THE UNIVERSITY OF CALGARY

EARLY INHABITANTS OF THE AMAZONIAN TROPICAL RAIN FOREST

A STUDY OF HUMANS AND ENVIRONMENTAL DYNAMICS

By

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ABSTRACT

Prior to the 60's Hunter-Gatherers in tropical forest ecosystems were considered as unmodified representatives of early tropical forest adaptive strategy. Their way of life was somewhere between the incipient slash-and-burn agriculturists and the rudimentary Stone Age populations. This view was challenged in 1968 when D. Lathrap (1968) proposed that tropical forest hunter-gatherers were descendants of unsuccessful tropical forest cultures that could not maintain their sociopolitical level due to resource competition with other populations. Groups forced into environments unsuitable to intensive agriculture suffered significant population loss and adapted to a more mobile existence. One logical extension of Lathrap's argument is that tropical forest hunter-gatherers are uninteresting in terms of their long history and that their recent history can be understood in relation to the control of resources by farmers. This led anthropologists to focus on farming adaptations with strong emphasis on resource availability (Meggers 1954;Meggers and Evans 1983; Myers1988; Lathrap1970).

Recently some researchers (Headland 1986; Headland and Reid 1989, Bailey et al 1989, Bailey and Headland 1991, Sponsel 1989) have proposed that hunter-gatherers adaptation to tropical forest ecosystems prior to the introduction or development of agriculture was impossible due to carbohydrate deficiencies.

Ethnographic data recovered in different tropical regions illustrates this dependency (Milton 1984; Peterson 1978a, 19788b, Politis and Rodríguez 1994, Silverwood-Cope 1972). However, Headland and Bailey's hypothesis is based on a model that does not consider the high variability of adaptations among hunter-gatherers while assumed the equivalence between the ethnographic present and the archaeological past adaptations.

This text encompasses detailed archaeological information of one early site in Amazonia: Peña Roja. Peña Roja is the most fully documented archaeological site dealing with information belonging to the late Pleistocene and early Holocene in Amazonia. The paleoenvironmental and archaeological data recovered in this site, and in the middle Caquetá River show a human population inhabiting a tropical rain forest before the introduction or development of agriculture. Consequently, Peña Roja's data allows us to evaluate the carbohydrate deficiency hypothesis from an archaeological perspective while contributes to the development of new directions in the interpretation and understanding of landscape evolution.

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To my band,

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CHAPTER 1

INTRODUCTION

> *It was, therefore, necessary to seek other localities in search of rarities.*
> Alfred Russel Wallace My Life. A record of events and opinions. 1905:281

One hundred years ago Amazonia was a fantastic place. Recently discovered by the educated Europeans, it became a source of new ideas, new experiences and most of all a laboratory to test new theories. Botanists, biologists and geographers navigated Amazonian rivers to prove Darwin and Wallace's theories on evolution. Most of them, paid by museums and scientific academies, collected samples of all types - including insects, mammals, plants, reptiles, stones and, of course, native crafts, to show the nature of the tropics to people of other latitudes. The number of strange things to be collected was unlimited and everywhere. A French explorer declared, after his very first night in South America, that if he kept collecting the bugs in his room, soon he would be richer in samples than the French Museum of Natural History[1]. Explorers like Thomas Whiffen (1915) justified their trips to Amazonia by their boredom with the European world, which contrasted markedly with the books they had read about the scientific exploration of Amazonia. South America, and particularly Amazonia,

[1] See Ordinaire, Oliver 1988.

represented a refreshing arena for intellectual Europeans of the time and a dream place for adventures.

Exotic plants and animals found their way to Europe. In turn more scientists[2] and explorers arrived, and with them businessmen looking for profitable opportunities[3]. New companies, with foreign capital, were created everywhere in Amazonian. Local politicians and governments oriented their interests toward Amazonian exploitation[4]. For instance, Rafael Reyes, a former Colombian president, attempted to amass a fortune with the exploitation of quinine and some spices in Amazonia. His brother, as he suspected at the time, was eaten by cannibals in the Caquetá river region while working for their company. Rafael Reyes abandoned the enterprise seeking a safer job in the Colombian government system[5]. Others persisted. Soon, the promoters of the rubber resin extraction business were on top of the social ranks; they devoted their richness to build weird cities like Manaos, in the Brazilian Amazon. An endless fortune was flowing from the Amazon basin.

While fortunes came and went, and opportunity knocked at some doors in the river ports, native populations in the "wilderness" were exterminated. The labor

[2] Henry Bates' and Alfred Russel Wallace's exploration of the Amazon basin was inspired by the publication in 1847 of W.H. Edwards "A Voyage up the Amazon". See Wallace 1905:164.

[3] A good example of this is William Herndon, 1996 (1853), who explored the Amazon river in search of commercial opportunities for the United States, including the exportation of slaves from the United States to Brazil.

[4] For instance see Goncalves Lopes 1904, for information on Brazilian Amazon resources and possible ways to exploit them.

needed for the production of wealth was based on native slavery[6]. Torture, massacres, and brutality devastated the not long before "pristine" world described by the explorers The exotic human communities living in the wilderness, guided by extraneous logic, as well as the picture of a world where vegetation eclipsed sunlight, were covered with blood. Greed defeated and changed an undiscovered universe. Only when the rubber boom collapsed, did the mass murder scandal become public, much to the shame of the noble rich British investors who claimed not to know about it[7].

This short story, that encompasses less than a hundred years, set the basis for the scientific definition and characterization of Amazonia. Indeed, the foundation of it, as a natural world, as well as a social system was established at that time. Explorers like Spruce (1996) dealt in detail with the botanical clues to organize an unknown world. Bates (1984), mainly interested in the description of some aspects of the world - among them butterflies - made some observations about the natives. He noticed that they were usually tired and stupid, and that they had problems functioning in the Amazonian climate[8]. But the most common opinion

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[5] See Rafael Reyes "Memorias". 1985.
[6] For some, the system that supported the rubber boom was a license to bring savages to civilization. See Lange 1912.
[7] See Gómez 1991; Gómez et. al., 1995
[8] Bates wrote " En los últimos años numerosos etnólogos han dado en afirmar que allí donde la tupida selva reviste la superficie de un país, las razas humanas nativas no pueden realizar ningún progreso hacia su civilización. Podría agrgarse que...el hecho... de que exista en la selva innumerables frutos silvestres deliciosos que los indígenas nunca han aprendido a cultivar parace demostrar, contrariamente al enfoque que hemos dado aquí a la cuestión, que es su innata estupidez más que la falta de materiales accesibles lo que les ha privado de la posibilidad de ayudarse a sí mismos en su proceso evolutivo". (1984:71).

was that they were primitive. A description of agricultural inhabitants of the Ecuadorian Amazon illustrates this perspective:

> They form an interesting study in that they differ in many respects from any other known savage tribes and are a living example of the stone age man, one of the very few surviving. (Up de Graff, F.W 1923:201).

The rich world of the Amazon lowlands, as pictured by the nineteenth - century voyagers, was inhabited by slothful nations[9]. Others presented a fearful view of the evolving "caboclo" society of the lower Amazon (Wallace 1969; 1905), as well as the temper of the natives in dealing with the hardship of every day life in the jungle (i.e., Humboldt 1982). But, only a few professional ethnographers like Theodor Koch-Grunberg (1995; 1994), showed a deep knowledge of native societies; sadly his books did not have wide distribution[10].

Since the beginning of the Amazonian exploration age, that for some is still in its childhood, the western scientific tradition has built an alternative interpretation of the Amazonian environment and the people who live in it. The models range from

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[9] Native Amazonians were considered as unadapted creatures to their environment. In Orton's (1875) words: "The Indian is not a tropical animal. The Negro and the Caucasian are far more at home on the equator. The Indian is very susceptible to changes of climate or altitude. He is very liable to sickness in going from the main river to the higher regions on the tributaries, or vice versá. Even a change of clothing he is not able to bear; feathers and bark are better for him than coast and calico. (1875:465). A decadent race "Northern genius may triumph over these physical obstacles, but the aborigines have a short future in the Amazons valley. Von Martius may believe that they are the degraded relics of a more perfect past; in other words, not a wild, but a degenerate race. But there is not a vestige of aboriginal splender east of the Andes, not a proof that the primeval men dwelling by the Great River were wiser than their descendants. (1875:463-465).

the delineation of factors limiting the development of the land, which in turn are seen to affect social and political developments, to models of effective native management of the tropical resources. The latter gives rise to the media and politicians' construction of "the reserved paradise" and revives the long ago dead myth of the "noble savage." Regardless of the validity of these models, which have not been satisfactorily tested with empirical data, they open a new door for on the study of native use of tropical rain forest, present and past,. Scientists hope that native knowledge of tropical rain forests will provide solutions to prevent human induced ecological disasters in due course. Massive migrations of penniless people in search of gold, timber, land and work in Amazonia have contributed to the development of highly concentrated settlement patterns and new consumption habits. Those factors fuel the destruction of this immense tropical rain forest and exacerbate an untenable future for our species.

> The experience of indigenous cultures teaches us that both flood plain and upland forest environments can be managed on a sustainable basis to support dense populations. Such lessons should be taken to promote not the widespread destruction of wilderness but, rather more rational utilization of already cleared areas. The history of pre-contact settlement in Amazonia implies not that all of Amazonia should be densely settled, but that environmental constraints to raising and sustaining agricultural yields can be overcome. The currently sparse populations in interfluvial areas and along many rivers are not an

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[10] His publications, mainly in German, were not translated to Spanish, Portuguese or English for many years.

> indication of Amazonia's agriculture potential. (Smith et. al., 1995:8).

All these models represent our changing view of the region, as well as the physical and social changes that are taking place there. Every one of them is useful to understand, at least in part, a complex dynamic reality. On the other hand, these models are important because they open new perspectives. In the words of the modern physics:

> A particular paradigm is neither right nor wrong, but merely reflects a perspective, an aspect of reality that may prove more or less fruitful depending on circumstances - just as a myth, although not literally true, may contain allegorical insights that prove more or less fruitful depending on circumstances. (Davies and Gribbin 1992:9).

There is an international urgency to understand Amazonia and its people. The carbon dioxide problem, the alarming rate of loss of biodiversity, the fight to cure new diseases, and the rapid cultural transformation that the region is suffering are all urgent concerns, but most importantly, this may be our last opportunity to prove our capacity to be humans.

In the following pages I will contribute to our knowledge of Amazonia from an archaeological perspective, using a model that incorporates every possible explanation as a part of history. Accordingly, I consider the relationship between human populations and their natural settings in a historical perspective that explains archeological patterning and landscape formation.

The empirical data that I use here derive from excavations at Peña Roja, an early site, which was occupied several times from the beginning of the Holocene up to 1500 A.D. In 1991 the preceramic component of this particular site was found and tested. In 1993 new excavations were made to obtain detailed information from the preceramic component of the site (Urrego et. al., 1995). The analysis of some samples of carbonized vegetal materials (Morcote 1994; Cavelier et. al., 1999) and lithic artifacts (Llanos 1995; 1997; Saunaluoma 1994) raise questions about the ways in which hunter gatherers adapted to and modified tropical rain forest (Cavelier et. al.1995; 1999; Gnecco & Mora 1997; Morcote et. al., 1998). From 1995 through 1998 a more detailed study of the lithic materials, which included approximately 2000 artifacts, took place.

At Peña Roja the chronology (8.700 - 9.300 B.P.), abundance of charred plant remains, and the high numbers of lithic materials provide a basis for the reconstruction of past subsistence activities and human adaptation to tropical rain forest. But more important is that palynological studies show little change in the vegetation cover at this site since the beginning of the Holocene (Van der Hammen et al. 1991; Urrego 1991). The characteristics of Peña Roja make it ideal to study the adaptive strategies of early hunter-gathers in a tropical rain forest prior to the introduction of agriculture and shed some light on early agriculture in the area (Piperno & Perasall 1998).

This dissertation will concentrate on an analysis of the stone tools, their patterned distribution in the site, associated charcoal, the ancient soils and other features of the encampment in an effort to recover as much information as possible about the activities which occurred at the site and their frequency. Paleoenvironmental data will allow me to place the occupation in an environmental and ecological context and to model the adaptive strategies of these tropical populations of antiquity. Analogies based on modern hunter-gatherers of the tropical rain forest will contribute to the development of a model of the ways these ancient populations conceived their space.

I hope that these results will contribute to our understanding of relationships between humans and nature within tropical rain forests, prior to the development or the introduction of agriculture, while contributing empirical data specific to the discussion concerning Amazonia.

CHAPTER 2

AMAZONIA:

THE ECOLOGICAL EXPLANATION OF SOCIAL SYSTEMS

Research studies made by anthropologists during the 1950's, 1960's, 1970's in the Amazon region gave rise to ongoing discussion and debate. The results of these works suggested that ecological factors could explain Amazonian cultural development. This discussion, however, covered a broad spectrum of interpretations, far beyond the scope of this chapter.

I will concentrate in this chapter on those issues that I consider relevant for the development of the perspective use to study the adaptation of hunter-gatherers in a tropical rain forest environment. Consequently, I do not attempt a revised history of the ecological paradigm in Amazonia, or a history of archaeology in Amazonia. In writing this chapter I only attempt to provide the reader with the background necessary to understand the perspective I used to study *one case of hunter-gatherers living in a tropical rain forest prior to the introduction or development of agriculture*. Probably the use of other sources - including unpublished material - could lead to a more general statement about the nature of adaptation in the tropical rain forest; however, that is not the objective of this text.

Foundations

Julian Steward's theoretical frame was responsible for the crystallization of the ecological paradigm in anthropology. He introduced ecological factors as important variables for understanding culture change and societies' organizational structures. For instance, with respect to band societies he stated:

> The essential features of these bands are most readily explained as the independent product of similar patterns of adaptation of technology and certain social forms to the environment (Steward 1976:123).

However, cultural change in his view could be triggered by diffusion of sociocultural patterns from one environment to another. This led to the question that guided an important part of his research: How are cultural patterns modified as a consequence of an adaptational process? Consequently, he viewed the study of the processes by which a society acquires many of its basic traits as a corollary to the study of adaptive processes (Steward 1977:45).

The introduction of the concept of adaptation, as a locus that consolidated historical cultural practices and environmental factors as the basis for cultural reproduction, opened a myriad of new interpretative alternatives for anthropologists. However, such interpretations presume the isolation of the components. This requires a history, as Western societies view it, and the understanding of the environment as a frame for human development. Due to the lack of a Western history of the people found in the Americas, archaeology, at Steward's time, became the principal source of history. However, the lack of archaeological information for Amazonia, led those anthropologists willing to understand adaptation as the convergence point of history and human usage of natural resources to turn to early European encounter accounts with natives in the Americas. In most cases, the data used by those anthropologists came from fragmentary historic accounts in which eyewitnesses obliterated context and created new situations, according to their own cultural background. With that information anthropologists produced a synthesis - for example the *Hand Book of South American Indians* -, that represents a model for the past. In that way, a long history was reduced to a few centuries. However, this synthesis has some obvious flaws. For instance Amazonian agricultural techniques and other techniques for resource exploitation described at that time were assumed to be constants up to the present, simply because it was impossible to contrast that kind of data with new information and frame it as part of an evolutionary process. Consequently, the native past was assimilated into the ethnographic present creating a homogeneous continuum between now and then.

If historical data had problems due to inadequacies of the sources and collections, ecological information was absent. The South American continent, and particularly Amazonia, was unknown from an ecological perspective. On the other hand, at that time, were considered to be simple and constant within specific geographical areas. This does not mean that Steward and his colleges denied the importance of the cyclical availability of resources but just that he considered resources as constant and predictable year round. One consequence of this reduction was that most of the information included in the analyses took a static form, which is not surprising due to the classificatory scheme used to collect it. Therefore, crucial data became uniform in the analyses, and corrupted the theoretical perspective. Steward's epoch could be characterized by its insufficient ethnographic and ecological data, both fundamentally important for a theory of Cultural Ecology (Barnard 1983).

Steward himself attempted to explain South American societies' history using a classificatory device based on four general types, with developmental implications (Steward 1946:7). The Andes and Mesoamerica, where complex societies emerged, reaching state levels of political integration and social division, influenced other regions creating new cultural patterns. For instance, the Andean chiefdoms, "...were the result of a diffused cult-complex of temples, priests, warriors, and human sacrifice, which may have originated in Mesoamerica but was re-adapted to the diversified environment of high mountains and deep valleys" (Steward, 1977:49). The Circum-Caribbean cultures that could be characterized by an intensive farming that supported dense populations were the outcome of Andean contacts. Planned large villages with storehouses, temples and chiefs' residences were characteristic of these societies. Several hundreds to several thousands of persons lived in each settlement. Stratification, into three or four classes, was common in such societies, and shamans had tremendous power, as did the warriors. Fields were permanent and in some places the agricultural production was based on sophisticated techniques. Warfare, practised with organized armies, was common and widespread. Such societies had a characteristic material culture, which included metallurgy (Colombian and Panamanian cases), elaborate ceramics with applied and incised decoration, and sophisticated weaving techniques to produce cotton cloth, often painted (Steward, 1946:4-5). On the other hand, the Tropical Forest Culture, where Amazonian societies were placed, was defined more in opposition to the others, and characterized by its lack of complexity, low population densities and subsystem systems mainly based on slash-and-burn agriculture, as described by the ethnographic reports of the time.

The archaeological exploration

Although explorers, ethnologists and archaeologists began to unearth prehistoric ceramics from various locations in the Amazon lowlands as early as the late 19th century, it wasn't until the 1950's that evidence was sufficient to define a chronological sequence in any one region.

Archaeological research in the tropical forests followed ecological-ethnographic variables –e.g., resource distribution and availability, soil characteristics– to explain the past, based on the assumption that it was similar to the present, as Lathrap mentioned in his dissertation (Raymond, personal communication 2000).

Consequently, modern low population densities, agricultural techniques and farmer/hunter-gatherer relationships were projected onto the past: the ethnographic record was considered stationary and was used to build a mirrored past. The result was a world where poverty, as conceived by the Western world, was seen as characteristic of human populations living in this environment. In this way early archaeological researchers in Amazonia, as their predecessors from the time of the exploration age, condemned Amazonian history to low population densities, dispersed settlements and lack of social complexity.

Meggers (1954; 1957) used a deterministic model to explain cultural variability (see also Evans 1955). The low productivity of tropical forest soils, according to Meggers (1954) restricted population density in the Amazon Basin and limited the development of socio-cultural complexity. Archaeological evidence of socio-cultural complexity, such as the remains of the Marajo culture from the mouth of the Amazon were best explained as a result of intrusions of cultures from the Andes, where environmental conditions were not as restrictive (Meggers and Evans 1957).

Megger's model denied the possibilism approach developed by the early anthropologists as a reaction to deterministic conclusions concerning human development. Landscape variability and resource diversity is negated in her work, but more important than that history is reduced to a few deterministic environmental variables. In short, the time frame, which makes archaeological knowledge unique, was replaced with the ethnographic present and stylistic comparison between pottery items in a chronological column. Nevertheless, Muggers' soil and agriculture conception of tropical rain forests as a limiting factor for development still is considered an important line of inquiry by some archaeologists (Myers 1992).

At the very same time as Meggers was formulating her model, other anthropologists studying tropical ecology, attempted to implement formulae to evaluate carrying capacity (i.e., Brush 1975; Carneiro 1960; Conklin 1959; Gourou 1966). These formulae represented, theoretically, an alternative interpretation to Meggers' model. Indeed, they put forth efforts to develop a more sophisticated system in which variables that could potentially limit human cultures could be understood. Those studies measure specific transformations at the technological - i.e., subsistence technologies and strategies - and ecological level. The complexity of the systems considered, however, makes variable delimitations difficult and contributes to the discussion of the relevance of the aspects included. For instance, the delineation of an effective environment proves to be useful; however, the interrelationship between components - ecological and social - was inadequately defined for specific cases creating theoretical and empirical problems while measuring particular variables. A time frame was essential. It was reduced, however, to days, months and years, for the most part. Anthropologists did not have access to long data sequences such as might come from archaeological sequences. On the other hand, the complexity of the systems studied, as well as the dynamic environmental aspects considered made it, at least at that time, difficult to operationalize such studies from an archaeological perspective.

