indicate that any inequalities present in this society were prestige based and related to the participation in ceremonial activities. In this line, the case of Java is more similar to the case of the Alto Magdalena than it is to the Central Panama case. However, even the indications of differences based on ceremonial activities are weaker in Java than in the Alto Magdalena, given that the anthropomorphic sculptures (that emphasize individuals) are spread across the settlement, and only the barriles and spheres (whose meaning or emphasis is difficult to determine) are more concentrated in the center, associated with the residential mounds.

These observations indicate that the case of Java contrasts also with the descriptions of indigenous groups in the chronicles of the Sixteenth Century. In those documents, the Spaniards describe the presence of chiefs in practically every single settlement, who possess not only prestige but also material wealth. Interestingly enough, the prestige of those chiefs described by the Spaniards is based on their participation in warfare, and they do not seem to have any kind of religious or ceremonial role.

In summary, based on the comparisons made so far, the site of Java is at the lower end of the spectrum of social inequalities based on wealth accumulation, where societies like the ones from Central Panama are at the upper end, at least for early complex societies. And while the site Java has some indications of prestige differences associated with ceremonial activities, these are not as strong or unequivocal as those in the Alto Magdalena.

Bibliography

Adler, Michael A., and Richard H. Wilshusen

1990Large-Scale Integrative Facilities in Tribal Societies: Cross-Cultural and Southwestern US Examples. *World Archaeology* 22(2):133–146.

Aldenderfer, Mark

2010Gimme That Old Time Religion: Rethinking the Role of Religion in the Emergence of Social Inequality. In *Pathways to Power: New Perspectives on the Emergence of Social Inequality*, edited by T. Douglas Price and Gary M. Feinman, pp. 77–94. Fundamental Issues in Archaeology. Springer, New York, NY.

Alvarado, Alfredo, and Rafael Mata

2016Soils of Costa Rica: An Agroecological Approach. In *Costa Rican Ecosystems*, edited by Maarten Kappelle, pp. 64–93. The University of Chicago Press, Chicago and London.

Arkush, Elizabeth N.

2022*War, spectacle, and politics in the ancient Andes*. Cambridge University Press, Cambridge, UK.

Badilla, Adrián, and Francisco Corrales

2012Informe de Investigación. Excavaciones en el sitio Finca 6, Estructura Funeraria 1 (Temporada 2011). Museo Nacional de Costa Rica, Departamento de Antropología e Historia.

Bandy, Matthew S

2004Fissioning, Scalar Stress, and Social Evolution in Early Village Societies. *American Anthropologist* 106(2):322–333.

Baudez, Claude, Nathalie Borgnino, Sophie Laligant, and Valerie Lauthein

1993*Investigaciones arqueológicas en el Delta del Diquís*. DRCSTE, San José, Costa Rica.

Bender, Barbara

2002Time and Landscape. *Current anthropology* 43(S4):S103–S112. DOI:10.1086/339561.

Bernardini, Wesley

2004Hopewell geometric earthworks: a case study in the referential and experiential meaning of monuments. *Journal of anthropological archaeology* 23(3):331–356. DOI:10.1016/j.jaa.2004.06.001.

Berrey, C.

2018Making absolute population estimates in the Intermediate Area using the area and density of ceramic sherd scatters: An application of regression analysis. *Journal of archaeological science* 97:147–158. DOI:10.1016/j.jas.2018.07.008.

Berrey, C. Adam, Robert D. Drennan, and Christian E. Peterson

2021Local economies and household spacing in early chiefdom communities. *PloS one* 16(5):e0252532–e0252532. DOI:10.1371/journal.pone.0252532.

Berrey, C. Adam, and Scott D. Palumbo

2022Survey, Shovel Probes, and Population Estimates: Studying Regional Demography in the Intermediate Area Using Subsurface Sherd Deposits. *Journal of archaeological method and theory* 29(1):83–137. DOI:10.1007/s10816-021-09509-7.

Borgstede, Greg, and James R. Mathieu

2007Defensibility and Settlement Patterns in the Guatemalan Maya Highlands. *Latin American Antiquity* 18(2):191. DOI:10.2307/25063104.

Brodie, Laura J., Scott D. Palumbo, and Francisco Corrales Ulloa

2016Early social complexity at Bolas, Costa Rica: First year southern Costa Rica archaeological project (Scrap) results. *Arqueología* 22(2):409–418. DOI:10.34096/arqueologia.t22.n2.3237.

Burger, Richard L., and Robert M. Rosenswig (editors)

2012*Early New World Monumentality*. University Press of Florida, Dordrecht.

Corrales, Francisco

2000An Evaluation of Long Term Cultural Change in Southern Central America: The Ceramic Record og the Diquis Archaeological Subregion, Southern Costa Rica. University of Kansas.

2001Informe de Inspección en Coto Brus. Museo Nacional de Costa Rica, Departamento de Antropología e Historia.

2016La Gran Chiriquí: Una historia cada vez más profunda. *Canto Rodado* 11:27–58.

Demarest, Arthur A., Matt O'Mansky, Claudia Wolley, Dirk Van Tuerenhout, Takeshi Inomata, Joel Palka, and Héctor Escobedo

1997Classic Maya Defensive Systems and Warfare in the Petexbatun Region: Archaeological Evidence and Interpretations. *Ancient Mesoamerica* 8(02):229–253. DOI:10.1017/S095653610000170X.

DeMarrais, Elizabeth, Luis Jaime Castillo, and Timothy Earle

1996Ideology, Materialization, and Power Strategies. *Current anthropology* 37(1):15–31. DOI:10.1086/204472.

Drennan, Robert D, C. Adam Berrey, and Christian E Peterson

2015*Regional Settlement Demography in Archaeology*. Eliot Werner Publications, Inc., Clinton Corners, New York.

Drennan, Robert D., Christian E. Peterson, and Jake R. Fox

2010Degrees and Kinds of Inequality. In *Pathways to Power*, edited by Douglas T Price and Gary M Feinman, pp. 45–76. Springer, New York, NY.

Drolet, Robert

1983Al otro lado del Chiriquí, el Diquís: nuevos datos para la integración cultural de la región Gran Chiriquí. *Vínculos* 9(1–2):25–76.

1992The House and the Territory: The Organizational Structure for Chiefdom Art in the Diquis Subregion of Greater Chiriqui. In *Wealth and Hierarchy in the Intermediate Area*, edited by Frederick Lange. Dumbarton Oaks Research Library and Collection, Washington, DC.

Earle, Timothy

1997Chiefly Power Startegies and the Emergence of Complex Political Institutions. In *How Chiefs Come to Power: The Political Economy in Prehistory*, pp. 193–211. Stanford University Press, Stanford.

Fernández, Patricia, and Ifigenia Quintanilla

2003Metallurgy, Balls, and Srtone Statuary in the Diquis Delta, Costa Rica: Local Production of Power Symbols. In *Gold and Power in Ancient Costa Rica, Panama, and Colombia: A Symposium at Dumbarton Oaks, 9th and 10th October 1999*, edited by Jeffrey Quilter and John Hoopes. Dumbarton Oaks Research Library and Collection, Washington, DC.

Giraldo, Javier

2014Sources of Power and the Development of Sociopolitical Complexity in Malagana, Southwestern Colombia. University of Pittsburgh.

Gómez, Luis, and Karel Soto

2001Tras las huellas de los antiguos pobladores del sitio El Zoncho: Una aproximación al modo de vida de los agricultores especializados, San Vito de Coto Brus. *Vínculos* 26:145–164.

González Fernández, Victor

1998Prehispanic Change in the Mesitas Community: Documenting the Development of a Chiefdom’s Central Place in San Agustin, Colombia. University of Pittsburgh.