Nonetheless, even at that time, some archaeologists argued that before European contact large agrarian societies had occupied the Amazon Basin (e.g. Lathrap 1970). This observation challenged Meggers' Amazonian archaeological record interpretation. Lathrap (1970:47) perceived these agrarian societies in terms of Tropical Forest Culture; a social arrangement where an economic system based on intensive root crop agriculture is fundamental. This Tropical Forest Culture, however, is not a uniform level of cultural achievement but a set of shared cultural elements that can be found in adaptations of different groups - riverine or interfluvial upland - throughout Amazonia. Tropical Forest Culture, accordingly, is the result of a long process of cultural adjustment to an extremely complex environment, like the tropical rain forest. Therefore, it has to be understood more in dynamic terms, and in relation to its variability due to different ecological locations, than in the sense of an unmovable category used to aggregate social organizations in respect to an ecological scenery.

Lathrap's definition of Tropical Forest Culture was inspired by his observations on Shipipo material culture, as well as in his experience with them (Raymond 1994). Consequently his model explains the archaeological record in light of human experiences: a model not just for pot sherds, but for the ethnographic and historical reality. In that way he was looking at social groups. This emphasis lead to systematic uses of ethnographic data that tie together archaeological interpretation and living tropical rain forest people[1]. His ceramic analysis, based more on a definition of ceramic complexes instead of types, attempted to demolish the barrier that archeologists encounter between material culture and living communities. The linguistic data used was, in this sense, an important aid. What he was doing with the application of the concept of a Tropical Forest Culture, in short, was developing a system to infer a set of rules, which contribute to understanding the nature of the relationship between culture and environment in a tropical setting.

Based on these ideas, Lathrap interpreted the dynamics of Amazonian prehistory in terms of competition for a rich source of animal protein and the good quality agricultural land of the riparian zones, which also afforded access to a communication network that enhanced the potential trade for exotic goods. Competition for control of the riparian zone was expressed through warfare and resulted in population displacement. The exploitation of the floodplain soils in riparian areas together with agriculture on the adjacent *terra firme* and the cultivation of root crops resulted in high productivity and settlement stability. In

[1] Lathrap's concern with ethnography/archaeology relationship can be verified in his students' desire to develop a perspective that considered these two approaches simultaneously. See Roe 1994.

such conditions some researchers believe that no ridged field systems were necessary in Amazonia (e.g., Myers 1992:91).

Unlike earlier researchers (e.g Meggers and Evans 1983; 1961; Steward 1947) who saw the colonization of the Amazon Basin as the result of a series of migrations originating in the Andes, Lathrap argued that Tropical Forest Culture was autochthonous, resulting from cultural adaptation to the forests and river system of the Amazon Basin. Adaptation and competition for the rich riparian resources of the Middle Amazon, then, became the engine that drove population expansion up the tributaries, accounting for the wide dispersal of particular languages. Ceramic remains, the most durable class of artifacts, and the identification of linguistic families became the archaeological means for Lathrap to test his model.

Lathrap's revolutionary ideas contributed to our understanding of cultural adaptation in Amazonia while shedding some light on its diversity. Moreover, this view transformed our perception of Amazonia and its importance in the history of Andean (Raymond 1989) and Caribbean societies (e.g Lathrap 1981; Foster & Lathrap 1975). Thanks to Lathrap, today it is commonly accepted that complex societies existed in the Amazon region.

The antagonism between Meggers' and Lathrap's views of Amazonian prehistory and cultural development in the region encouraged field work: more data was needed to evaluate these hypotheses. One important difference between Lathrap's and Meggers' positions was reflected in the implications of the terms used by them to characterize the archaeological materials - mainly ceramics -: Horizons versus Traditions. These two terms became, in the archaeological literature of that time, markers of the theoretical orientation followed by specific authors. Both of them followed Willey and Philipps (1958) definitions[2].

During the late 1960's and early 1970's, processual archaeologists attempted to study cultural change as a long-term adaptation to the environment (Binford 1968; Flannery 1972). They, as well as the cultural ecologists (Meggitt 1977; Rappaport 1967a), underlined the role of population growth that exacerbated intergroup competition over resources. Demographic and environmental information became progressively crucial in the explanation of the dynamics of all sorts of societies. For instance Struever (1968) viewed subsistence playing a key role in settlement patterns that can be considered as adaptative responses to specific environmental conditions. For him settlement patterns reflected the relationship between subsistence and the environment, which shaped the entire cultural system. Complex societies were viewed as the result of an expanding population that caused agricultural intensification (Boserup 1965; Turner, Hanham & Portararo 1977). Johnson & Earle (1987) built a model in which

[2] A horizon is defined "as a primarily spatial continuity represented by cultural traits and assemblages whose nature and mode of occurrence permits the assumption of a broad and rapid spread."(Willey and Phillips 1958:33). An archaeological tradition is (primarily) a temporal continuity represented by persistent configurations in single technologies or other systems of related forms" (Willey and Phillips 1958:37).

political evolution was based on the demographic factor. In such a model population density is the clue for a systematic classification of cultural levels. For them population is the main cause of social change and human evolution through complexity. However, the hunter and gatherer "way of life" was studied, from a theoretical point of view, as conditioned by a peoples' environment and subsistence techniques (Fried 1967; Sahlins 1972; 1968). These ideas, incorporated into the Amazonian archaeological tools set mainly by Lathrap's writings, slowly became part of the perspective used in Amazonia.

In 1980 Roosevelt published *Parmana: Prehistoric Maize and Manioc Subsistence along the Amazon and Orinoco*, in which she presents a hypothesis of technological change. For her the introduction of maize increased productivity, allowing more complex social arrangements within the same ecological conditions previously noted by other authors - black rivers versus white rivers, várzea versus hinterland. Despite the presence of technology in the equation, her view of the landscape was, at least in that book extremely limited[3], Her argument asserted that ecological differences were minimized by technology, a crop, which enabled her to produce a generalization that included tropical rain forest - Amazonia - and Savanna environments - Orinoquia - in one single hypothesis of cultural change. The information to evaluate this hypothesis, at

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[3] A.. Roosevelt is one of the most prolific authors ever to work in Amazonia. Consequently her opinions had evolved accordingly to the changing knowledge that archaeology and other science acquired.

least for the site she excavated on the banks of the Orinoco, was published seventeen years after the Paramana book (see Rooselvet 1997). While these data were available to the public, researchers in different Amazonian regions, had found evidence of the introduction of corn, mainly in palynological analysis. This evidence belongs to a time prior to the development of any complexity, bringing into question her hypothesis (e.g Bush, Piperno and Colinvaux 1989; Mora et, al., 1991). Roosevelt (1997) argues in defense of her technological change hypothesis that the number of identified maize samples in the tropical lowlands is statistically insignificant. Even if statistics allow her to dismiss these data, and archaeological materials preservation in the low lands works in her favor, this evidence suggests that such crops did exist in Amazonia prior to the first millenium AD.

Recently Heckenberger (1998), using data from the Upper Xingú, suggested that there is no need of a technical transformation in Amazonian cultures in order to develop fully sedentary populated towns. In his view, bitter manioc and fish increase productivity and provide an appropriate basis for such development, without the introduction of other crops. Carneiro presented the same ideas some years before using ethnographic data.

The subsistence base of Amazonian societies is still a subject of debate (i.e., Carneiro 1995; Cavelier et. al. 1990; Kerr 1990; Heckenberger 1998; Heckenberger et. al.,1999; Myers 1992; Roosevelt 1987; 1989a; 1989b; 1991;

1997). The empirical data necessary to reconstruct archaeological cultural patterns associated with riverine and upland landscapes and to establish their relationships within different archaeological sequences are still missing. Indeed, more information is needed to explain the complex patterning of archaeological deposits in Amazonia that suggest that urban centers arose during the first millennium A.D. (see for instance Roosevelt 1997), and the adaptation of different societies to the gamut of environmental conditions in the region.

The application of ecological principles to archaeological studies, however, still has to overcome the gap between general ecological theory and a theory of human behavior. Otherwise the result is an over generalization in which human behavior is reduced to environmental determinants. In the past, this has been the fate of the marriage between ecology and archaeology.

> Notwithstanding the large contributions that the heuristic approach has made to archaeological research, it has its disadvantages. Explanatory models are ad hoc, constructed for archaeological data from a particular site or region: because they are tied to specific environments and to specific human groups, the models are unlikely to have any relevance elsewhere. The reason is that predictions drawn from such models are most likely to be confirmed under ecological and cultural settings that are identical to the model. (Hardesty 1980:157).

Landscape Revaluation: Ecology and Culture

During the eighties it was demonstrated that the conclusions derived from studies on the limitations of the environment were based on the assumption of a homogeneous ecosystem for which a small group of variables was considered. These led to the over-simplification of the problems studied and in turn led to reductionist conclusions (Hames and Vickers 1983). This made it imperative to deepen the knowledge of diversity within the Amazon landscape from an ecological point of view. Ecology, in addition, forced the evaluation of the role of human groups within that environment and reevaluated the importance of some factors considered as limiting. Soon, the supposed generalized adaptation system was replaced by a more complex conception. In Moran's words

> Amazon populations developed site-specific solutions that reflect the characteristic diversity of Amazon ecosystems. Native peoples adjusted to the limitations of each zone; exploited, whenever possible, areas at the edge between habitats; and maintained strategies that adjusted resource use to resource availability in highly localized microenvironments. (1981:56)

Moreover, new ethnographic data questioned some assumptions, such as soil exhaustion and its influence on mobility, that were not considered to be a convincing explanation for settlement patterns of groups like the Yanomamo (see Chagnon 1992:91), similarly the carrying capacity of local microenvironments could not explain settlement size (see Frechione 1990:125, 130 for the Yekuana case). Mobility and settlement size in Amazonia began to be seen as the result of interactions among multiple variables, and could not be reduced to a single factor (Gross 1983). Even the differences in agricultural production between the riparian areas and the intermediate zone of the uplands where considered less dramatic than thought initially (see Lizot 1977:501; Descola 1994). Consequently, new investigations attempted to understand specific adaptations (i.e., Hill & Moran 1983).

Ecology, the leading paradigm in social anthropology and archaeology in Amazonia during the eighties, began to be criticized for its reductionist results. Simple, functionalist models of ecosystems lack the explanatory power needed to understand complex issues like history and cultural change (Nugent 1981:67). As Lizot (1977) pointed out:

> When ecology is given undue emphasis, social anthropology tends to lose a sense of proportion and forgets that various factors combine dialectically to make a society what it is: the natural environment and resources, to be sure, but also the history, the internal dynamics specific to each civilization - technological innovation or borrowing, etc... One runs the risk of mistaking effect for cause, of deliberately or unknowingly distorting the social facts while collecting them and then interpreting them in order to fit them into pre-established and simplistic frameworks (pp 497).

Based on a diachronic perspective, the cultural ecological paradigm was criticized for constructing a natives' vision that omits their reality.[4]

> The cultural ecological paradigm of the 1970s had two weaknesses. The first of these was its neofunctional perspective. Neofunctionalism is a theory that tribal customs, even those that seem bizarre to Westerners, may actually function ecologically to keep local populations adapted to their environments. The neofunctionalist school grew out of the work in the 1960s of Marvin Harris, Roy Rappaport, and Andrew Vayda. It promoted the idea that primitive peoples lived in a near-perfect equilibrium with their environments. In this homeostatic model, culture was the thermostat that kept people in balance with nature.....The second weakness in the cultural ecology of the 1970s was its frequent failure to adopt a diachronic perspective in cultural analyses - to look seriously at the history of human-occupied ecosystems. (Headland 1997: 606- 607).

In the 1980's social and environmental aspects were reconsidered. Social relations and kinship, which guaranteed distant resource access, were identified as important parts of subsistence strategies by ethnographers (see, for example the Uanano case Chernela 1982; 1985; 1992; 1993 Correa 1990 for the Taiwano and Moran 1991 for the Cubeo, Tukanoan, Maku, Uanano). Trade motivation and trade systems became more important for ethnographers (i.e., Hugh-Jones 1988) and ecological - cosmological - conceptions became relevant in understanding social change (e.g. Whitten 1978; 1985 for the Canelos Quichua).

Archaeologists attempted to gather ethnohistorical and archaeological data in order to define such systems (e.g. Myers 1981; 1982; Porro 1994). Agricultural systems, like the Tukanoan swidden plots, were considered polycultural and polyvarietal, where roots, tubers, and low successional vegetation of swidden areas were used to attract game animals such as rodents, peccary, and deer (Hames 1983; Dufour 1990:656). The stereotype in which a manioc garden – a clearing in the rainforest -- where primitive people try to earn a living was replaced by the idea of an agricultural system in which selective clearing, selective weeding, crop diversity and animal management were used to produce crops with minimal environmental degradation (see Beckerman 1983). The diversity of the agricultural techniques used by native Amazonians proved to be immense (see Padoch & Jong 1992 and Eden & Andrade 1987 for the Andoke and Witoto cases, Stocks 1983 for Candoshi and Cocamilla; Treacy 1982 for the Bora case). Even our ideas of the antiquity of some crops in Amazonia were proven to be erroneous; the introduction of cultivars like corn, used by some scholars to explain the rise of chiefdoms during the first millenium AD (e.g. Roosevelt 1980), as mentioned earlier, was shown to have an early history in South American lowlands (see Bush, Piperno and Colinvaux 1989; Mora et al 1991). Concomitant with the revaluation of the environment, a new emphasis on native knowledge, as a key source to understanding native's relationship with nature, was spreading (i.e., Descola 1987). Ethnobotany developments in the

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[4] The use of a simple ecological functionalist paradigm is still proclaimed by some authors as the appropriated way to explain cultural development in Amazonia as an adaptation. See for instance Wilson

area proved this (i.e., Baleé, 1987b; Palacios 1987; Schultes 1988; Schultes & Raffauf 1992; Vickers & Plowman 1984; Prance 1985)

In 1986 la Fundación Erigaie and the Instituto Colombiano de Antropología, with the financial support of Daimco-Casam, TropenBos, Colciencias, El Fondo FEN and the National University of Colombia started an archaeological inquiry in Amazonia. The goal of this research was to produce quality environmental and social information for a restricted area in the Middle Caquetá-Yapura river. The emphasis was placed on agricultural development and social change (Caverlier et. al., 1987a; 1987b). The principal sources of information were: identification of cultivars, using palynological techniques with the aid of extensive sample recollection among native inhabitants[5]; soil analysis, to verify human intervention and plant usage; settlement distribution analysis; and archaeological excavations, in order to define activity areas (see Mora et. al., 1991). The results contribute to our understanding of human adaptation and change of a local environment in the tropical lowlands within a perspective that does not base its conclusions in a few variables under the frame of environmental constrains, but on human environment interactions as possibiles routes to specific adaptations. Similar changes in researchers' perspectives are taking place in the central and southern part of Amazonia (Brazilian Amazonia) (Barreto 1998; Funari 1989).

1999.

[5] One of the results of this work is a palynological atlas of the region. See Herrera & Urrego 1996.

In the late 1990's more archaeological inquiries incorporated native knowledge to understand points in common between their history and our history. For instance, it is now known that ancient Amazonian human activities changed soil structure and composition, increasing phosphorus and organic values and producing anthropic soils. Baleé regards these soils as artifacts "... many groups, including the Araweté, use an anthropogenic resource, *terra preta do Indio*, which is better understood as an artifact in the broad, materialistic sense that Spaulding gave it" (1992:42). Some researchers considered these soils to be the result of unintentional or natural processes (Andrade 1986; Eden et al. 1984; León and Vega 1983), used opportunistically by modern communities to increase agricultural production (Balée 1992). Others viewed them as the result of deliberate human action to increase productivity and stability in special areas during the pre-European time (Cavelier, Mora & Herrera1990; Herrera, et al.1992). Either way, their antiquity – e.g 3,750 BP for the San Carlos Río Negro (Sponsel 1986:73) - and their broad distribution along the river banks, challenged explanations based only on their agricultural function (see Smith 1980). On the other hand, the Northwest Tukano Indians considered these soils to be a property of Pamurí Mahsé, a mythical hero from the time of the colonization of the region. For them, at the time the geography of the world was defined, it was loaded with meanings that can be reflected in the "natural" setting (see Reichel-Dolmatoff 1990:38; 1996:80). Therefore their history becomes relevant to our understanding of settlement distribution and landscape interpretation. This new perspective that combines native history and archaeological knowledge within landscape is growing.

One result of this new focus was that some researchers arrived at the conclusion that the history of the tropical forest was tightly linked to human activities. The forest, far from being a virgin fraction of the planet, could be considered to be the result of human occupation (Balée 1987a; 1987b; 1988; 1989a: 1989b; 1992; Bennett 1992; Dufour 1990; Posey 1985; 1992). Vine forests, for example, could be a consequence of millennia of human interference in "natural" successional processes (Baleé 1987a:14). In Baleé's words "The Indians of today, therefore have come to use forests that are dominated by species that could only have achieved prominence through the repeated interference of prehistoric and early post-Columbian Indians" (Balee, 1987a: 32 see Politis 1996a:58; 1996b). Human forest disturbance may change the composition of local fauna, favoring some species while replacing others that require minimal disturbance (Frumhoff 1995:458). This gave way to the study of cultural landscapes, where special spots in terms of vegetation, soils and topography had important historical connotations that link pre-contact communities with modern native societies. In Reichel's words

> They are liminal spots where transformations are likely to occur, places where all values are abolished and replaced by others, places that lie outside of time. It is obvious that we are entering here a dimension of the imaginary, but

> as these places do exist in reality as landscape features, and are singled out by the Indians as components of their concept of nature. (Reichel-Dolmatoff 1996:48).

The extent of human intervention in Amazonia, however, is still not clearly understood at the flora and pedological levels. Even so, some estimates suggest that at least 11.8% of the 3,303,000 square kilometers of the Amazon region were deeply affected by humans (Balée 1989b; Solarte 1991:94). In this manner, the study of cultural development has acquired a new relevance with respect to the ecological history of Amazonia. Archaeological work has become a prerequisite for any study of the vegetal communities or soil formation (e.g., Solarte 1991; Schmidt 1994). Paradoxically, this new view of Amazonia and its inhabitants is closely related to the native perception of their world, not long ago considered as primitive (see Reichel-Domatoff 1996). Nonetheless, in this new perspective the economic structures of the native societies of Amazonia are still poorly understood and their connection with the ideology flawed.

Hunter-gatherer studies in Amazonia are a special example of the myriad of explanations built on the relationship between humans and nature. They have an important place in Amazonian cultural and ecological history. Lathrap (1968) challenged earlier interpretations of pristine hunter-gatherers in the tropical forest based on ecological data. He portrayed the more mobile, low-density populations of the interfluvial regions that practiced hunting and gathering as a way of life, as populations displaced from the more productive riparian zones by resource competition. Consequently, they were pictured as deculturated farmers. This proscription made early hunter-gatherers unnoticeable and living hunter-gatherers groups interesting to study only in relation to farmers. Since then, Amazonian hunter-gather adaptation has been reduced to one theoretical perspective based on ecological models in which the most relevant aspects are the limiting factors for human survival. Access to resources such as protein and carbohydrates, considered to be limited by seasonal distribution and/or scarcity, are seen as critical factors for tropical forest human occupations prior to agriculture (see Bailey, R. C. M. Jenike, R Rechtman 1991;Bailey, R. & T. N. Headland 1991; Bailey, R; G. Head, M. Jenike, B. Owen, R. Rechtman, & E. Zechentes. 1989; Lathrap 1968: 24,26; Myers 1988; Sponsel 1989).

The absence of empirical archaeological data prevents hunter-gatherer study. Indeed archaeological research in Amazonia is scarce and sampling problems, due to poor preservation, are common (Stahl 1995; Pearsall 1995). Contextual information and lithic materials are scarce, and a few isolated occurrences of plant macroremains have only been identified. In short, empirical data contributing to this discussion of early - prior to agriculture - foragers in Amazonia is still missing and solid interpretations cannot be supported without large samples of data collected systematically. The revaluation of Hunter-Gatherer studies in Amazonia requires a strong theoretical frame, as well as empirical data to support any argument. Therefore, It also requires additional investigation.

CHAPTER 3

HUNTER-GATHERERS OF THE TROPICAL RAIN FOREST

> *Generación de gitanos, o rama de ellos, que entregados a una vida vagabunda, todo lugar fijo, aunque lleno de las mayores conveniencias, les parece cárcel intolerable, y remo de galera insufrible.* Gumilla, Historia natural civil y geográfica de las naciones situadas en las riveras del río Orinoco. 1955:170.