Haas, Jonathan, Winifred Creamer, and Alvaro Ruiz

2004Power and the Emergence of Complex Polities in the Peruvian Preceramic. *Archaeological Papers of the American Anthropological Association* 14(1):37–52. DOI:10.1525/ap3a.2004.14.037.

Haberland, Wolfgang

1955Preliminary report on the Aguas Buenas complex, Costa Rica. *Ethnos* 20(4):224–230. DOI:10.1080/00141844.1955.9980802.

Hearne, P, and R Sharer

1992*River of Gold: Precolumbian Treasures from Sitio Conte*. University Museum of Archaeology and Anthropology, University of Pennsylvania, Philadelphia.

Helms, Mary

1979*Ancient Panama: Chiefs in search of Power*. University of Texas Press, Austin.

1993*Craft and the kingly ideal: art, trade, and power*. University of Texas Press, Austin, TX.

Herrera, Anayensy, and Francisco Corrales

2001Ni Kira: Gente antigua en el Coto Colorado. *Vínculos* 26:79–112.

Herrera, Roberto

2015Social and Ritual Dynamics at El Cholo: an Upper General Valley Funerary Village of the Diquis Subregion, Southern Costa Rica. University of New Mexico.

2016Identifying settlement variability in the Isthmo-Colombian Area: alternative models from the Upper General Valley of the Diquís archaeological subregion. In *Settlement Ecology of the Ancient Americas*. Routledge.

Herrera, Wilberth

2016Climate of Costa Rica. In *Costa Rican Ecosystems*, edited by Maarten Kappelle, pp. 19–29. The University of Chicago Press, Chicago and London.

Hoopes, John

1990Golfito Archaeological Project. 1990 Field Season: Project Report. Department of Anthropology. University of Kansas.

2005The Emergence of Social Complexity in the Chibchan World of Southern Central America and Northern Colombia, AD 300–600. *Journal of Archaeological Research* 13:1–47.

2007Sorcery and the Taking of Trophy Heads in Ancient Costa Rica. In *The Taking and Displaying of Human Body Parts as Trophies by Amerindians*, edited by Richard Chacon and David Dye. Springer, New York.

Ibarra, Eugenia

1990*Las sociedades cacicales de Costa Rica: siglo XVI*. Editorial UCR, San José, Costa Rica.

2012*Pueblos que capturan: esclavitud indígena al sur de América Central del siglo XVI al XIX*. Editorial UCR, Ciudad Universitaria Rodrigo Facio.

Inder

2014Informe de caracterización del territorio Buenos Aires - Coto Brus. Instituto de Desarrollo Rural de Costa Rica.

Johnson, Gregory A

1982Organizational Structure and Scalar Stress. In *Theory and Explanation in Archaeology*, edited by Colin Renfrew, Michael Rowlands, and Barbara Abbott Segraves, pp. 389–421. Academic Press, New York.

Jones, Eric E.

2006Using Viewshed Analysis to Explore Settlement Choice: A Case Study of the Onondaga Iroquois. *American Antiquity* 71(3):523. DOI:10.2307/40035363.

Keeley, Lawrence H., Marisa Fontana, and Russell Quick

2007Baffles and Bastions: The Universal Features of Fortifications. *Journal of Anthropological Research* 15(1):55–95. DOI:10.1007/s10814-006-9009-0.

Kovacevich, Brigitte, and Michael G. Callaghan

20131 Introduction: Inalienability, Value, and the Construction of Social Difference. *Archaeological Papers of the American Anthropological Association* 23(1):1–13. DOI:10.1111/apaa.12012.

Lange, Frederick

1984Elite Participation in Precolumbian Ceramic Transfer in Costa Rica. In *Inter-Regional Ties in Costa Rican Archaeology: papers presented at a symposium at Carnegie Museum of Natural History, Pittsburgh, April 27, 1983*, edited by Esther Skirboll and Winifred Creamer. BAR International Series, Oxford, England.

1992*Wealth and Hierarchy in the Intermediate Area: A Symposium at Dumbarton, Oaks 10th and 11th October, 1987*. Edited by Frederick Lange. Dumbarton Oaks Research Library and Collection, Washington, DC.

Lara, Gustavo

2001Informe de topografía por las labores realizadas en el sitio arqueológico Java (U.C.R. 490) entre los días 1 y 17 de diciembre del 2000. University of Costa Rica.

Laurencich, Laura Laurencich de, and Luigi Minelli

1973La Fase Aguas Buenas en la región de San Vito de Java (Costa Rica). In *Actas del 40 Congreso Internacional de Americanistas*, pp. 219–224.

Laurencich, Laura, and Luigi Minelli

1966Informe preliminar sobre excavaciones alrededor de San Vito de Java. In *Actas del 36 Congreso Internacional de Americanistas*, pp. 415–427.

LeBlanc, Steven

1999*Prehistoric Warfare in the American Southwest*. University of Utah Press, Salt Lake City.

Linares, Olga F., and Anthony James Ranere (editors)

1980*Adaptive radiations in prehistoric Panama*. Peabody Museum monographs 5. Peabody Museum of Archaeology and Ethnology, Harvard University, Cambridge, Mass.

Linares, Olga F., Payson D. Sheets, and E. Jane Rosenthal

1975Prehistoric Agriculture in Tropical Highlands. *Science (American Association for the Advancement of Science)* 187(4172):137–145. DOI:10.1126/science.187.4172.137.

Lothrop, Samuel

1963*Archaeology of the Diquís Delta, Costa Rica*. Vol. 51. Papers of the Peabody Museum of Archaeology and Ethnology, Harvard University. Peabody Museum, Cambridge, MA, USA.

Martín, Alexander J., and R. Felipe Sol

2021Variation in the Structure and Role of Religious Institutions: Examples from Pre-Columbian America. *Current Anthropology* 62(6):692–716. DOI:10.1086/717777.

Maschner, Herbert, and Katherine Reedy-Maschner

1998Raid, Retreat, Defend (Repeat): The Archaeology and Ethnohistory of Warfare on the North Pacific Rim. *Journal of Anthropological Archaeology* 17:19–51.

Mayo, Julia, and Carlos Mayo

2013El descubrimiento de un cementerio de élite en El Caño: Indicios de un patrón funerario en el Valle de Río Grande, Coclé, Panamá. *Arqueología Iberoamericana* 20:3–27.

McCool, Weston C

2017Coping With Conflict: Defensive Strategies and Chronic Warfare in the Prehispanic Nazca Region. *Latin American Antiquity* 28(3):373–393. DOI:10.1017/laq.2017.28.

Mills, Barbara J.

2004The Establishment and Defeat of Hierarchy: Inalienable Possessions and the History of

Collective Prestige Structures in the Pueblo Southwest. *American anthropologist* 106(2):238–251. DOI:10.1525/aa.2004.106.2.238.

Mollenhauer, Jillian

2014Sculpting the Past in Preclassic Mesoamerica: Olmec Stone Monuments and the Production of Social Memory. *Ancient Mesoamerica* 25(1):11–27.

Murillo Herrera, Mauricio

2010Diversidad Sociopolítica en Costa Rica Precolombina. Implicaciones para la comprensión del cambio social. *International Journal of South American Archaeology* 6:16–34.

Murillo, Mauricio, and Felipe Sol

2023*Multiscalar Analysis of a Precolumbian Village in Cosat Rica: Barranca (A-372 Ba)*. Translated by Amanda Suárez. University of Pittsburgh Memoirs in Latin American Archaeology 28. Center for Comparative Archaeology, University of Pittsburgh, Pittsburgh.