From prehistory last representatives to displaced thieves and beggars

Since the time of the early European colonization of South America, religious missionaries have vilified hunter-gatherers living in the tropical lowlands[1]. Their way of life was considered miserable and their character unconquerable; to bring them to civilization was a difficult task, if not impossible. Rivero (1956), a Catholic priest, described lowland nomads' visits to sedentary villages as an economic and social catastrophe. They vandalized the agricultural fields, plundered orchards, stole women, and tricked villagers with unusable forest products. Their sorcery powers and their knowledge of an unfamiliar world, as well as the villagers' need of special resources from the forest explained in part why farmers tolerated them, and even welcomed them (Morey & Morey 1973:234).

This view was not modified during the scientific exploration of the late 19th and early 20th century. Indeed, early travelers depicted hunter-gatherers in tropical forests as horrible creatures, living in the wilderness without law, religion or chiefs. They were captured and traded as slaves among Amazonian sedentary communities, but their disposition to drink and thievery made them undesirable people[2]. However, from the anthropological point of view, at the time, their language was considered interesting due to its "primitiveness". The literature of that particular period is full of comments about their unusual "dialects"[3].

The development of a theoretical framework, such as Steward's cultural ecology, did not alter this view, but emphasized other aspects of it. Hunter-gathers were viewed as the result of a long process of adaptation to environmental factors within specific technological conditions. Steward, from an anthropological point of view, indicated three outstanding features of hunter-gatherers:

> ..it is a cultural type whose essential features - patrilineality, patrilocality, exogamy, land ownership, and lineage composition - constituted a cultural core which recurred cross-culturally with great regularity, whereas many details of technology, religion, and other

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[1] See Gumilla (1955), Rivero (1956) Pacheco (1962); Mercado(1966).

[2] Koch-Grunberg 1995 described them at the turn of the 20th century as follow: Los makú vagan errantes y fugitivos por los bosques, sin vivienda fija, despreciados y perseguidos por sus vecinos más desarrollados, para quienes deben trabajar como esclavos en el hogar y en los sembrados y quienes incluso los canjean a los blancos por meracancía europea. Un joven makú equivale a un fusil de repetición o menos. Por esto es frecuente encontrar esclavos Makú en todos los caceríos del Río Negro, muy codiciados por su inteligencia innata y su aptitud para la caza. Por otra parte, tienen también grandes desventajas, como su carácter mentiroso, su tendencia al robo y su inclinación al alcoholismo" (T-1 pp 56-57).

[3] See for instance Koch-Grunberg 1995 T-2, pp 91.

> aspects of culture represent independent variables, the nature of which was determined by diffusion or unique local circumstances. ...., its cultural core resulted from ecological adaptation which, under the recurrent conditions of environment and subsistence technology, could vary only within minor limits. .....its multifamily aggregates found cohesion not only in kinship relations but in co-operative hunting, in common landownership, and to some extent in joint ceremonies. (Steward 1976:122-123).

In short, the peculiarities of this social type were explained as the product of adaptation patterns of technology and certain social forms congruent with the environment. Their history, if any, was reduced to "some archaic culture which developed at an early period of human history and has been preserved ever since" (Steward 1976:123). Métraux (1948) confirmed this view in the *Handbook of the South American Indians*, when he considered the Makú as the last representatives of a primitive culture of hunter-gatherers.

At the time of the writing of the *Handbook*, social complexity as well as the lack of it were explained in terms of environmental factors, as mentioned earlier. Evolution, consequently, was shaped by particular environmental conditions. E. Service agreed with Steward's social change explanation. In his words:

> Once the neolithic era began and the tribes gradually expanded, some bands were transformed, others possibly obliterated, and the remainder pushed into, or confined to,

> ecological areas where domestication of plants and animals was not feasible. (1971:59).

This deterministic view, later on, affected the reconstruction of vital aspects of hunter-gatherers' lifestyles such as mobility patterns and settlement duration. Ethnographic data, however, suggests that the factors affecting hunter-gatherer behavior are variable and complex.

> The current prevalence of ecological deterministic thinking has resulted in mobility being conceived of primarily in terms of ecology.....mobility is not necessarily ecologically determined, and the roles played by social, and ritual factors in determining mobility can be as important as, or in some cases more important than, those played by ecology (Kent, & Vierich 1989:97).

For Service the ecological argument was a good explanation to understand demographic patterns, but not sufficient to cope with social organization variability. He did not accept Steward's idea of the family as an isolated social unit. Either way, modern hunter-gatherers were depicted as a static social form, belonging to the past.

The identification of past and present in hunter-gatherer studies was broken when the ethnological record was compared with the archaeological data that proved a global hunter-gatherer distribution in the past. Following these arguments, Fried (1967) noted that living hunter-gatherers, the ones used to build Steward's model, differed from early hunter-gatherers in terms of the physical setting. Modern, or ethnographic, hunter-gatherers are confined to marginal settings, while in the past they occupied rich resource areas. By marginal Fried meant two main factors: an environment in which return calories are minimal in relation to expended work-energy, and areas located in regions beyond the margins of more developed cultures. For him these areas are undesirable to complex societies due to economic problems associated with their ecological conditions (1967:54).

In theory, there are two possible outcomes that can be inferred from this reasoning. First, ecological differences could explain social change, or lack of it – (environmental determinism?), or second, a special kind of adaptation could be developed by hunter-gatherers living in marginal areas, which can hardly be compared with the "pristine" hunter-gatherer adaptations recorded in resource rich environments. Nevertheless, hunter-gatherers in tropical forest ecosystems were considered unmodified representatives of early tropical forest adaptive strategy. Their way of life was somewhere between the incipient slash-and-burn agriculturists and the rudimentary Stone Age populations. They were living representatives of the ancient past. In words of Donald. Lathrap:

> The suggestion has also been made that some, perhaps most, of these peoples represent groups of primitive hunters only slightly modified by trait-unit diffusion from their more advanced agricultural neighbors, and

> thus show a large degree of cultural continuity from a pre-Neolithic period stage. (Lathrap 1968:25).

This view was challenged when Lathrap (1968) proposed that tropical forest hunter-gatherers were descendants of unsuccessful tropical forest cultures that could not maintain their sociopolitical level due to resource competition with other populations. Alternatively, some riverine groups' warlike activities denied other groups access to the rich flood-plain environment. Consequently, the slash-and-burn agriculturists were forced into environments unsuitable to their basic economic patterns; in these groups agriculture became unproductive and was gradually abandoned as the main source of food production. On the other hand, the relatively scarce game available in the interriverine uplands and the absence of significant aquatic resources led to nomadism and high dependence on wild food. Therefore, the scattered resources of the tropical forest could be used to explain population density, social structure and mobility. This hypothesis was supported by the analysis of ethnographic data, mainly Sirionó, as presented in Holmberg's (1969) classic ethnographic work.

In short, Amazonian hunter-gatherers were the result of a deculturation process and were not "unmodified" early hunter-gatherers. The idea of "degraded descendants" of peoples who at one time maintained an advanced form of tropical forest culture, in Lathrap's thought, explained why their study could not instruct us at all about the nature of pre-neolithic hunting cultures (see Lathrap 1968).

One case of such degradation process is exemplified by the Yupuí culture, the Bolivian Amazon's foragers. Stearman (1990) described the Yupuí as a society that lacks cultural elaboration. She explains their rudimentary aspects as a consequence of deculturation resulting from isolation and population decline (Stearman 1990:221). The Yupuí are unable to make fire, but they have in their language Tupí-Guaraní words for cultivated crops and for institutions such as an upper caste and hereditary slavery. The Yupuí case, as documented by Stearman, is a recent deculturation process - late 20th century. Many other similar cases are documented in the ethnohistorical literature. Early 20th century travelers of the Orinoco Llanos noted how some agriculturist communities disappeared due to the pressure of colonization that forced their incorporation into nomadic hunter-gatherer groups -- (mainly Guahibos and Chiricoa[4]).

> The remains of the tribes which have not been absorbed are being mixed into the large, strong and numerous Guahibo and Chiricoa tribe...Many tribes have ceased to exist because the name of the Guahibo has erased their own. (Vela 1935-1936 in Morey & Morey 1973:239)

[4] see Morey 1979

Many other deculturation cases had been mention in Amazonian ethnography (see for instance Goldman 1972).

The belief that tropical forest environments are inhospitable to hunters and gatherers has reinforced the inference that the earliest colonists of South America were adapted to grassland areas where, presumably, big-game could be found in abundance. (Willey 1971; Lynch 1978:473). Recent archaeological research (e.g., Bryan 1973; 1978; 1986; Dillehay et. al., 1992), however, indicates that economic adaptations of the early hunter-gatherers were varied and that they occupied varied environments, from coastal strips and lowlands to mountain forests. (see next chapter).

One logical extension of Lathrap's argument is that tropical forest hunter-gatherers are uninteresting in terms of their long history. This idea and other similar ideas (see Meggers 1954, Myers 1988), led anthropologists to focus on farming adaptations with strong emphasis on resource availability (i.e., Meggers 1954; Meggers & Evans 1983; Lathrap,1970), while hunter-gatherers' studies remain nonessential to their goals. The central theoretical issue in anthropology and archaeology is resource availability (e.g. Harris 1979; Gross 1975; 1982a; 1982b; 1983; Meggers 1954), which demands the examination of the hunter-prey relationship (see Baleé 1985; Hames & Vickers 1982; Redford 1993; Redford &

Robinson 1987; Vickers 1991; 1988; 1984)[5], agricultural techniques and their impact (see Baleé 1992; 1989a; Beckerman 1983; Conklin 1959; Uhl & Jordan 1984; Leeds 1961; Posey 1985) as well as indigenous adaptation strategies (e.g Cavelier et al 1990, Chagnon & Hames 1981, Herera et al 1992, Denevan 1996, Hames & Vickers 1983; Mora et. al., 1991, Moran 1989, 1991).

Lathrap's interpretation of tropical hunter-gatherers history, however, was criticized, as was his view on adaptation and productivity in the flood plains. These critiques pointed out that his position was the result of his own lack of hunter-gatherer ethnographic knowledge (Reid 1979:20 in Cabrera et al., 1999:37; Mahecha et. al., 1996-1997:97-98). Sadly, the critique never introduced supporting data showing an alternative interpretation. As a result these observations never led to a review of the issue and the picture of the "degraded farmer" prevailed in Amazonian anthropological and archaeological studies. One important consequence of this was that Fried's (1967) cautionary tale about the marginal physical setting occupied by modern hunter-gatherers became meaningless for some South American archaeologists.

[5] Some modern hunting studies attempted to evaluate human communities' impact on the composition of particular ecosystems from a conservationist perspective, therefore, they did not attempt to understand social development but to asset impact. See, for instance Redford (1993).

Hunter-gatherers: dependence or independence?

The existence of pre-agriculture hunter-gatherers was denied during the 1960's, and their independence from agriculturists with respect to subsistence was questioned during the 1980's. The ethnographic record suggested that a hunting-gathering way of life was impossible in the tropical forests without the existence of exchange relationships with neighboring agriculturalists. Consequently, some researchers (i.e. Headland 1987; Headland & Reid 1989, Bailey et al 1989, Bailey & Headland 1991; Bailey, Jenike & Rechtman 1991 Milton, 1984; Sponsel 1989) proposed that hunter-gatherers' adaptation to tropical forest ecosystems was impossible due to carbohydrate deficiencies.

Certainly, the ethnographic record of a hunting and gathering way of life shows that those groups filled their basic carbohydrate needs with agricultural products. Indeed, data recovered all over the world shows this very pattern. For instance, in the Philippine Islands Puti farmers and Agta hunter-gatherer relationships have been described as integrated by means of social relations, affinities and marine exchanges (Peterson 1978b). The function of this integration can be found in its economic consequences: it guarantees food supply to the groups involved[6]. In Peterson's words:

[6] See also Peterson 1978a, chapter 4, where she presents a deep analysis of the relationship between these two groups - Agta and Palanan.

> In terms of the Palanan system as I have describe it, the major concern is that one of the needs to be fulfilled by the system is food supply for its constituent members. Where food shortage by allowing for allocation of food surplus. Food changes hands daily at every level so that everyone may eat. (1978a:104)

This, and similar examples, led to the development of an interdependent economic model of tropical hunter-gatherers' that emphasizes their relationship with neighboring farmers or pastoral societies in every aspect of their culture. Cultural similarities between hunter-gatherers and neighboring agriculturalists were underlined (e.g Gregg 1988; 1989 Kent 1992). The conclusion was a model in which this interdependence was stressed and projected to the past.

> ...archaeological remains from scattered sites in northeastern Luzon reveal that rice agriculturalists were living in close proximity to areas presently inhabited by Agta hunter-gatherers by al least 3500 years ago (Peterson 1974; snow et al. 1986; Thiel 1980). To some researchers, this suggests the early development of economic symbiosis with adjacent food producers and/or a long-term strategy of situational shifting between agricultural and foraging economic modes ......Other researchers have adopted the more extreme position that tropical forest hunter-gatherers in Southeast Asia (as well as Central Africa and elsewhere) are incapable of sustaining a "pure" foraging adaptation independent of agriculture, and therefore these interactions were essential to actual colonization of this environments. (Junker 1996:392-393).

For instance, Junker (1996) explained increasing complexity in the Philippines as an important factor in hunter-gatherer adaptation to tropical rain forest. In her view, complex societies' need for status goods increased interaction with the hunter-gatherer societies that supplied raw materials. This process also contributed to hunter-gatherer expansion and specialization in the exploitation of specific environments as reflected in the archaeological settlement patterns and lithic assemblages in the Philippines. While hunter-gatherer societies provided rattan, beeswax, honey, tree resins, spices, and animal pelts, among others, they received in return different manufactured products, depending on their social arrangement and the value of the exchange items. Eighteenth century Jesuit missionaries in the Colombian and Venezuelan plains documented similar exchange systems which included products like vanilla, and magic portions produced with "exotic" raw material by nomads (Gumilla 1955; Rivero 1956). Peterson (1978b), based on her ethnohistorical and ethnographic research, thinks that the primary characteristic in this exchange relationship is the trade of non-domestic protein (hunter-gatherer produce) for domestic carbohydrates produced by farmers. The ethnographic record suggested for the Philippines that the more egalitarian societies may have only acquired foodstuffs in this exchange system (Junker 1996:402); however, the ethohistorical record in Colombia and Venezuela suggested that they were involved in an extended exchange system that included multiple items (Morey 1975).

These long-term interactions affected hunter-gatherer societies, as the data suggested. Some such societies became incorporated into the sedentary agriculturist societies as workers, slaves and family members. Thus, there arose a new category: the opposite of Lathrap's deculturated farmer, the "deculturated" hunter-gatherer - if that is possible. Amazonian historical and ethnographic records are full of descriptions that exemplify these processes[7]. Comparable processes may have occurred in the long history of hunter-gatherer societies in the tropical rain forest, transforming the supposed pristine character of this social organization.

In part the perspective that saw tropical hunter-gatherers as dependent on farmers, was a reaction to anthropologists' need to depict societies as isolated and timeless, while preserving the "pristine" idea as one of the most important pillars in their studies. Some researchers, however, regarded such a perspective as over generalized and suggested that it reduced the variability of the interactions apparent in the studies of different groups.

> We challenge the notion that contact automatically undermines foragers and that contemporary foragers are to be understood only as degraded cultural residuals created

[7] The main criterion to recognize these groups was their language. For instance Koch-Grunberg noted " "Los llamados Baníwa de Tunuhy y de algunos otros lugares río arriba, dominan actualmente la lingoa geral y además, un dialecto aruak, que tiene muchas palabras iguales a las del karútana del bajo Icána. Se dice que antiguamente hablaban un dialecto diferente y muy desagradable, semejante al makú, cuando todavía eran nómadas, antes de adoptar la civilización, cultura y lengua baníwa (grupos aruak) cuando éstos los invadieron desde el noreste (1995:Vol 1:80). See also Koch-Grunberg 1995, Vol. I: 250-251; Vol. II: 69; 91

> through their marginality to more powerful systems. We consider the possibility that foragers can be autonomous without being isolated and engaged without being incorporated. (Solway & Lee 1990:188).

Amazonian hunter-gatherers did not escape this interpretation. Indeed, Makú semi-nomadic adaptation to interfluvial tropical rainforest was conceived as a result of manioc (*Manihot esculenta* Crants) exchange with neighboring fisher-gardeners living in settlements in the major tributaries (Silverwood-Cope 1972). The Tukanoans provide nearly 80% of the manioc annually consumed by those upland rainforest dwellers (Milton 1984).

The dynamic social interactions, as shown in the ethnographic record, suggested that the incorporation of hunter-gatherer societies into agricultural sedentary societies had been common in the past. Amazonia's ethnographic record is rich with such cases. But, it shows also the opposite: the incorporation of agriculturalists into band societies. The documentation goes back less than one hundred years, yet it suggests a complex history where interchanges of people both ways between hunter-gatherer and farmers were customary. Specific cases have been explained as a consequence of external pressures - e.g., Achagua and Saliva incorporation into Guahibo society due to Carib pressure and European contact (see Morey 1975) -. However, those pressures may have existed in variable intensities and regions in the past; European disruption of the

Amazonian world is, without any doubt, important but probably is not the first or the last one.

Until now, the study of the hunter-gatherer/farmer relationships in Amazonia has been considered mainly in economic - functional terms. The results of the evaluations that used such perspective are unclear. As Morey & Morey (1973) pointed out, the economic need, is not sufficient to explain the nature of hunter-gatherer/farmers relationship in the Llanos (see Morey & Morey 1973). In the Guahibo case, changes in agriculturalists' attitudes toward hunter-gatherers affected their relationship; however, the nature of the relationship before the changes had not been explained. Despite the fact that these two categories - hunter-gatherers and farmers -had been important tools in the construction of an evolutionary perspective, their limits are unclear and their coevolution has been documented just for the last hundred years. A perspective that considered a long term interaction among hunter-gatherers and farmers may contribute to our understanding of why some tropical hunter-gatherers, like the Nukak, include in their oral traditions cultivated plants, which supposedly they did not acquire until much later. Their oral history mentioned that when the first Nukak emerged from a hole, they were carrying cultivars (Politis 1996b; Cabrera et. al., 1999). This can be explained as the history of degraded farmers, but alternatively it could represent a long history of interactions with farmers. Hunter-gatherers' incorporation, on the other hand, is the result of a long series of processes with setbacks that need to be understood within specific historical conditions (see for instance Wadley 1996) and multiple dimensions, (see for instance Jolly 1996) not as a simple rule: assimilation.

On the other hand, the hypothesis concerning the subsistence problem is hard to prove or disprove using the ethnographic record, due to the increasing contact between these two ideologies, economic and social arrangements at the present, and the lack of documentation over their history. The hypothesis test requires the definition of pure categories that can be applied to reality. This is a difficult task in a world where the marginal areas, as defined by Fried (1967), are becoming just a theoretical category. Indeed, it is hard to find in a world where important resources such as wood and petroleum are located in the last "traditional territories", the pure hunter-gatherer wandering in the forest or the plain agriculturist just ready to domesticate new species. In Geertz's words:

> ...now that our ideas about "primitives" has grown less primitive and our sureties about "civilization" less sure: the very notion of...isolation lacks, these days, much application. There are very few places (now that gold panners have discovered the Amazon and New Guinea has discovered the political party, there may not be any) where the noises of the all-over present are not heard... (1996:65)

Consequently, the ethnographic present is not appropriate to test these hypotheses. Politis and Rodríguez (1994) attempted to evaluate hunter-gatherers' independence from or dependence on farmers based on studies of modern Amazonian nomads[8]. The only possible conclusion to be reached is the one they arrived at: which is that there is a need for more studies[9]. As Politis -and others (see Politis 1992; 1996a; 1996b; Politis & Martinez 1992; Politis, Gustavo & Rodríguez 1994; also Cabrera et. al., 1999; Cavelier et. al., 1999; Morcote, 1998) had convincingly suggested hunter-gatherers in tropical rain forest are important contributors to landscape change with the creation of rich resource areas. Therefore, after thousands of years of landscape transformations the conditions in which these modern nomads live must be quite different from those of the people who lived in other times. If Politis is right, the forest must have been different in the past. This perspective in which past human actions are considered important to understand present human populations has been supported even by one of the proponents of the dependence/independence hypothesis. In Headland's (1997) words:

> In ecological anthropology in particular, doctrines long accepted have in the past half-decade increasingly been attacked as myths:

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[8]"They said" En este trabajo se discutirá esta hipótesis - hunter-gathers dependece or independence from farmers - con base en la información que proveen los Nukak y se caracterizará sus subsistencia y economía para examinar la significación de los productos cultivados. (1994:171).

[9] Politis and Rodríguez (1994) concluded "Como ya se ha dicho, algunos modelos de poblamiento humano de las áreas tropicales han planteado que los cazadores-recolectores no podrían vivir en las zonas intefluviales sin algún aporte de plantas domesticadas (Headland 1987, Bailey et. al., 1989). Para discutir esta hipótesis en profundidad, la información recogida hasta ahora entre los Nukak debe ser ampliada con más trabajo de campo, y se deben realizar análisis fitoquímicos adecuados, así como una estimación sobre el significado dietético del chontaduro. No obstante, la variedad, disponibilidad y cantidad de recursos, vegetales y animales no domesticados que explotan los Nukak no apoyan el modelo de deficiencia de algunos componentes nutritivos en la floresta tropical Amazónica. (1994:203). It is contradictory to approve or disprove the hypotheses of dependence/independence with more analisys of a domesticated plant as the Chontaduro - *Bactris gasipaes* -.

> ecologically noble savages, pristine forest, isolated !kung Bushmen, Kayapó-made forest islands, the idealization of primitivity, neofunctionalism, the belief in wild food abundance, and so on. A refreshing new approach in ecological anthropology called historical ecology is being advocated as a better tool for understanding indigenous cultures in the ethnographic present. Historical ecologists emphasize not only that environments have a history but that the dichotomy between "natural" and human-influenced landscapes is a false one. They argue that all ecosystems have been greatly modified by humans for thousands of years. (1997:605).

Assuming the static nature of the human-landscape relationship is dangerous. Ethnographers can witness social, political and economic change over their lives (Geertz 1996), but it is another thing to assume that the conditions that they describe are equivalent to those of the remote past, as has happened with the debate over the dependence or independence of tropical hunter-gatherers'. There is nothing wrong with the use of ethnography as a way to understand past activities. Archaeologists can infer from the ethnographic data processes, in the form of analogies to shed light on the past, but to trust ethnographers' abilities to produce history or prehistory is another thing. Archaeologists that follow that path are condemned to reinvent the present over and over.

Today some anthropologists acknowledge the value of history. In general they agree with the archaeological perspective based on diachronic analysis.

Landscape is part of this human history as archaeologists know. Most anthropologists will, then, concur with Headland when he said

> Historical ecology requires that when we look at a human-occupied ecological system we not only study how the human-induced components (e.g., economics, religion, politics, new roads, or hospitals) influence information and energy flow but also consider it diachronically. That is, we must examine its history if we are to understand its structure and functions (Winterhalder 1994:23) and the culture of the people in it. The term "history" here means more than just a study of a people's past; it should also include an analysis of the dialectic between environmental change and cultural change. (1997:608-609).

Even though we agree, a point of disagreement can be found in the meaning of history for anthropologists and archaeologists. We talk about the same things, but we mean different things.

Ethnographic data works in ecological settings where ecosystem variability is defined in terms of years with different episodes such as heavy rainy seasons, flowing, drought or annual resource cycles. Undoubtedly, all these factors affect human societies and contribute to the organization of social and political activities, to some extent. In the same vein, human impacts on the landscape, as registered by ethnographers, can explain many cultural activities as well as social and political decisions, in particular moments of time, while opening a door to our understanding of beliefs. Unquestionably, within a temporal frame of one hundred or two hundred years this perspective gives a coherent frame for the present in relation to the past. But the time vector in archaeology is much greater. Remote human activities in the past have important consequences in the ecosystems that we study today. Places that at the present are deserts in the recent archaeological time were tropical forests, or the opposite. Consequently, the space that archaeologists have to consider in their hunter-gatherers' tropical rain forest studies varies in accordance with a changing biogeographic history which in part is human produced. It is true that today and for the last hundred years hunter-gatherers have depended on farmers for their subsistence, but also is it true that forests are located in different places and they have been transformed by natural and cultural histories. Time, in archaeological terms, ecological change, forest evolution and human activities, as part of the landscape history, are some of the variables that make it even more difficult to acknowledge and accept the correspondence between the ancient past and the present. Certainly, the past is different from the present. No pristine hunter-gatherers are left, no untouched environment exists. The debate over the independence/dependence of farmers is a sterile topic, if one tries to prove or disprove it with ethnographic data. However, the study of the interactions among hunter-gatherers, from an ethnographic perspective, can shed light on culture change and will enhance our understanding of different types of contacts. It will help us to predict the archaeological visibility or invisibility of cultural contacts and ecological management, and will give relevance to social aspects (see, for instance Head & Fullagar 1997).

On the other hand, these ethnographic based models have been criticized from an ecological point of view (Colinvaux et. al., 1991; see also Gragson 1992). The main argument in such critiques is that the hypothesis does not take into consideration tropical forest diversity or humans capability of using multiple resources. Additionally, archaeological evidence suggests that in the past some hunter-gatherers' groups lived in tropical rain forest environments before the introduction of agriculture or the native development of it (e.g. Cavelier et al., 1995; Gnecco & Mora 1997; Pavlides & Gosden 1994; Urrego et. al., 1995).

In order to understand hunter-gatherers' adaptation to tropical forest it is necessary to re-evaluate the assumptions on which our models are built. The classic hunter-gatherers, as described by Lee and Devore (1968) were, in many cases, projected into the past. The result was a powerful tool with which to approach such societies systematically for the first time. The concept that emerged, however, in the long run, denied variability. Hunter-gatherers in tropical forest ecosystems were neglected due to paradigm bias. The ethnographic record proved a strong dependency between those societies and farmers. However, it is another matter to accept that this fact is universal through time. Nowadays, the question is not if hunter-gatherers existed in tropical rain forest environments before agriculture. The question is how they adapted to and changed this ecosystem.

CHAPTER 4

EARLY HUNTER-GATHERERS OF THE TROPICAL RAIN FOREST

Where is the tropical rain forest?

The northern South American region is far from being a homogeneous geographical area in the present; neither was it homogeneous in the past. The Andes in Peru and Ecuador form a continuous, although diverse mountain chain characterized by plateaus, deep canyons and traverse valleys. This massive mountain range is flanked in Ecuador, on both sides, by lowlands covered with tropical rain forests. In Colombia the Andes split in three branches - east, central and west cordilleras - each one having a different geological origin. The result is the formation of inter Andean valleys much wider than the narrow valleys from the Peruvian and Ecuadorian Andes. These two gigantic valleys are cut by the Magdalena and Cauca rivers, running to the north, that contribute to create a variety of ecological zones.

West of the Colombian Andes lies a tropical rain forest limited in the southern part of the country by a low coast, cut by meandering rivers, where widespread mangrove vegetation defines its border with the ocean. The north Pacific coast has a slightly higher topography covered with uninterrupted tropical forest vegetation and is characterized by a complex environment in one of the world's most rainy areas[1]. This narrow - ca 1,000 kilometers long and 100 kilometers wide - Pacific strip of tropical forest contrasts markedly with the immense forest that extends from the eastern rim of the eastern cordillera to the shores of the Atlantic ocean. This Amazonian forest, far from being an homogenous landscape, represents a gamut of variability as a consequence of local rainfall patterns, geological variation and climatic history as well as its distance from the Andes. A tropical rain forest, by definition, must have at least 1,500-1,800 mm of annual precipitation without a dry season (Hooghiemstra & Van der Hammen 1998; Forsyth & Miyata 1984; Richards 1975) - however, in the huge Amazonian territory precipitation conditions vary from 1,500 mm to ca 5,000 mm annually, contributing to the formation of different ecological areas. To the North of the Amazonian region, large plains, covered with grasses and forests along the rivers - gallery forest -, characterize the landscape. This savanna formation, mainly defined by a climatic pattern in which a heavy and long rainy season is followed by some months without any precipitation, contrasts markedly with the Amazonian rainforest (Sarmiento 1983; Sarmiento & Monasterio 1975). In the past this savanna environment expanded and contracted in relation to the Amazonian tropical forest, depending on global climatic shifts and other factors such as human exploitation. Today the transitional area between these two vegetation zones is considered to be where annual precipitation is over 2,400-2,500 mm per year (Behling & Hooghemstra 1999a:464). With the exception of the Sierra Nevada de Santa Marta, a cone-like mountain 5,775 meters ASL high, the landscape north of the Colombian Andes is made up of the rolling Caribbean savannas and the arid strip of the Atlantic coast of Venezuela. Due to the fact that this geography is located in Equatorial latitudes, altitudinal gradients produce dramatic climatic changes and contribute to variations in solar exposure, rainfall, and soil formation. The result is a mosaic of markedly different landscapes. Amazonia is just one of the complex South American areas in which humans adapted to and changed the environmental to different degrees in different epochs.

If one wants to understand climatic variation in Amazonia as well as changes in the basin's hydraulic systems, an understanding of the relationship with the Andean mountains is essential. Precipitation high in the mountains increases the volume of water in the rivers far below and contributes significantly to seasonal flooding, erosion and sedimentation. Wind, cold fronts from the South pole, and hot air masses from the Equator, create local and regional variations, in the past and in the present, and all of these affect vegetation's composition, faunal distributions and soil formation.

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[1] The Chocó is known for its extremely high precipitation it can reach->7,500 mm/year near the foothills of the Andes. However, in the north and south it is ca. 4,000 mm/year. see Behling & Hooghiemtra 1998.

Two competing hypotheses have been proposed to explain tropical rain forest natural history and high biodiversity in the Amazon Basin. In the first hypothesis, stability is the key to understanding how evolution worked to produce this biogeographic region. In this hypothesis the tropical rain forest is regarded as an unchanged environment, acknowledging local variation, but within the parameters of high dense vegetation and a prolonged rainy season without major dry periods. The second hypothesis is based on Haffer's (1969; 1982) ideas. This hypothesis, initially developed to understand bird speciation, became a theory used to infer tropical forest dynamics through time. Basically the refugium theory, as it is called, argues that tropical rain forest distributions have varied over time, expanding and contracting in different patterns according to climatic shifts. Areas outside the rainforest refugia experienced a reduction in precipitation, during dry cycles leading to the replacement of rain forest by savanna vegetation. According to this hypothesis, relicts of past climatic events are still evident. Indeed, some regions nowadays have the precipitation and temperature needed to develop a tropical rain forest, yet they are savanna environments and are interpreted as relicts from ancient dry climatic periods. The savanna tracts of southern Venezuela located in areas where rainfall exceeds 2,500 mm a year, constitute one such example. Their preservation is explained as a local process.

> As Hueck (1957) has suggested in Brazil, such "islands" may represent relics of more extensive savanna which existed during a previous climatic phase. The latter was presumably relatively dry, and the savanna

> island would have become isolated during a subsequent period of general forest advance, associated with the transition of wetter conditions. It is assumed that the savanna islands persisted as a result of fire which, although unable to prevent general reforestation, occurred frequently enough in a few places to maintain outliers of savanna. (Eden 1974:105).

The South American palynological record suggests that important climatic changes have occurred in the region. Indeed, judging from the palynological record of the beginning of the Holocene, the northern South American landscape was different from today's. For instance, in the Ecuatorian Andes pollen analysis shows that the vegetation was affected by glacial cooling at all elevations (Colinvaux; Bush; Steinitz-Kannan & Miller 1997). Immense lakes, like Lake Valencia in Venezuela did not exist (Salgado 1980). Similarly data collected in southern and central Brazil suggest that dry climatic conditions and savanna vegetation (Ledru et. al., 1998) existed in areas now covered with tropical rain forest. These variations, registered mainly by samples from geological and palynological surveys, suggest a highly dynamic landscape. Other data, however, such as sediments from the western tropical Atlantic Ocean, suggest that some climatic changes like tropical aridity were part of the chain of events leading up to the Ice Ages, rather than a response to glacier oscillations (Harris & Mix 1999).

The refugium theory, either way, potentially explained how these and other environmental changes affected vegetation and faunal distribution. In Hooghiemtra and Van der Hammen's words:

> We assume that, depending on the geographical area, the vegetation in the Amazon basin during the Late Quaternary was either permanently rain forest, possibly partly with a different forest composition compared to the present-day situation, or experienced periods with semi-deciduous tropical forest, or even was replaced by different types of savanna-like vegetation, all depending on changes in annual precipitation, seasonality in precipitation, temperature changes, and geographical setting. (1998:157).

Authors like Colinvaux (1996) have argued that this hypothesis cannot be supported with the available data. Others like Gentry (1992) and Van der Hammen (1974) believe that the new data recovered show tendencies that can be interpreted in favor of the refugium theory. Either way, the data needed to test these theories is unavailable, but it is slowly emerging as a result of the development of extensive palynological research in the area

In archaeological terms the debate over stability and the refugium's theory is relevant because the changing environmental conditions of the past have to be understood in order to explain South America's early human occupation. Certainly, South American archaeological models based on ecological variables are affected by the logical consequences of these climatic models. If tropical rainforests predominated during the late Pleistocene and early Holocene in Amazonia and/or along the Pacific coast, and hunter-gatherers were unable to survive in such environments without agriculture, an alternative explanation to the early migrations - colonization - of South America has to be found. On the other hand, if hunter-gatherers can survive in tropical rain forest we have to understand the flexibility of such adaptations and their impact on forest environments. In short, the co-evolution among these two systems.

There is no archaeological data concerning the early occupation of the far Northern Pacific coast of South America. The archeological exploration of the region has been mainly concerned with the chiefdom-like organizations of the first millenium A.D. The oldest record of human activities came from the analysis of a palynological column.

> There is some evidence of human influence on the rain forest since 3460 14C yr B.P. Agriculture (maize cultivation) in the surroundings of the lake appeared ca. 1710 14C yr B.P. (Behling, Hooghimstra & Negret 1998:306).

However, this human induced landscape disturbance needs to be examined with more archaeological data; at this point the evidence is no more than an indicator of possible human activities. On the other hand, the same palynological data show that little change, if any, has occurred in the tropical rain forest of that region since the beginning of the Holocene (see Behling, Hooghiemstra & Negret

1998 for a paleoenvironmental reconstruction of the south Pacific Coast of Colombia). These data, however, only cover ca. 8,500 years B.P. Nevertheless, based on other analyses, Gentry (1982) and Prance (1982) proposed that the region was a tropical forest refugium area during the last glacial age. If there was a tropical forest in the northern Pacific South American coast, from where did the early South Americans appear and how did they handle living in such a forest?

The reconstruction of Amazonian forest history, from a natural history perspective, shows much more climate induced variation than does the Pacific Coast. Air masses coming from the Pacific ocean that collided with the Andes explained the high rainfall of that region. In Amazonia a more open space may contribute to much more climatic diversity in the past. Cold fronts from the Antarctic as well as changes in the intertropical convergence area may affect rain fall pattern distribution. Based on the available data, the supporters of the refugium theory have constructed different scenarios in which the precipitation isoline is the main factor delimiting forest distribution. Figure 4.1 shows the hypothetical distribution of tropical rain forest in Amazonia. Scenario 3 represents forest distribution during the last glacial period. This scenario is based on the available palynological data collected at Mera, Araracuara and Pata. Other evidence such as the palynological analysis of eastern Ecuador support this model of forest distribution showing seasonally wet and dry conditions (see Athens 1999). In the same vein, the analysis of phytoliths and macroscopic charcoal from a site near Manaus, in the Brazilian Amazon, suggests that forest has existed in the area since at least 4,600 yr B.P. However, the composition of this forest changed during the Holocene (Pipemo & Becker 1996).

The refugium theory, as a model, may not presented reality. In figure 4.1 the tropical rain forest areas depicted could be bigger or smaller than they really were. In addition, forest characteristics such as number of species and density could have been significantly different for modern tropical rain forest. Despite that, it is important to note that in each case, meaning for a long time, the area that corresponds with the Colombian Amazon has been continually covered with tropical rain forest.

Northern South America early inhabitants. Archaeological data

Panama's early human occupation is not well documented from an archaeological perspective. The earliest human evidence came from the sediments from lake La Yeguada - in the Pacific basin - that showed a sudden increase in charcoal and shrub species, as indicated in pollen and phytolith analysis. These facts have been interpreted as human landscape modifications that date between 11,050 and 14,000 years B.P. (Piperno et. al.,1991a; 1991b). There is no other evidence of such an early occupation. Although the archaeological record of early human occupation in Panama is not rich with evidence, the stone tool analysis from different locations - e.g. Caraballí, Lago Alajuela-Oeste, Corona, Los Santanas, Cueva de los Vampiros - shows that the

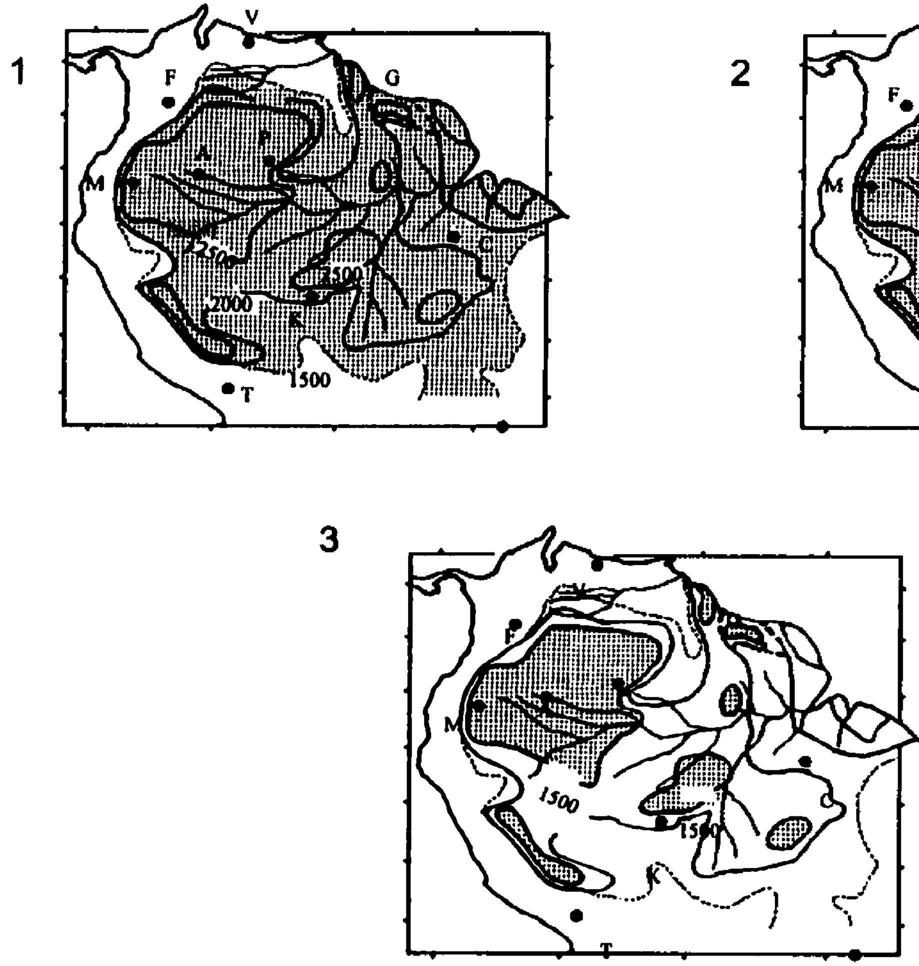

Figure 4.1 Amazonia: Tropical Rainforest Distribution

1 Present forest distribution

2 Present -25%

3 Present -40%

SITES

F - Fuquene; V- Valencia; G- Georgetown

M - Mera; A- Araracuara; P- Pata; C- Crajas

K - Katira; T- Toticaca

After Hooghiemstra & Van der Hammen 1998 inhabitants were using scrapers, bifacial chipped tools and bifacial points (Cook & Ranere 1995). Bifacial chipped tools have been interpreted as an "endogenous response to changing subsistence patterns" (Cook & Ranare 1992:122) suggesting a broad adaptational spectrum. The adaptation of these groups has been described as fluid movement between two different ecological zones: premontane oak forests and lowland woody scrub (ibid:119).