Palumbo, Scott

2009The Development of Complex Society in the Volcán Barú Region of Western Panama. University of Pittsburgh.

2013Villages, Wards, and Houselots in Western Panama. In *Multiscalar Approaches to Studying Social Organization and Change in the Isthmo-Colombian Area*, edited by Scott Palumbo, Ana María Boada, William Locascio, and Adam Menzies. Center for Comparative Archaeology, University of Pittsburgh.

2017Investigaciones arqueológicas en la región del sitio Bolas (P-90 Bl-1), Provincia de Puntarenas, Costa Rica: Temporada de 2016 Informe final para la Comisión Arqueológica Nacional. Unpublished report.

2018aNew Survey Results From the Bolas Region, Costa Rica. Paper presented to the 83rd Annual Meeting of the Society for American Archaeology in Washington DC.

2018bConspicuous Consumption in Ancient Costa Rica and Panama. In *Modeling Cross-Cultural Interaction in Ancient Borderlands*. University Press of Florida.

Pauketat, Timothy R.

2000The tragedy of the commoners. In *Agency in Archaeology*, edited by M.A. Dobres and J.E. Robb, pp. 113–129. Routledge.

Piscitelli, Matthew

2017Pathways to Social Complexity in the Norte Chico Region of Peru. In *Feast, Famine or Fighting? Multiple Pathways to Social Complexity*, edited by Richard Chacon and Rubén Mendoza, pp. 393–415. Springer International Publishing.

Potter, James M

2000Ritual, Power, and Social Differentiation in Small-Scale Societies. In *Hierarchies in action: Cui bono?*, edited by Michael W Diehl, pp. 295–316. Center for Archaeological Investigations, Southern Illinois University, Carbondale.

Quilter, Jeffrey

2004*Cobble Circles and Standing Stones: Archaeology at the Rivas Site, Costa Rica*. University of Iowa Press, Iowa.

Quilter, Jeffrey, and Aida Blanco

1995Monumental Architecture and Social Organization at the Rivas Site, Costa Rica. *Journal of Field Archaeology* 22(2):203–221.

Quilter, Jeffrey, and R. Jeffrey Frost

2012Monumental Architecture and Social Complexity in the Intermediate Area. In *Early New World Monumentality*. University Press of Florida.

Ranere, Anthony

1980Stone Tools and Their Interpretation. In *Adaptive Radiations in Prehistoric Panama,* edited by Olga F. Linares and Anthony Ranere, pp. 118–137. Peabody Museum monographs 5. Peabody Museum of Archaeology and Ethnology, Harvard University, Cambridge, Mass.

Redmond, Elsa

1994aExternal warfare and the internal politics of northern South American tribes and chiefdoms. In *Factional competition and political development in the New World*, edited by Elizabeth Brumfiel and John Fox. Cambridge University Press, Cambridge.

1994b*Tribal and chiefly warfare in South America*. Museum of Anthropology, University of Michigan, Ann Arbor, MI.

Renfrew, Colin

1973Monuments, mobilization and social organization in neolithic Wessex. In *The Explanation of CUlture Change: Models in Prehistory*, edited by Colin Renfrew, pp. 539–558. Duckworth, London.

Rice, Prudence

2015*Pottery Analysis. A sourcebook*. Second. The University of Chicago Press, Chicago.

Rick, John W

2004The Evolution of Authority and Power at Chavín de Huántar, Peru. *Archaeological Papers of the American Anthropological Association* 14(1):71–89. DOI:10.1525/ap3a.2004.14.071.

Roscoe, Paul

2016War and the Food Quest in Small-Scale Societies: Settlement-Pattern Formation in Contact-Era New Guinea. In *The Arcaheology of Food and Warfare*, edited by Amber VanDerwarker and Gregory Wilson, pp. 13–39. Springer International Publishing, Cham, Switzerland.