The archaeological data recovered in South America concerning evolving landscapes indicates that human beings were exploiting open areas as early as the late Pleistocene. In the arid coast of Venezuela several sites have been investigated. At the site of Taima Taima El Jobo points were found in apparent association with a mastodon carcass, and radiocarbon dates indicate an age of ca. 13,000 B.P. (Cruxent and Rouse 1956; Rouse and Cruxent 1963; Bryan 1973; Bryan et. al., 1978; Ochsenius and Gruhn 1979). At the time of the occupation these hunter-gatherers lived in an arid or semi - arid landscape.

Stothert (1985) has found evidence of several early hunter-gatherer occupations on the Santa Elena peninsula in Ecuador in formerly rich maritime inland ecotones. The archaeological data recovered suggested that the inhabitants' economy, at this particular location, was based on broad-spectrum hunting and gathering that included fishing as well as the hunting of terrestrial game. Associated radioocarbon dates range between 11,000 to 6,600 B.P.

South American high mountain forests, however, have yielded the more abundant evidence of early human occupations. The Sabana de Bogotá archaeological sequence is by far the most complete and best documented regional sequence of the northern Andes. Ranging from about 12,000 B.P. to the appearance of agriculturalists some 3,000 years ago, (e.g., Correal & Van der Hammen 1977; Correal 1981, 1986; Groot 1992; 1995; Hurt et al. 1977) it suggests that there were various strategies employed to cope with the environment. Two lithic traditions - Tequendamiensis and Abriensis - have been identified in the Sabana de Bogotá (Correal & Van der Hammen 1977; Correal, Van der Hammen &. Lerman 1970; Correal, Van Der Hammen & Hurt 1977). The technological characteristics identified in these traditions as well as the fact that they overlap in time has aroused questions in relation to the adaptation patterns and the origin of the communities producing these artifacts. Two hypotheses have been proposed to explain these remains. First the technological differences in the tool assemblages are considered the result of separate groups that moved seasonally from the Magdalena valley - 200 m.a.s.l - to the Sabana de Bogotá - 2700 m.a.s.l. The technological differences have suggested separate origins – and analysis of raw material sources corroborated the possibility of migrations. The second hypothesis has viewed these contrasting technologies as reflections of specific adaptations to regional conditions by the same social group of "people" (Pinto 1999). Either way, paleoenvironmental reconstruction points towards a dominance of forest formations in mountain areas throughout the last

13,000 years and it is to this environment that these people were adapted (Van der Hammen & Correal 1978).

Some well defined regional archaeological sequences suggest that only human occupations of diverse tropical forest habitats occurred with some frequency. For instance, there is evidence of a persistent stone tool technology in the upper and middle Calima valley, in a forest formation, dated ca. 10,000 years ago (Cardale 1992; Salgado 1990; 1995). Data from the Popayán Valley, southwest Colombia, also suggest that during an early hunter-gatherer occupation the landscape was covered with forest vegetation (Gnecco 1994;1995; Gnecco & Mora 1997). This evidence indicate that the tropical lowlands may have been occupied since the late Pleistocene (see also Dillehay et.al., 1992; Athens 1999).

In the Orinoco river basin Barse (1990; 1995) has recovered unifacial stone tools dating to the early Holocene. Probably this occupation took place in a forest/savanna environment. López (1992; 1995) has found in the semi-arid Magdalena river valley evidence of a late Pleistocene-early Holocene occupation, including Paiján-like projectile points. To some authors (see for instance Kipnis 1998) southern Brazil archaeological sequences suggest that humans had to cope with a changing landscape - rainfall fluctuations, vegetation zones changes, and fauna distribution variance - that made resources unpredictable during the late Pleistocene and early Holocene. They believe that the result was a multiplication of subsistence strategies that created regional adaptations to local paleoenvironmental conditions. Despite the fact that archaeological hunter-gatherer research in Amazonia has received little attention from archaeologists, there are data that suggest early Holocene occupation (Correal et. al., 1990; Gnecco & Mora 1997; Haynes et. al., 1997; Imazio, Feathers, & Henderson 1997). These data suggest, too, that foraging and the exploitation of palms were important subsistence activities (see for instance, Gnecco & Mora 1997; Morcote et. al., 1998; Morcote 1994; Roosevelt et. al., 1996). However, variability in this adaptation is still poorly understood.

It was thought that the earliest hunter-gatherers populating the continent were specialized big-game hunters and, therefore, that they lived in or near open environments (Willey 1971). This is an untenable interpretation based on the data available today. It is hard to explain the early history of South American occupation based on a model of early hunter-gatherers using a specialized technology and avoiding tropical rainforest to invade the mountains. Certainly, a recent model for early South American human colonization, in opposition to this idea of open savanna hunter-gatherers, shows hypothetical pathways that cross Amazonia's rain forest. This model has been built using archaeological and topographic data[2].

> Interestingly, and likewise perhaps counter to expectations, the analysis suggests that initial

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[2] The topographic maps used are available in http://edcwww.cr.usgs.gov/landdaac/gtopo30/papers/olsen.html.

> colonization of the Amazon basin may have proceeded from the headwaters to the mouth, rather than the other way around. In passing, the irregular zig - zag pattern of a portion of the secondary route across the central Amazon to Monte Alegre and puedra (sic) Furada is due to problems with the elevation data in this area... (Anderson & Gillam 2000:52).

Hunter-gatherer adaptation during the early colonization of South America cannot be reduced to a single subsistence strategy or exploitation of a narrow range of resources, e.,g. big game hunting in open grasslands. The archaeological data suggest a broad variability. Archaeologists have to prove how human hunter-gatherers adapted to the tropical rain forest, prior to agriculture, based on the assumption of high variability of hunter- gatherer adaptation. Headland & Bailey have proposed an hypothesis based on a model which does not consider this aspect. The scarce archaeological data associated with tropical rain forest groups is not a proof by itself of their non-existence. We cannot assume this hypothesis to be true until it is tested (see Headland & Bailey 1991).

The palynological information suggests that some South American regions have retained good tropical rain forest despite important climatic changes that occurred during the Pleistocene and Holocene. On the other hand, archaeological research in such environments is scarce and sampling problems, due to preservation, are common. Poor bone preservation has hindered faunal analysis as a source for the identification of dietary habits. Pollen and carbonized vegetal remains do not survive well due to animal activity and weather conditions. Contextual information and lithic materials are scarce, and isolated occurrences of plant macroremains have only been identified taxonomically without integration into a large environmental picture. In short, empirical data contributing to this discussion are still missing and solid interpretations cannot be supported without large samples of data collected systematically. Despite the preservation issue and the methodological difficulties a strong body of data that suggests multiple adaptive strategies for tropical forests is emerging. These data, combined with paleoenvironmental reconstruction, do not support the hypothesis of hunter-gatherer dependence on agriculture in tropical rain forest.

Bailey and Headland (1991) accepted that there could be exceptions to their statement that: "humans have never subsisted in tropical rain forest independently of cultivated foods" (p 281) because data show that "humans have subsisted in tropical rain forest independently of cultivated foods only in Malaysia" (p 281). However, other exceptions are becoming known. It may be that only some late Holocene hunter-gathers have been dependent on cultivated foods for the adaptation to the tropical rain forest.

This encourages the search for a more suitable explanation for early hunter-gatherers living in a tropical rain forest environment. Despite the fact that archaeological investigations of hunter-gatherer adaptations to tropical rainforest ecosystems were neglected until quite recently due to paradigm biases, those approaches have been discussed previously. Now the time has come to disprove the comment biased using empirical data form a archaeological site located in a tropical rain forest. Peña Roja, an archaeological site dated in the early Holocene, provide such data.

CHAPTER 5

PEÑA ROJA: THE GEOGRAPHICAL CONTEXT

> Il faut abandonner ma demiére embarcation et chercher un chemin par terre. Nous atteignons un gran plateau formé par un gres analogue á celui qu'on rencontre dans les vosges. C'est au milieu de cette montagne que le Yapura a été obligé de s'ouvrir un passage; ses berger blanches, formées de roches fendues en long et en travers, ressemblent á des muraille élevées par des géants. (Creveaux. Voyages dans L'amérique du sud 1883:367).

The Landscape

The most visible feature in the Middle Caquetá river region in south Colombia is the sandstone formation from the Paleozoic age that rises 300-350 m above sea level. This formation is cut by the Caquetá River at Araracauara, generating a sequence of rapids that extend for some kilometers. Navigation is impossible in this part of the Caquetá River. The Araracuara Plateau has extensive flat areas and dome-like structures where the rock is exposed and where vegetation cover is absent. This terrain is interupted by deep fissures and areas where a special forest type grows within white sand: small palms and bushes give the impression of a savanna landscape[1]. In short, edaphic conditions determine vegetation cover in Araracuara plateau.

Today, the plateau exhibits ancient and modern evidence of human activities: an air-strip runs across the middle of it; some concave surfaces with marks produced by ancient grinding activities and stone tool sharpening are found in dome flanks and rocky surfaces. On the river shores' rocky surfaces carved figures and signs from another time emerge during low river levels. Black soils associated with archaeological materials attest to the earlier presence of human settlements, and palynological evidence has revealed ancient agricultural activities (see Andrade 1986; Cavelier et. al., 1990; Herrera et. al.,1992; Herrera et. al.,1980-1981; Mora et. al., 1991 for a complete disscusion).

Otherwise, the landscape in the Middle Caquetá River consists chiefly of deeply dissected tertiary sedimentary plains that can be divided into periodically flooded plains, low terraces, and high terraces. Despite human activities in the region, a mature tropical rain forest covers the landscape; low modern population densities explain the absence of remarkable interventions.

Low terraces that originated during the middle Wisconsin glacial age – around 65,000 to 26,000 years BP, comprise 41,596 ha. in the Middle Caquetá region,

[1] For a description of Araracuara plateau vegetation see Duivenvoorden & Cleef 1994.

representing 6.2% of the landscape (Van der Hammen et al., 1991a). Usually these low terraces have extensive poorly drained areas with concentrations of *Mauritia flexuosa*, and *Oenocarpus bataua*; they may also have three clearly demarcated sectors distinguished by differences in drainage: flat well-drained surfaces; low swampy areas; and combined low well–drained, flat swampy areas. Sediment studies show well-rounded gravels and sand at the base, and clay on top, in low terraces. Areas where floods are infrequent can have moderately rich soils, with medium texture and a neutral pH. These soils have been classified as *Tropofluvents* or *Fluvisols*. Other sectors that are periodically flooded have moderate poor soils or poor soils usually with clayey textures, medium to high acidity, and low amounts of exchangeable cations and phosphorus – soils classified as *Tropofluvents*, *Dystropepts* or *Fluviosols* and *Cambisols* - (Duivenvoorden & Lips 1993).

The climate in this area is classified as Afi, according to the Holdridge system (Holdrige et. al., 1971) and the natural vegetation pertains to the life zone known as the humid tropical forest. The yearly rainfall in the region reaches about 3,000 mm, with a concentration of rainfall during the months of June, July and August, and reduced levels during November, December and January. Rarely do more than three days go by without rainfall, even during the dry season (Dominguez 1985; Proradam 1979).

The Andean climatic regimen affects Caquetá's river level, which fluctuates 7 to 9 meters during the year, having its lowest level in December (Urrego 1997:68). Average temperatures are of 25.7° C, however, daily temperatures daily variation is great for a warm tropical region and the influence of cold fronts from Antarctic can drop temperatures to 15° C or lower. Evapotranspiration in the Araracuara locality has been calculated at 1,437 mm. (Duivenvoorden & Lips 1993).

The Peña Roja archaeological site, 50 kilometers down stream from Araracuara, comprises 21 squared meters located on a low terrace of the Caquetá River (figure 5.2 and 5.3), a broad flat surface 10 to 15 meters above the river. Human activities, such as household activities, intensive agriculture and forest management, that took place in Peña Roja between 1,400 and 400 BP transformed soil characteristics, increasing phosphorus (P) values and the amount of exchangeable cations, and darkened the affected horizons (see table 5.1 and figure 5.1 for chronological information). The result was an anthropic soil, which differs broadly from other low terrace soils. This rich soil horizon is associated with the Camani and Nofurei ceramic complexes, characteristic of the Méidote period of the Middle Caquetá. The people who produced these materials occupied the plateaus and more stable riverbanks of the river and controlled the most important waterways of the area for at least a thousand years (Mora et. al.,

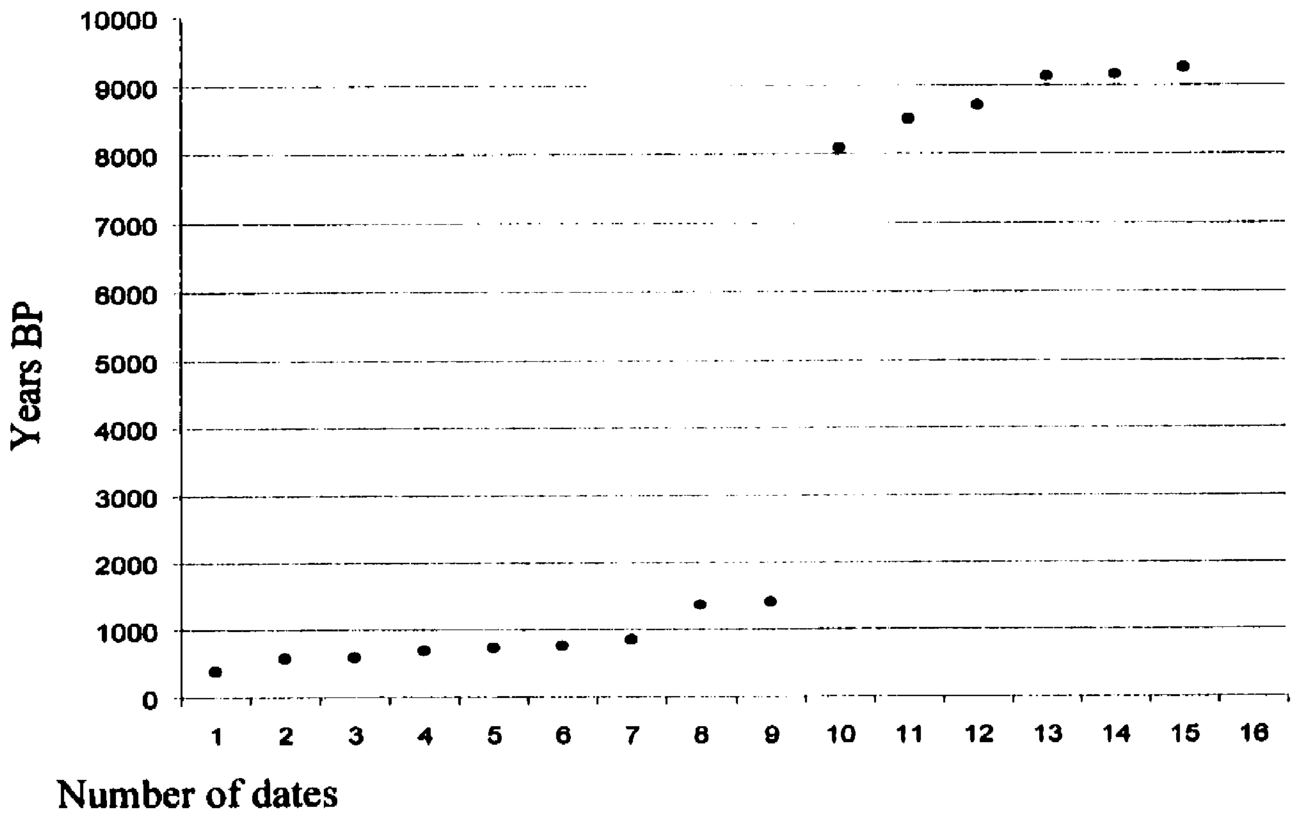


Figure 5.1 Peña Roja Site $_{14}C$ dates BP.

1991 for more information). Below this transformed soil a pre-ceramic occupation was discovered and documented (see figure 5.1 for chronological information).

Small meandering creeks dissected the flat surfaces in the north and south areas of Peña Roja's low terrace and created gullies 2 to 6 meters deep. During the ceramic occupation that transformed the soils, these streams acted as a natural limit to the expansion of the anthropic soil (see figure 5.2). The gullies created by the creeks in the south part of the site are swamps where "Canangucha" palms – *Mauritia flexuosa* - are abundant.

Today the Nonuya community, a small group of survivors of the bloodshed that the rubber boom brought to native Amazonians during the early 20th century, inhabit the archaeological site. Three *campesino* type houses and one communal long house – a maloka – are the dwellings built by this community. Social activities take place in the maloka as well as some cooking for daily and special occasions. At night most of the residents move to their *campesino* type houses. Special guests and family members from other locations dwell in the maloka. Only four nuclear families inhabit the terrace. Visitors from both distant and close communities are common. The Nonuya differ from other middle Caquetá communities such as the Huitoto and the Andoke. The Nonuya roclaim that they have some special knowledge that other groups lack - as well as a different language. However, they were assimilated during the 20th century into Huitoto society, and it is only during the last quarter of the Twentieth century that they moved to Peña Roja and began to reconstruct their ancient ways in a desperate search for their cultural identity.

Beta 52964	9250	140	Cavelier, et. al., 1995	27
Beta 52963	9160	90	Cavelier, et. al., 1995	27
GX 17395	9125	250	Cavelier, et. al., 1995	27
Beta 64602	8710	110	Llanos 1997	14
Beta 64601	8510	110	Llanos 1997	14
UCR 3419	8090	60	Piperno & Pearsal 1998	204
Beta 21892	1400	80	Herrera, Cavelier & Mora 1987	70
GrN 14992	1365	30	Herrera, Cavelier & Mora 1987	70
Beta 21891	840	60	Herrera, Cavelier & Mora 1987	70
GrN 14991	755	30	Herrera, Cavelier & Mora 1987	70
GrN 14990	735	30	Herrera, Cavelier & Mora 1987	70
GrN 14989	695	30	Herrera, Cavelier & Mora 1987	70
GrN 14993	585	30	Herrera, et. al., 1989	200
GrN 14988	580	30	Herrera, Cavelier & Mora 1987	70
GrN 14999	385	30	Herrera, Cavelier & Mora 1987	70

Table 5.1. 14C dates from Peña Roja. Uncalibrated dates.

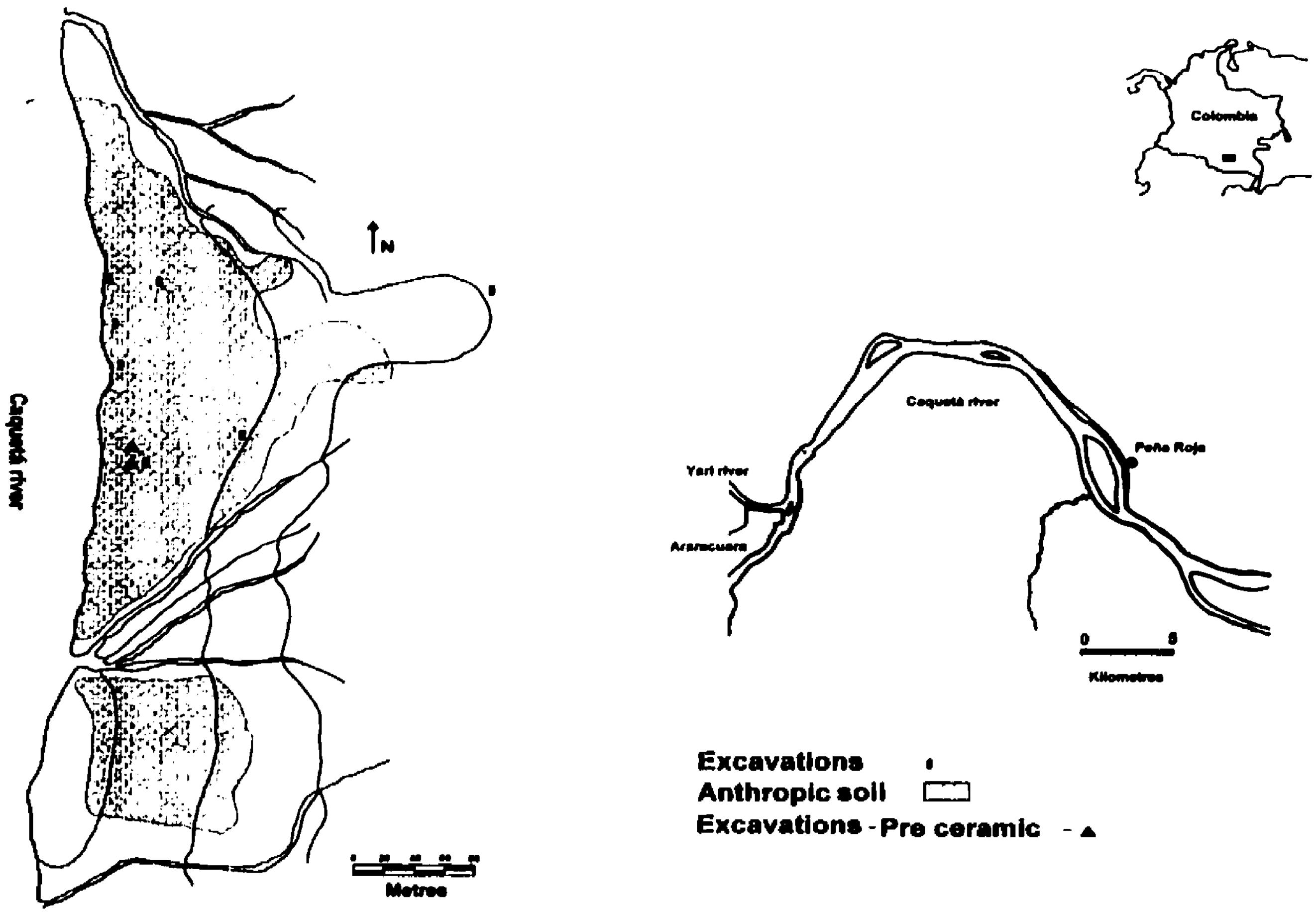


Figure 5.2 Peña Roja anthropic soil distribution and archaeological test location

Nonuya economy is based on hunting, fishing and gathering as well as root crop cultivation. These people can be identified as a tropical rain forest culture, in Lathrap's terms (1970). The basic staple of Nonuya economy is cassava (*Manihot esculenta*), represented by 56 sweet varieties and 20 bitter varieties. They also cultivate a number of fruit trees such as peach palm (*Bactris gasipaes*), caimo (*Pourouma caimito* Raldk), ucuye (*Macoubea witotorum* Shult.), umarí (*Poraqueiba sericea*), guamo (*Inga sp.*), maraca (*Theobroma bicolor* H.B.K), guacure (*Poraqueiba sericea* Tul), marañon (*Anacaedium occidentale* L) and uva caimarona (*Pouroma cecropiifolia* Mart). Within the Peña Roja terrace the Nonuya have house gardens where they grow pineapple (*Ananas comosus* L), batata (*Ipomea batata* Poir), Mafafas (*Xanthosoma* sp.), some medicinal plants like tobacco (*Nicotiana tabacum* L.), ortiga (*Urera urtica*), coca (*Erithroxilon coca*) and fishing poison (*Longchocarpus nicou*). They cultivate 75 plant species belonging to 36 taxonomic families (Vélez & Vélez 1999:88). The agricultural fields – chagras - are located on the northern and southern ends of the terrace where *Manihot* (*Manihot esculenta*) and pineapple (*Ananas comosus* L) are the predominant crops. Other agricultural areas are located on Sumaeta Island – 500 meters from the terrace – and in nearby terraces where banana and cassava (*Manihot esculenta*) are planted. These "distant" agricultural plots represent different stages of forest regeneration in the swidden agricultural system characteristic of tropical lowlands around the world[2].

[2] A detailed analysis of the agricultural systems in the Middle Caquetá river region can be found in Vélez & Vélez 1999. In this publication the authors present Peña Roja agricultural practices as

Peña Roja's location in a Quaternary low river terrace could suggest use of abundant fish from the white-water river (Gragson 1992; Rodríguez 1992). Indeed, fishing is practised in small creeks using line and hooks; the traditional traps made of palm fiber are still used in the Caquetá River as well as on small rivers during the low water levels. During the months that we spent with the Nonuya, in several field seasons - mostly during the dry season - fish was a constant in their diet. Nearby swampy areas, covered predominantly by *Mauritia flexuosa* palm, is a secure source of fruit, fibers and fish bait (see Goulding 1980; 1989; 1993). However, the Nonuya do not practice commercial fishing.

Hunting is practiced outside the low terrace, mainly by expeditions to abandoned agricultural gardens and in riverbanks or in paths within the forest, where Pacas (*Coelogynis paca*), deer (*Odocoileus virginianus*), monkeys (i.e., *Cebus apella*, *Lagothrix lagotricha*) and tapir (*Tapirus terrestris*) are shot. Despite the fact that prey such as tapir (*Tapirus terrestris)*, sahino (*Tayassu tajacu)*, and "puerco de monte" *(Tayassa pecari)* are common in the Colombian Amazonian region (Walschburger & Hildebrand, 1991), the Nonuya did not put much time into hunting them during our team's excavation seasons. Coleoptera larvae (for a description Cabrera et. al., 1999; Dufour 1987; Politis 1996b) were collected occasionally. The Tertiary hills bordering the Peña Roja terrace on its eastern flank represent a low density source of forest plants and animals for this

a case study of agroforestry in the tropical lowlands. See also Van der Hammen M. C. & C. Rodríguez 1999.

community; occasional expeditions brought palm fruits, fibers, pets - mainly parrots - and medicinal plants to the community. Special expeditions are sent to this area to look for medicinal plants; however, during these expeditions people collect any useful resource and do not miss an opportunity to snack where resources are available.

The landscape then

The natural history of the Caquetá river basin has become known in the last ten years due to the study of sediments, geomorphology, vegetation cover and pollen from different places and epochs (Behling et. al., 1999b; Duivenvoorden & Cleef 1994; Duivenvoorden & Lips. 1993; Urrego 1997; 1991; Van der Hammen et. al., 1992; 1991a; 1991b). Certainly, from a natural history perspective this area is probably one of the most understood in Amazonia

I will concentrate on landscape reconstruction from the time of the early human occupation of the Peña Roja terrace in an attempt to understand the geographical setting and how humans utilized and transformed it. As shown in figure 5.1 the first settlers used the low terrace ca 9,000 BP. This time corresponds, in geological terms, to a transitional epoch between the late Pleistocene and the early Holocene. Consequently, the time period is characterized by important climatic transformations that affected the entire local ecosystem. Despite the fact that tropical rain forest was not replaced by savanna vegetation in the Araracuara region, as pointed out in Chapter 4, changes in Andean and Amazonian weather patterns strongly affected river levels and this had consequences for sedimentation rates and river dynamics. As well a local increase or decrease in average annual precipitation must also have had an impact on the composition of the forest community. Such alterations, in turn, change vegetation's succession process and affected vegetation distribution and composition near the river banks, lower areas and terraces.

Cores for palynological study were taken from the northern area of Mariñame Island and from Pantano de Mónica, a region just to the south of Peña Roja (see figure 5.3). These two areas exhibit ecological characteristics that have resulted in good ancient pollen preservation. The Mariñame location today is flooded at least nine months a year, consequently the vegetation cover is characteristic of a seasonal *vársea* area in which swamp vegetation and *terra firme* species are combined. However, the predominant specie is *Mauritia flexuosa* due to its ability to adapt to swamp environments (Urrego 1991; 1997). The second region, Pantano de Mónica, is located not far from a lower Caquetá River terrace, 5 kilometers south from Peña Roja archaeological site. In this region three palynological sites, M1 and M2 located in swamp areas, and M3 in a forest area were studied. In Pantano de Mónica swamp areas *Clusia sp.* and *Mauritia flexuosa* dominate, while in M3 *Euterpe* is frequent (Behling et. al., 1999b).

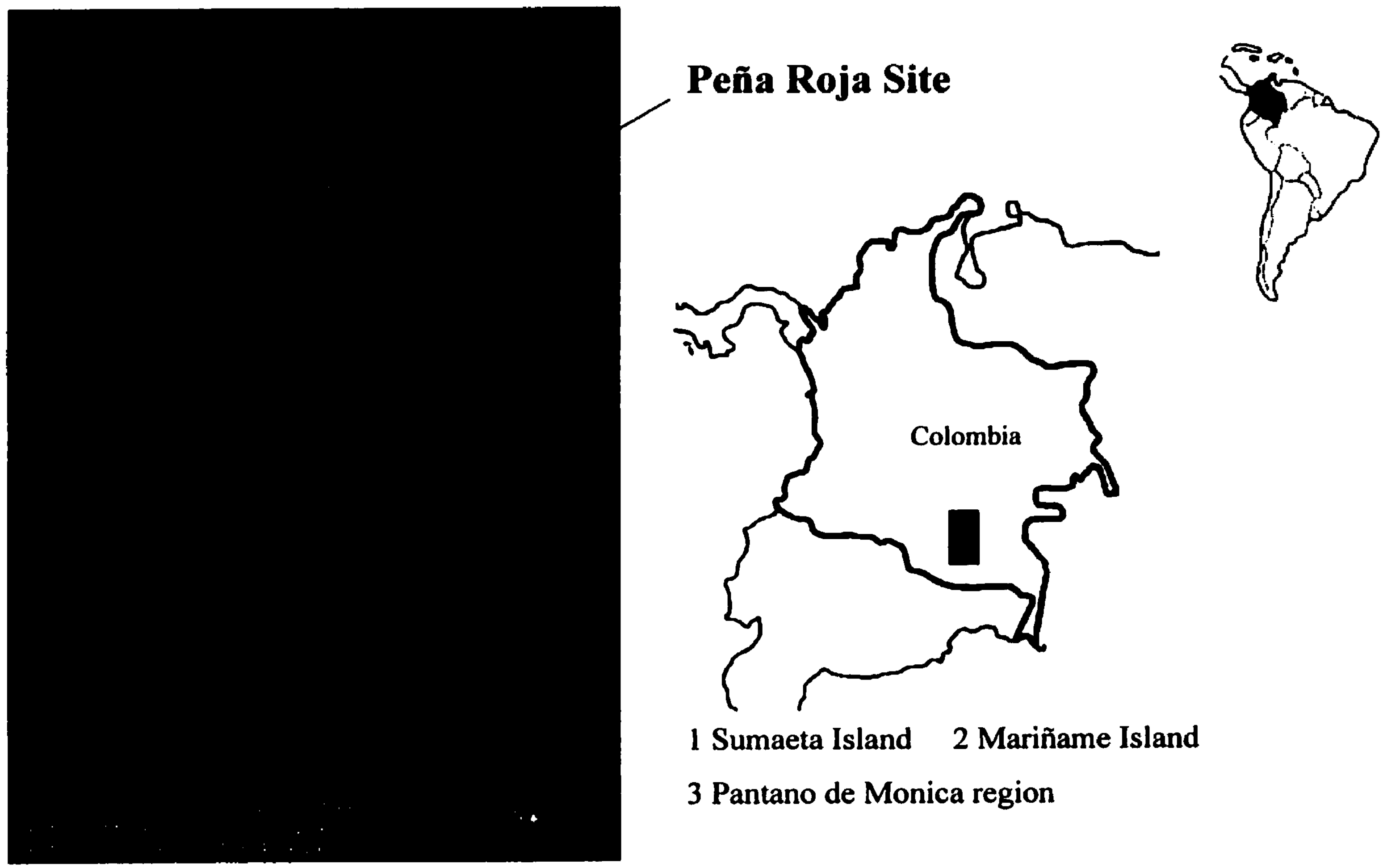


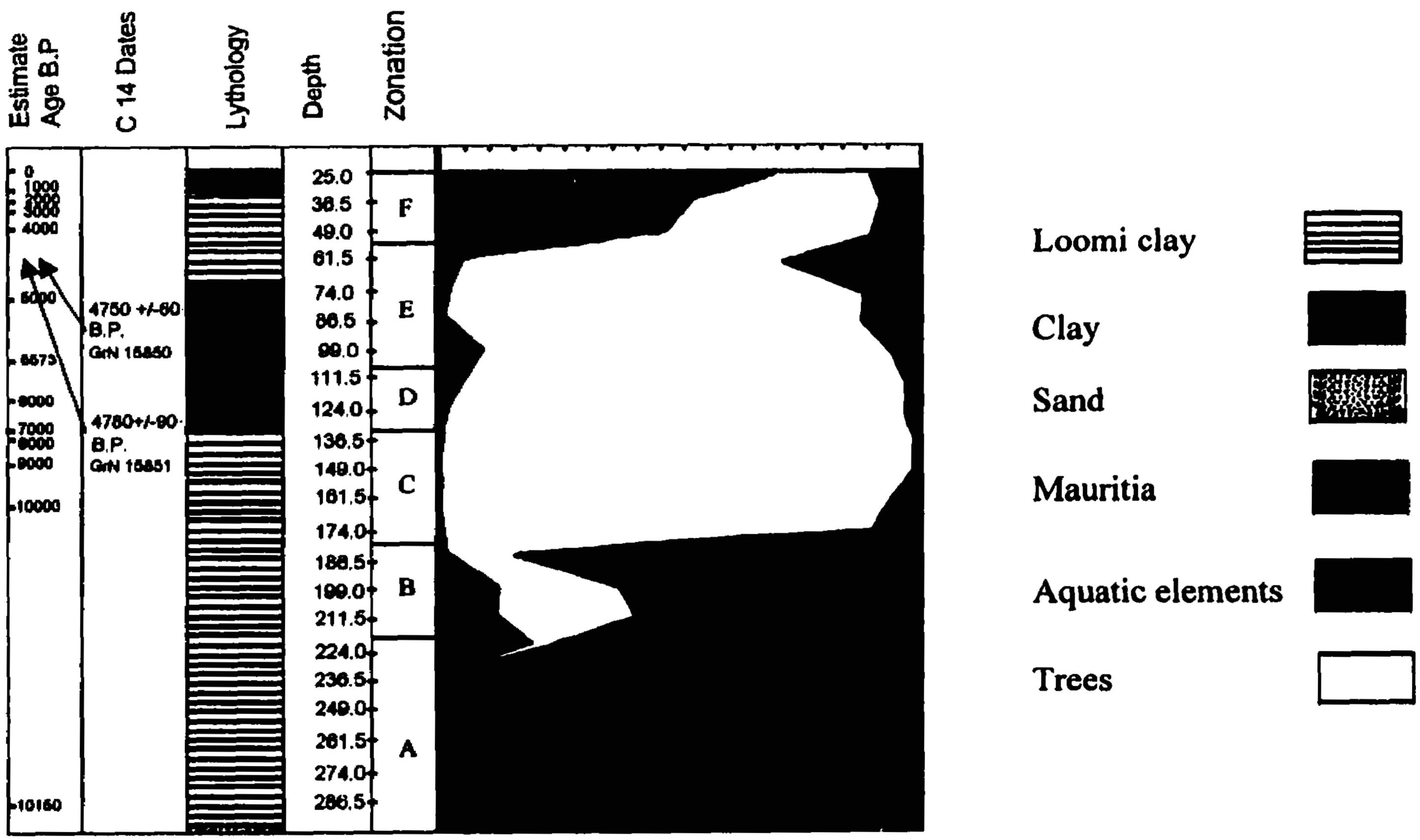
Figure 5.3 Peña Roja site and sites with paleoenvironmental data considered in the middle Caquetá river

Pollen samples collected in the archaeological site during the field season did not yield usable results due to preservation problems. Human activities, particularly agriculture, probably negatively affected pollen preservation. Natural events such as trees uprooted by floods on the low terrace as well as animal burrows would also have affected the pollen record.

The paleobotanical investigations in both areas - Mariñame and Pantano de Mónica -have good chronological control based on C14 analysis and associated sedimentation rate calculations. (see Van der Hammen & Cleef 1992; Van der Hammen et. al., 1991b; Van der Hammen et. al., 1991a; 1991b; Urrego 1991:104)[3]. The Mariñame chronology is inferred from a calculated rate of sedimentation based on two C14 dates (see figure 5.4). Ten C14 dates - four from M1, three from M2 and three from M3 support the chronology from Pantano de Mónica. Because of its long sequence the M1 column is the most relevant sample for our discussion. The extrapolated age at 234 cm has been calculated to be 11,150 BP. (Behling et. al., 1999b:197).

The Mariñame Island pollen sample, as well as the sediment analysis, suggested that the tropical forest fragmentation supposed to have occurred during the dry periods of the recent Ice Age did not affect dramatically the vegetation cover in

[3] More than 30 14C dates, from different areas in the Caquetá valley, have been analyzed in order to construct the sedimentation sequence and its relationship with weather pattern change. See Van der Hammen 1991b.



After Urrego 1991

Figure 5.4 Mariñame Island -Caquetá river - Pollen Diagram

this area of the Caquetá basin (Van der Hammen et al. 1991a; 1991b; Urrego 1992). However, other important changes in vegetation have to be mentioned. The main overall pollen diagram from Mariñame island shown in figure 5.4 suggest that early human occupation in the area begins during a dryer period. In the zonation column this sector is called zone C. The pollen patterns recorded for Mariñame island show at this time an increase in forest vegetation and a dramatic decrease in aquatic elements. *Mauritia flexuosa* palm, which usually grows in swampy areas, corroborates this observation. Indeed, this palm displays its lowest values in the pollen counts during this period. Other important changes in the vegetation composition at about the arrival of humans in the region are increases in Melastomataceae, *Cecropia*, *Alchomea* and *Euterpe* trees (see Urrego 1991). No indication of human activities has been registered at this particular location. The Pantano de Mónica M1 pollen diagram shows, in zone M1-II, that corresponds with the beginning of human occupation in Peña Roja, a continuous increase in palms (Arecaceae). At the same time it reveals a very slight diminution of trees, shrubs, climbers and epiphytes as well as a low presence of ferns. Ferns in the previous zone were predominat in the core. Anacardiaceae, Sapotaceae and Malpighiaceae, the last one in low percentages, are present among other tropical forest elements (see Behling et. al., 1999b).

In short, these studies and others (see Van der Hammen et. al., 1991a; Urrego 1997) suggest that this region of the Caquetá Valley circa 10,000 BP, was predominantly an extensive flooded landscape in which clay sedimentation was common. In the same vein, the vegetation's composition indicates a relatively wet climate. At the time of human colonization the sedimentation rate slowed down until it reached almost zero, suggesting dryer conditions. The extensively flooded forest gave way to a more tree-like forest and the river established fixed limits for its course giving rise to the Caquetá Valley (Van der Hammen et. al., 1991a:76). Despite these changes, a forest, as indicated by *Ficus*, *Alchornea*, *Macrolobium* and *Euterpe* among others, grew in this area (Van der Hammen et. al., 1991a: 67-68). The archaeological sequence reveals other changes and landscape features that can be important to understanding human occupation in this tropical forest landscape. These will be taken up in the next chapter.

CHAPTER 6

PEÑA ROJA: PROCEDURES AND ARCHAEOLOGICAL DATA

Introduction

During the field season of 1991, the archaeological exploration of Peña Roja revealed a preceramic component below the anthropic soil, which had been dated circa the first half of the first millenium AD. (figure 5.1). At that time some stone tools were recovered and samples of soil were taken. The objectives of the field season, however, were focused on the ceramic component. Later, in 1993, detailed information of this preceramic component was recovered through additional excavations. A new excavation area was established near the spot where the preceramic component was detected. Stone tools were recovered systematically in a much broader area, and soil samples for flotation, phytolith extraction and soil analysis were added to the ones previously taken. These units were located in a slightly elevated part of the site with an east-west axis (figure 5.2). The spatial limits of the site were established using a soil auger. The preceramic component was determined to cover an area of 350 square meters. Two different excavations were carried out. Peña Roja 9 and Peña Roja 10.

Each provided complementary information concerning Peña Roja's preceramic component (Urrego et. al., 1995).