Sakaguchi, Takashi, Jesse Morin, and Ryan Dickie

2010Defensibility of large prehistoric sites in the Mid-Fraser region on the Canadian Plateau. *Journal of Archaeological Science* 37(6):1171–1185. DOI:10.1016/J.JAS.2009.12.015.

Sánchez, Maureen

1987Un estudio de la arqueología de la Cuenca Superior y Media del Reventazón. Unpublished Trabajo final de graduación para optar al grado de Licenciatura en Antropología con énfasis en Arqueología., Universidad de Costa Rica, San José.

2013Las sociedades de rango y su distribución territorial en el Pacífico Sur de Costa Rica. *Revista de Arqueología Americana* 31:59–80.

Scarborough, Vernon L., and Lisa J. Lucero

2010The non-hierarchical development of complexity in the semitropics: water and cooperation. *Water History* 2(2):185–205. DOI:10.1007/s12685-010-0026-z.

Snarskis, Michael

1981The Archaeology of Costa Rica. In *Between Continents/Between Seas: Precolumbian Art of Costa Rica*, edited by Suzanne Abel-Vidor, Dirk Bakker, and Detroit Institute of Arts. H.N. Abrams, New York; Detroit.

1986Un modelo de evolución cultural en Costa Rica (500 a.C. - 1500 d.C.). In *Memorias del Primer Simposio Científico sobre Pueblos Indígenas de Costa Rica*, edited by Ramiro Barrantes, Maria Eugenia Bozzoli, and Patricia Gudiño. Consejo Nacional de Investigaciones

Científicas y Tecnológicas, Universidad de Costa Rica, Instituto Geográfico de Costa Rica, San José, Costa Rica.

2003From Jade to Gold in Costa Rica. In *Gold and Power in Ancient Costa Rica, Panama, and Colombia: A Symposium at Dumbarton Oaks, 9th and 10th October 1999*, edited by Jeffrey Quilter and John Hoopes. Dumbarton Oaks Research Library and Collection, Washington, DC.

Sol Castillo, Felipe

2013Religious Organization and Political Structure in Prehispanic Southern Costa Rica. University of Pittsburgh.

Soto, Karel, and Luis Gómez

2002Sitio arqueológico El Zoncho (CAT.U.C.R. N°168): Una manifestación de los agricultores especializados en las tierras intermedias de San Vito, cantón de Coto Brus, Puntarenas. Unpublished Tesis de licenciatura, Universidad de Costa Rica, Ciudad Universitaria Rodrigo Facio, San José, Costa Rica.

Spang, S, E.J. Rosethal, and O Linares

1980Report Number 9. Ceramic Classes from the Volcan Baru Sites. In *Adaptive radiations in prehistoric Panama*, edited by Olga F. Linares and Anthony Ranere, pp. 353–370. Peabody Museum monographs 5. Peabody Museum of Archaeology and Ethnology, Harvard University, Cambridge, Mass.

Stanish, Charles

2017*The Evolution of Human Co-operation*. Cambridge University Press, Cambridge.

Taylor, Zachary P., Chad S. Lane, and Sally P. Horn

2020A 3600-year record of drought in southern Pacific Costa Rica. *Quaternary research* 98:36–48. DOI:10.1017/qua.2020.37.

Thompson, Victor D., and Thomas J. Pluckhahn

2012Monumentalization and ritual landscapes at Fort Center in the Lake Okeechobee basin of South Florida. *Journal of anthropological archaeology* 31(1):49–65. DOI:10.1016/j.jaa.2011.10.002.

Trigger, Bruce

1990Monumental Architecture: A Thermodynamic Explanation of Symbolic Behaviour. *World Archaeology* 22(2):119–132.

Vázquez de Coronado, Juan

1976Al muy ilustre señor Licenciado Juan Martínez de Landecho, Presidente de la Audiencia de los Confines. In *Colección de Documentos para la Historia de Costa Rica*, edited by León Fernández. Editorial Costa Rica, San José.