The Peña Roja site's multicomponent archeological deposit shows some general characteristics that have to be made explicit in order to understand its history. Four main sections can be recognized based on the archeological profile. The first, which comprised ca. the upper 30 centimeters, is characterized by darker soil coloration with high phosphorus and organic values. This section has a small number of lithic artifacts associated with a much larger number of ceramics from the Meidote period. The archaeological features associated with this occupation are presented elsewhere (see Mora et. al., 1991). A second section, approximately 25 centimeters in deep, has a lighter soil color, along with a significant increase in the abundance of lithic materials and only occasional ceramic fragments. This section is considered to have been a transition zone, disturbed mainly by farming activities carried on between ca 400 to 1500 BP. From a pedological perspective the beginning of this transitional zone is characterized by an abrupt increase in the percentage of clay and a concomitant decrease in the percentage of silt (figure 6.1; soil Horizon 4, in figure 6.9). This transitional layer rests on top of a stratum 65 centimeters thick in which lithic materials are predominant. Finally, a section 30 centimeters or so in thickness, between the culturally sterile soil and section three, is characterized by features consisting of pits filled with darker soil, lithic materials and charred remains.

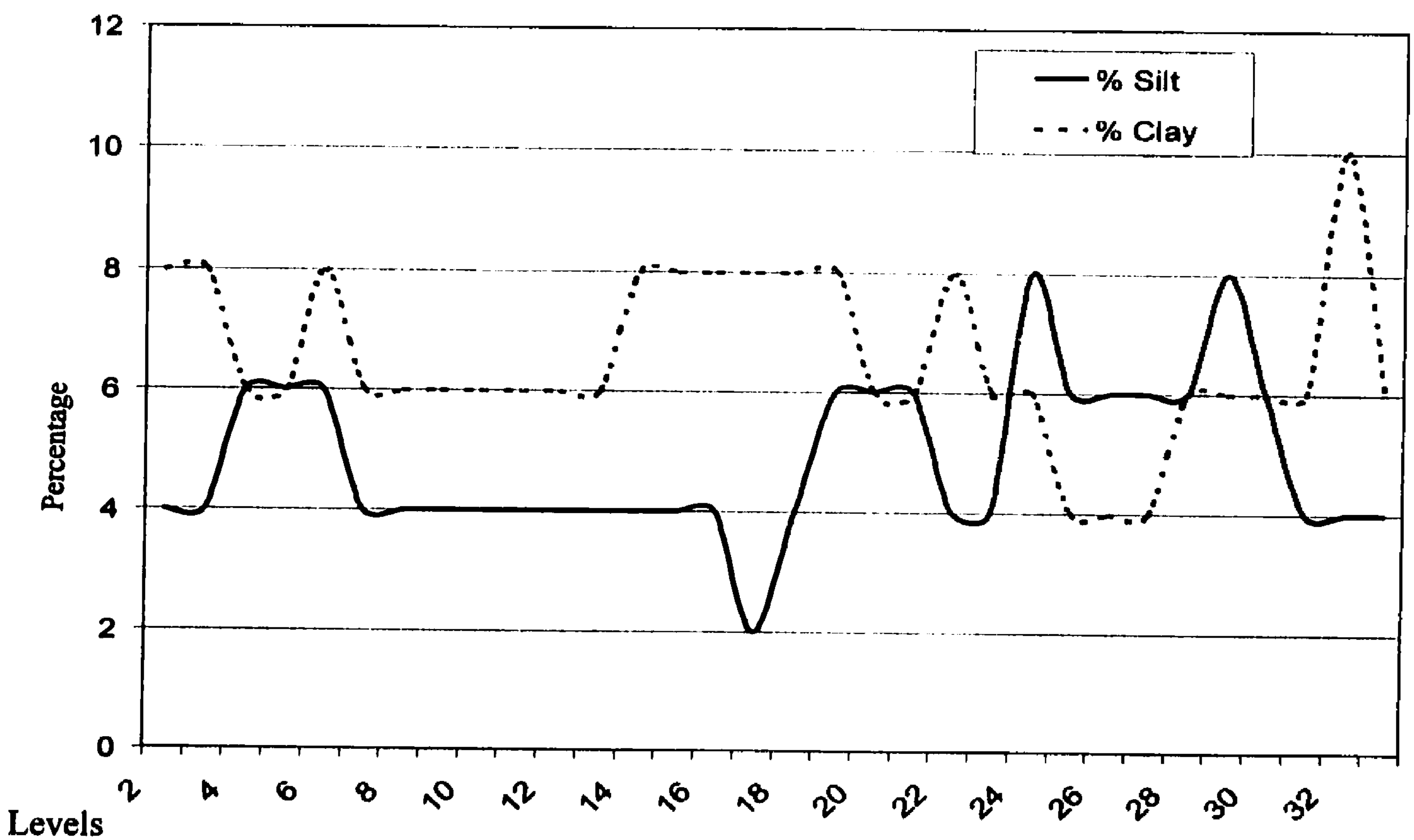


Figure 6.1 Silt and Clay distribution by level. Peña Roja 10

Each of the different Peña Roja occupations, including the Nonuya who inhabit Peña Roja today, transformed and altered the natural setting and the archaeological remains from previous occupations. Therefore, meticulous archaeological work was needed to separate the different occupations and human activities.

Excavation techniques

The sandy soil matrix of Peña Roja's archaeological deposit, as noted during the 1989 and confirmed during the 1991 and 1993 excavation seasons, as well as the distribution patterns of the stone tools and macro botanical remains, forced the use of a technique capable of detecting every change in the structure and composition of the deposit. The goal was to be prepared to reconstruct occupation floors in future area excavations; after all, Peña Roja 9 and 10 are just test pits that comprise less than 4% of the total preceramic area. Consequently, future excavators must be able to use these data for comparative purposes.

The horizontal decoupage technique was chosen due to its methodological rigor. This technique is a progressive clearing of the deposits, exposing large surfaces where the archaeological materials exposed are used to create multiple layers, or archaeological levels. Later, these can be used, after analyzing the archaeological materials, to define occupational floors. Consequently, the archaeological levels *per se* do not reflect occupational floors; rather, later, laboratory-refitting of the assemblage delimits them. Thus, archaeological stratum thickness varies according to material density, size and distribution. Archaeological level depth were recorded using a water level affixed to a relative topographic point zero. The average depth of a level was 4 centimeters. Soil samples were taken for each individual square meter and any changes in soil color and texture were recorded. Special soil samples were taken in small areas where soil characteristics changed. In addition each exposed 1-m square and layer was drawn to scale and photographed; notes were made of their properties. This graphic record of every horizontal decoupage level includes each and every lithic item more than 3 centimeters in maximum dimension; smaller objects were not included in the drawing, but were collected. Seed fragments bigger than 0.5 centimeters were recovered manually, with smaller pieces obtained via flotation sample. Soil analyses were carried out for each horizon and excavation level, and a complete soil description and drawing was made for the north, south and west profiles. In this way we were able to infer the existence of areas associated with human activities (alterations caused by macro-organisms and roots that were carefully taken into account).

The archaeological remains from each level were collected, numbered, and their location and depth were recorded. A number sequence of four digits was assigned to each square meter, for each horizontal decoupage level. Numbers for individual remains were added to the unit/level number placed on each item. These numbers are important clues in the archaeological database organization that was used. A sample of 10 litres of soil for flotation of carbonized material was collected from each square so excavated. Samples were also taken from most units for phytolith studies. Pollen samples were taken from excavation profiles. Unfortunately, after the preparation of 10 samples, we concluded that pollen preservation was too poor for statistically valid samples to be analyzed. Indeed, only the first 30 centimeters have any quantity of pollen (Cavelier et. al., 1995:31). Samples for soil analysis were taken from each decoupage level as well as from the profiles.

Materials

After the end of each field season, the materials collected were sent to Fundación Erigaie in Santafe de Bogotá. Subsequently the different kinds of materials recovered at Peña Roja were sorted. Some were sent to specialists; others went through long experimental analytical processes. For instance, the phytoliths samples were sent to Dolores Piperno for their analysis (Piperno 1999); her results are available in a recent publication (see Piperno & Perasall 1998).

Charcoal samples were used in different analyses. Charred plant macroremains - mainly seeds and wood - were collected during the excavation process. Later, more vegetal remains were recovered during the flotation process. The analysis of the seeds recovered was done in La Fundación Erigaie as part of the development of a reference collection. Wood fragments were set apart, and species identification started by thin sections analysis. A Ph.D dissertation will present these materials (Archila personal communication 1999).

Partial results of the stone tool analysis - mainly flaked artifacts - from Peña Roja 9 were published in 1995 (Cavelier et. al., 1995; Urrego et. al., 1995). An undergraduate thesis of Universidad Nacional de Colombia focused on ground stone artifacts from Peña Roja 9 and 10 (Llanos 1995). From 1995 through 2000 I undertook a more detailed study of Peña Roja lithic materials, focusing on a broader collection of artifacts from Peña Roja 10.

Charcoal

Charcoal was manually collected for every square meter of the excavation as were soil samples for flotation. In Peña Roja 10 a total of 5965.8 grams of charcoal were collected. Charcoal distribution by recovery technique is shown in figure 6.2. This figure can be interpreted as an index of carbon size in the

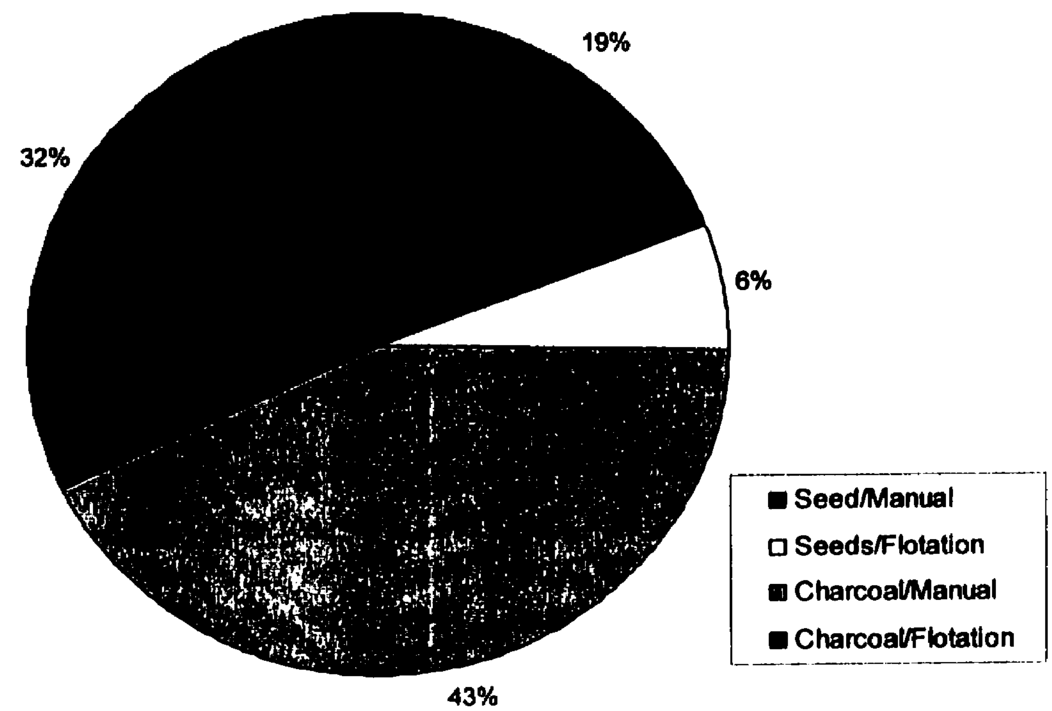


Figure 6.2 Charcoal weight percentage by collection procedures.
Peña Roja 10

archaeological site; manually collected charcoal was equal or bigger than 1 centimeter while flotation charcoal usually was smaller than 0.5 centimeter.

Manually collected charcoal was weighed and sorted: carbonized seeds were placed into the archaeological carbonized macro-remains collection for identification, and medium and large sized wood fragments - more than 0.5 millimeters - that could be used as a source of wood identification, were set in a special category.

Peña Roja 10 flotation charcoal gave some indications of human activity intensity through time. Figure 6.3 shows charcoal distribution by level in Peña Roja 10 in grams. In this particular test pit the limit for the transition between what we infer to be the agrarian occupation and the hunter-gatherer occupation is located among levels 11 to 14, as suggested by artifacts and soils. Two important facts can be observed in this figure. From level 14 and below an increase in charcoal accumulation is recorded, with the exception of level 29 where it dramatically decreases, while above that, during what we are suggesting is the agrarian occupation, the amount of charcoal is significantly less. Second, from level 11, where there was a slight increase, to the charcoal values are lower in comparison with the lithic stratum. This observation contradicts any prediction in which more charcoal accumulation is expected in tropical rain forest archaeological assemblages where agriculture has been practised. The

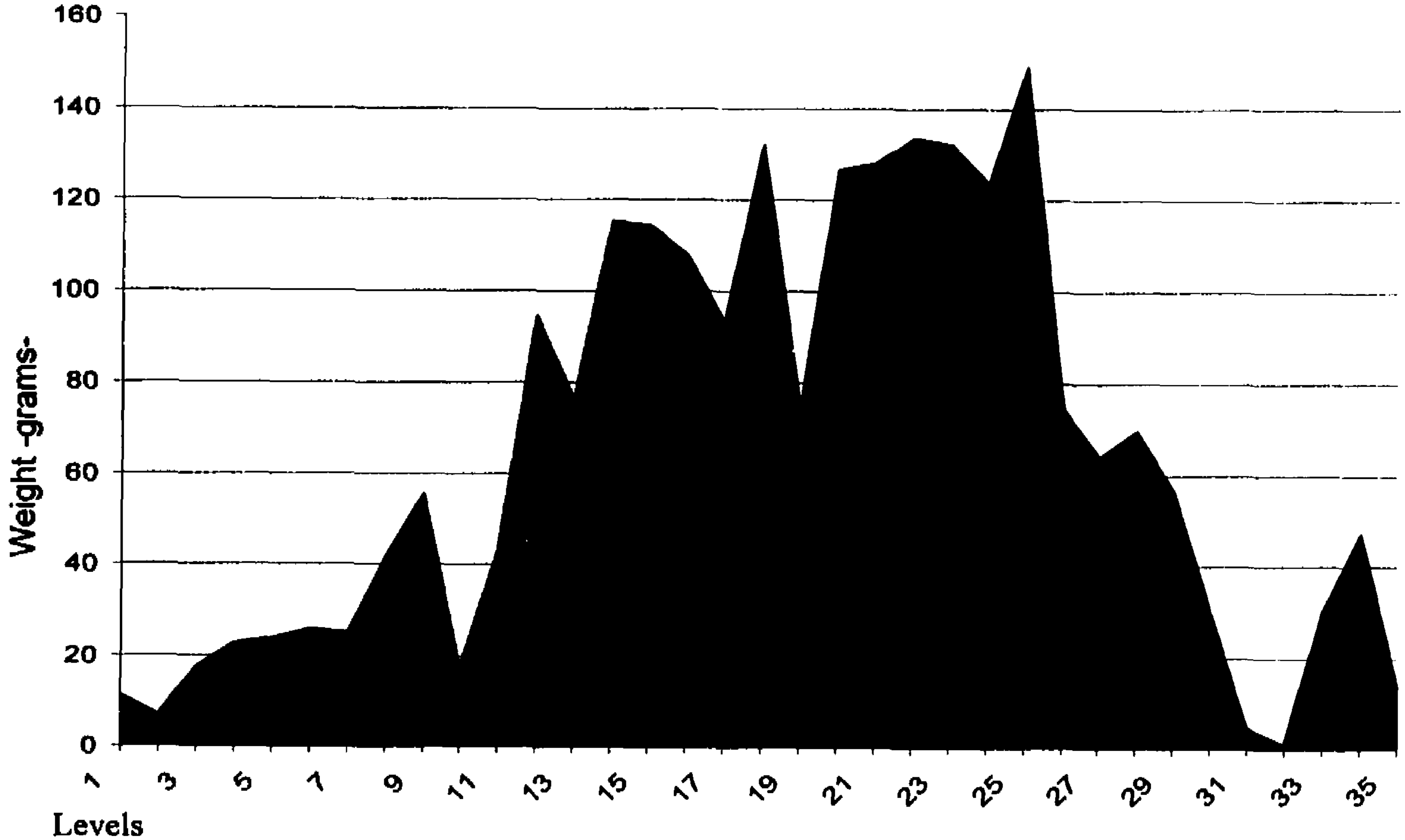


Figure 6.3 Charcoal weight by level: flotation technique. Peña Roja 10

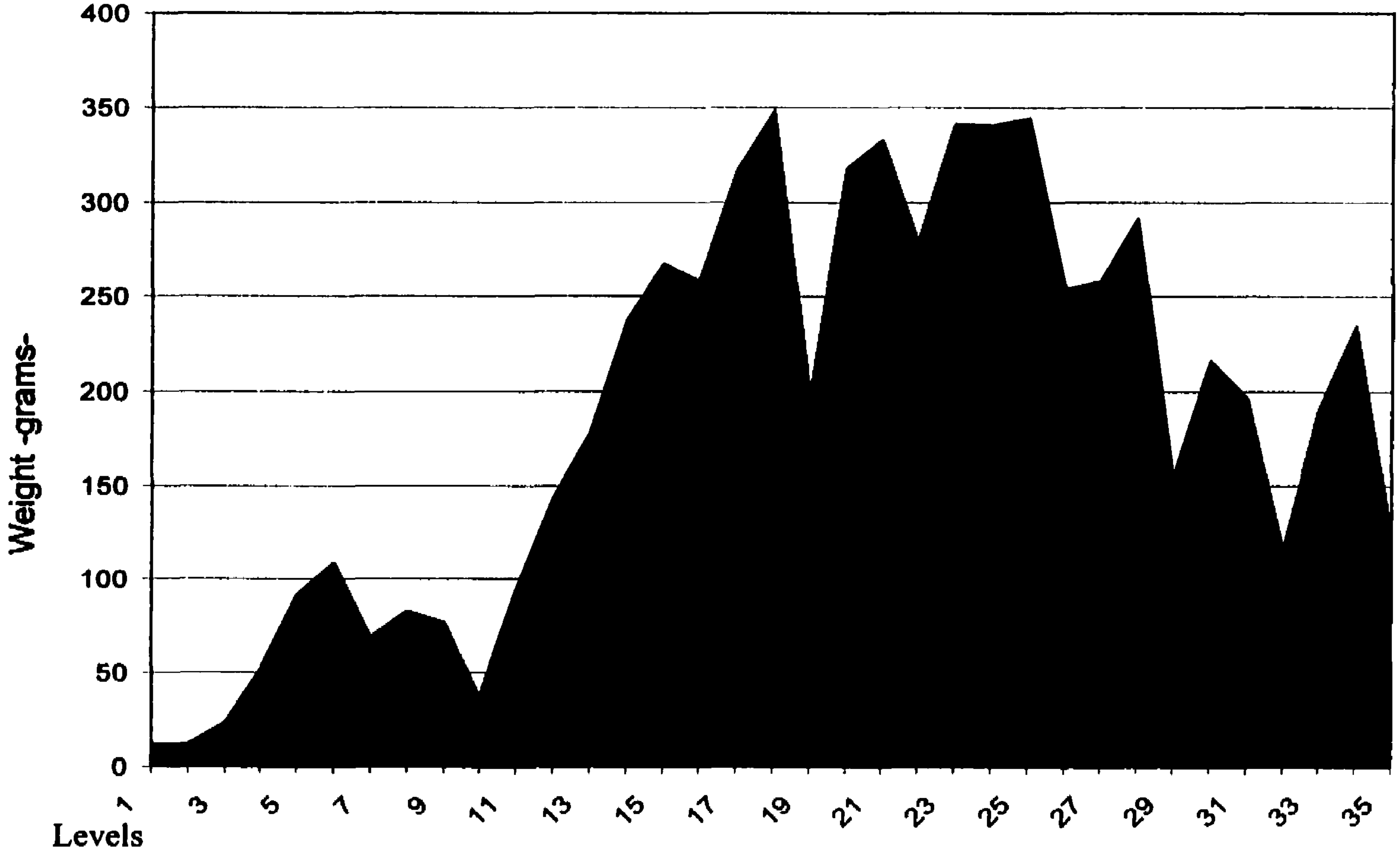


Figure 6.4 Charcoal weight by level. Manual collection. Peña Roja 10

assumption that slash and burn agriculture - the tropical rain forest agricultural system par excellence - involves significant burning of the vegetation does not apply to Peña Roja, at least in the comparison between the pre-ceramic and ceramic components of the site.

The comparison between the distributions of flotation charcoal, as shown in figures 6.2 and 6.3 and manually recovered charcoal, shown in figure 6.4, illustrate other patterns. Charcoal decreases in levels 33, 30, 20 and 14 and an increase from level 11 are recorded in the figures. Despite the differences in charcoal size between manually-recovered and flotation- recovered charcoal, that can be explained by post-burning processes such as wind transportation, percolation or water transportation, charcoal shows a consistent pattern in the mentioned levels. Consequently, these observations can be interpreted as consequences of less burning in levels 33, 30, 20 and 14. On the other hand, the variance of charcoal in the span between level 11 and 14, where a constant decrease is obvious, could be explained as an outcome of an initial forest cleaning in the area at the beginning of the agrarian occupation. Hypothetically, the processes associated with an agrarian population in Peña Roja may have allowed the ground surface to be washed by rain as a result of agricultural practices that included the removal of mature forest. Soil loss could happen during such initial agricultural phases. Other interpretations can be inferred from the study of charcoal distribution in association with artifacts. These will be discussed later.

Plant macroremains

Plant macro-remain identification was difficult due to the lack of a reference collection that included carbonized samples from Amazonia. Macro-remain reduction during the carbonization process has to be taken into account as well as changes in weight and morphological features after carbonization. As well botanists, mainly trained in plant identification based on flowers and leaves, could not help much in the identification process. Consequently, we initiated an experimental program of carbonization, using seeds from useful plants collected in Amazonia, which helped with the identification of specimens. Palms were the focus of this experimentation program due to their relative abundance in the collection and their importance in native Amazonian economies (see Koch-Grunberg 1995; LaRotta 1989; 1982). Information from these findings are published (see Cavelier et. al., 1995; Gnecco & Mora 1997; Morcote et. al., 1998; Urrego et. al., 1995). An undergraduate thesis –of Universidad Nacional de Colombia (Morcote 1994) synthesized all the information and methods concerning palm macro-remain research in Peña Roja 9. Plants other than palms have been also identified in the Peña Roja carbonized macro-remain collection; however, the study is still incomplete (see Cavelier et. al., 1999). A large collection is stored at the Fundación Erigaie to be studied in the future. The most representative collection of charred plant macro-remains from Peña Roja are those from Peña Roja 9. The analysis yielded important information about plants used at the time of the first settlers in this area. Thus, we will concentrate on them, after discussing some methodological concerns.

Peña Roja 9 charred macroremains were recovered after taking five litters of soil from every excavated square meter. This soil was rinsed with water using a 2 mm screen. The sediment left in the screen after this process, which removes small uncarbonized vegetal materials and clay, was dried without exposing it to direct sunlight. Sudden dehydration can destroy the fragile specimens. The collected material was then weighed and packed. Later, a manual separation of the large fraction without using any optical device was followed by a separation of the smaller fraction using a microscope with magnification of 25X and 40X (see Morcote 1994). Provisional types, based on morphological features, were used to start a systematic comparison with a charred reference collection. A separate taxa was used for parts of seeds that could not be identified due to poor preservation.

Seed preservation state was used as an important criterion to separate the specimens acquired during the manual collection and the soil rinse process. Three categories were established: unbroken, half-broken, and highly fragmen-

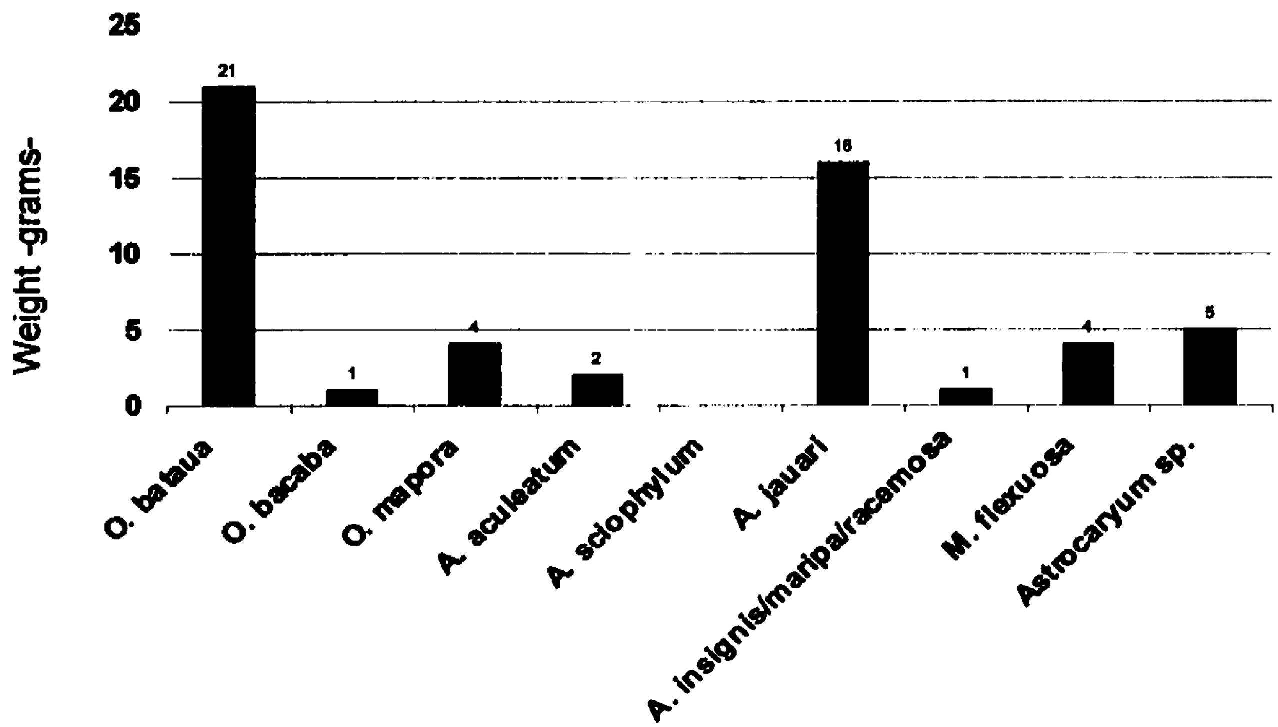


Figure 6.5 Carbonized seeds recovered unbroken. Peña Roja 9

ted seeds. It was hoped that these categories could give clues about uses of each individual taxonomic category during the occupation. Figure 6.5 shows unbroken carbonized palm seed abundance recovered at Peña Roja 9.

The main taxonomic groups identified based on Peña Roja's sample are shown in table 6.1. Palms (Arecaceae) are predominant in the sample and included five genera (Cavelier et. al., 1999; 1995:34, Morcote 1994, Urrego et. al., 1995). Even today this group of palms is a very important source of food, raw materials for house construction and tool manufacture. Their uses change, however, according to cultural traditions and technological requirements. Palm taxon abundance by level is represented in figures 6.6 to 6.8.

Family	Genus	Species
Arecaceae	Astrocaryum	*A. aculeatum*
	Astrocaryum	*A. javari*
	Astrocaryum	*A.sciophilum*
	Attalea spp.	
	Attalea	*A. Maripa*
	Attalea	*A.insignis*
	Attalea	*A. racemosa*
	Mauritia	*M. flexuosa*
	Oenocarpus	*O. bataua*
	Oenocarpus	*O. mapora*
	Oenocarpus	*O. bacaba*
	Dieffenbachia sp	
Caryocaraceae		*Caryocar aff. Glabrum*
Humiriaceae		*Vantanea peruviana*
	Humiriastrum sp.	
	Sacoglottis sp.	
Apocynaceae		*Macoubea guianensis*
Lauraceae		*Beilschmiedia brasiliensis*
Annonaceae		*Oxandra euneura*
Chrysobalanaceae		*Licania pyrifolia*
Leguminosae		*Parkia multijuga*
	Inga spp	

Table 6.1. Taxonomic groups identified in Peña Roja's carbonized macro botanical remains.

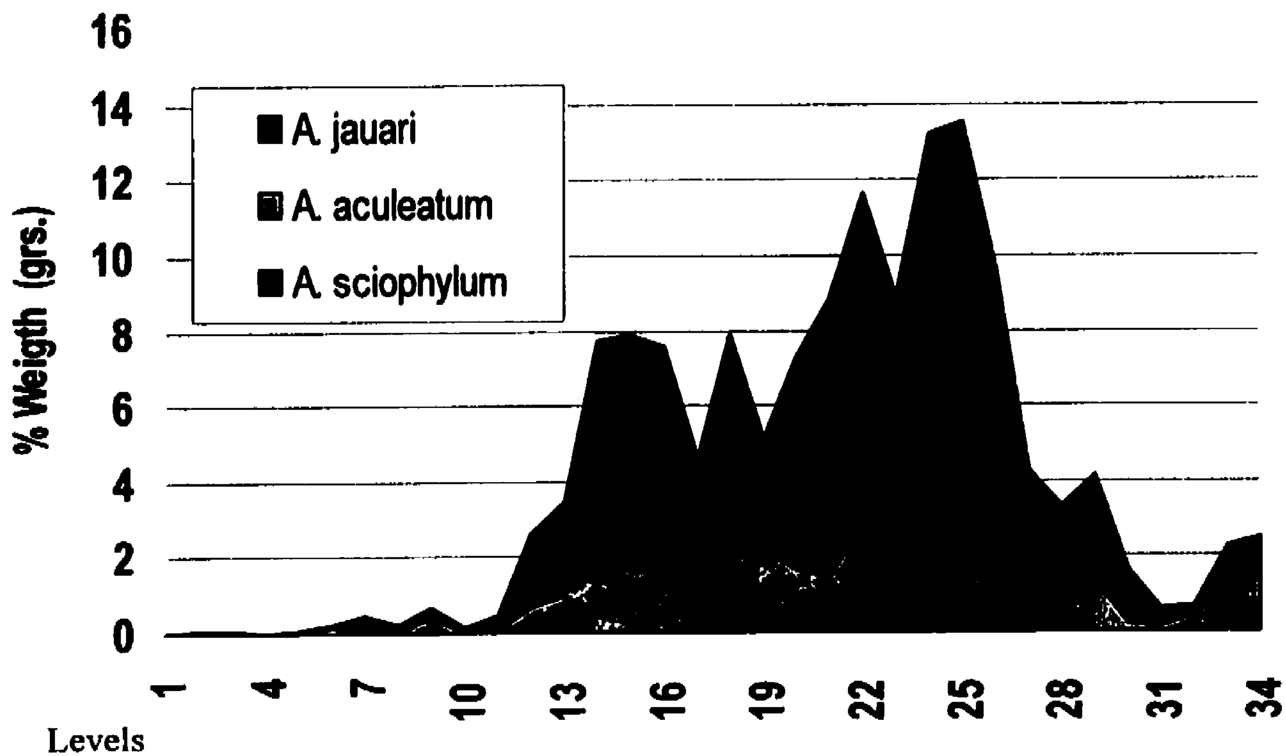


Figure 6.6 Distribution of Genus Astrocaryum by level. Peña Roja 9

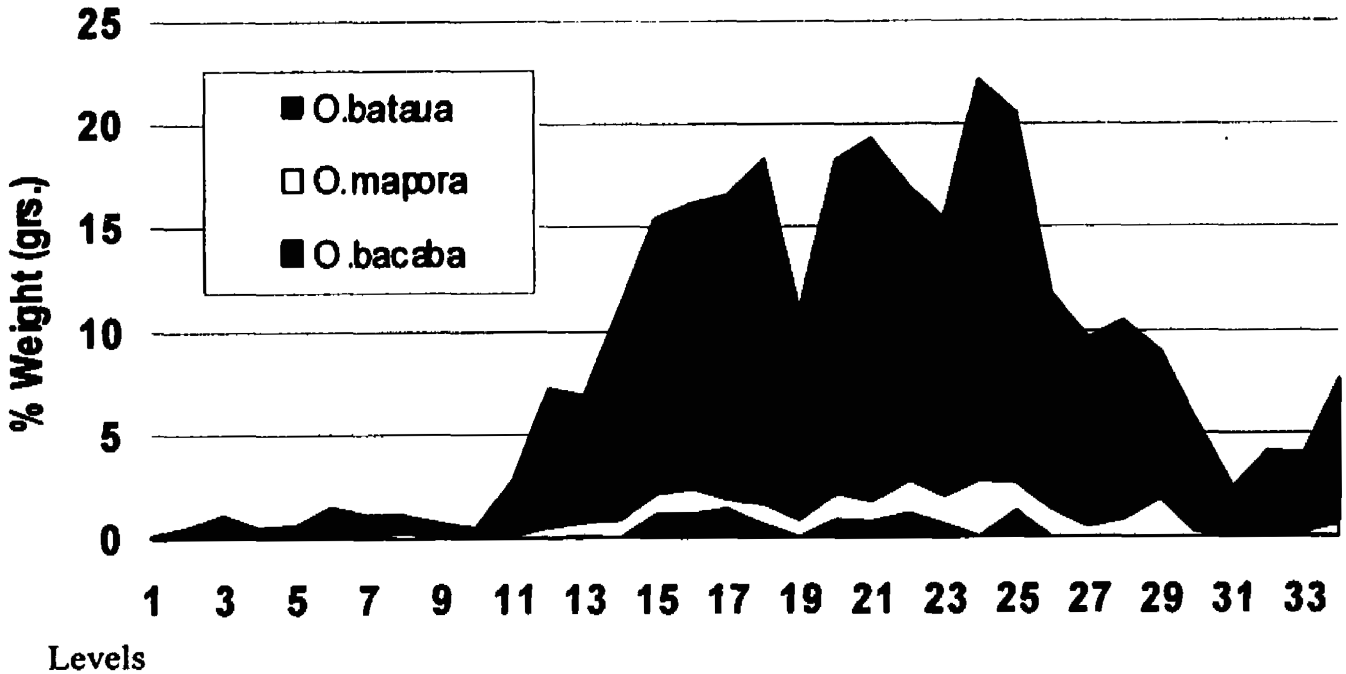


Figure 6.7 Distribution of Genus Onenocarpus by level. Peña Roja 9

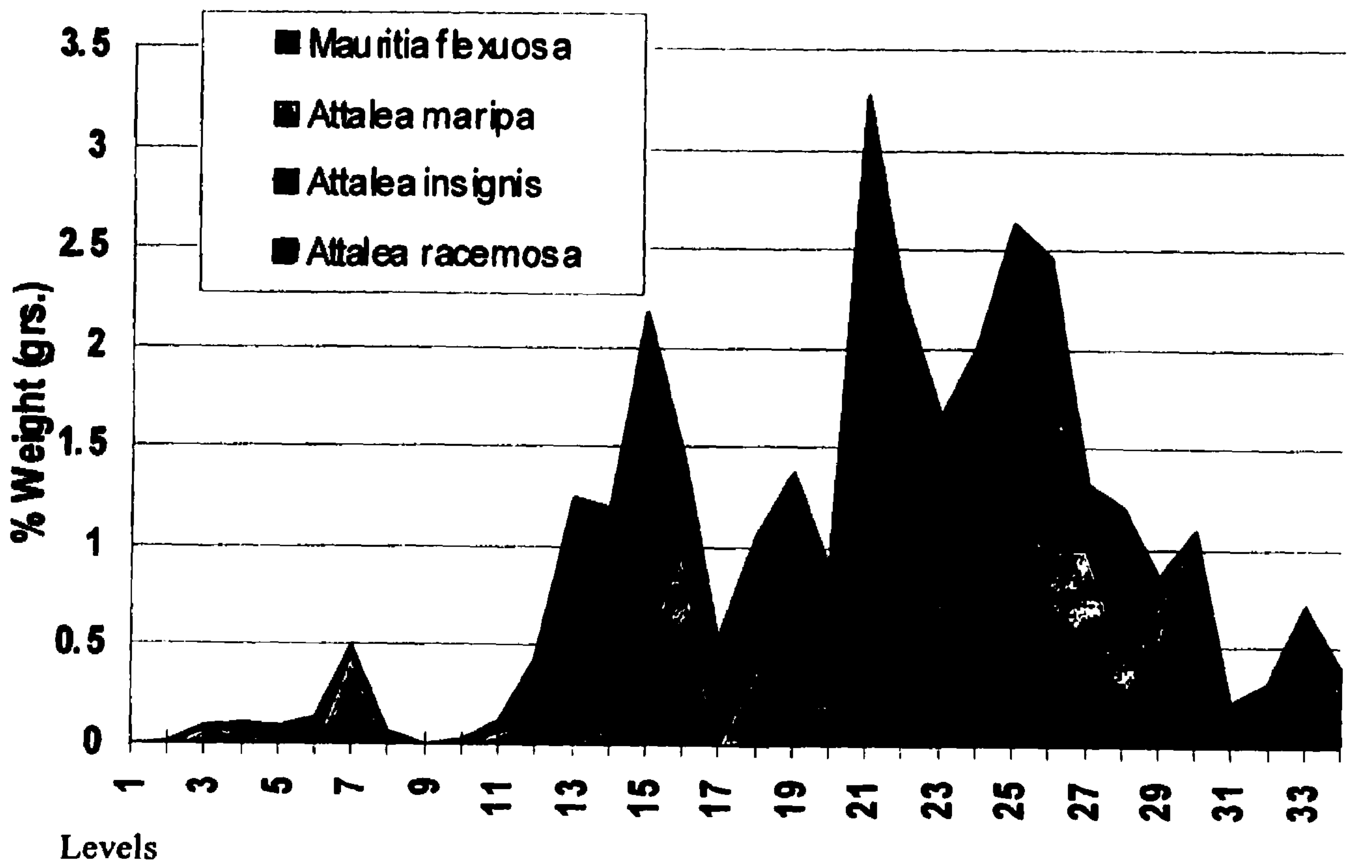


Figure 6.8 Distribution of Genus Attalea and Maurita flexuosa.
Peña Roja 9

Some of these macro-remains suggest that fishing was an important activity during the preceramic. The occurrence of *Dieffenbachia sp.*, based on ethnographic analogies, that it was used for fishing. Indeed, the Miraña used macerate *Dieffenbachia humilis* Poeppig's roots and leaves to produce a fish poison (Sánchez 1997:72); *Dieffenbachia sp.* seeds are used as fish bait (Cavelier et. al., 1999).

Most *Astrocaryum* seeds were recovered fragmented - *A. sciophylum*, *A. aculeatum* ; however, *A. javari* represents the second most unbroken seed in the Peña Roja sample, after *Oneocarpus bataua* (figure 6.5). This palm displayed two significant abundance picks during the preceramic, in levels 22 and 24 (figure 6.6), and a relatively high percentage by the end of the preceramic (see figure 6.6). However, the frequency of occurrence declines significantly in the levels associated with the agricultural occupation. Today, native communities in the Caquetá river basin use *Astrocaryum javari* seeds as fish bait (Sánchez 1997). There is no ethnographic information concerning *A. javari* used as food; however, the shoot of this palm can be used - as the Miraña do - as bait for turtle hunting - mainly *Podocnemis expansa* - (Sánchez 1997:79). To be used as fish bait *A. javari* seeds do not require any special processing that would involve breaking the seed, which may explain the high frequency of unbroken seeds in the Peña Roja assemblage.

The other members of the genus *Astrocaryum* show a lower percentage in the archaeological record and a lower presence in the unbroken preservation category, as mentioned earlier. *A. aculeatum* has its maximum frequency in levels 23 and 26, decreases considerably in all of the other preceramic levels, and occurs in minimum amounts in the upper or ceramic levels. *A. sciophilum* follows the same pattern as *A. aculeatum*, with a maximum frequency on level 23, and a smaller frequency on level 14; however, it disappeared entirely in level 11. On the ceramic levels the incidence of *A. sciophilum* seeds is quite low (see figure 6.6 and Cavelier et. al., 1995).

The palms - *A. aculeatum* and *A. sciophilum* - are considered to be good raw material sources for bow strings (Koch-Grunberg 1995:130, 185 vol 1) and other cords used in hammock manufacture and house construction. *A. aculeatum* leaves are used for sanding wood (Sánchez 1997:78). Their seeds are good bait, for attracting fish and animals. The trunk is used for nursing edible insect larvae and as firewood; and the leaves also can be used in fishing. The Nukak consume A. *aculeatum* seeds (Cabrera et. al., 1999:249). *A. sciophilum* seeds are eaten by the Andoke in the Colombian Amazon and the tree sap has medicinal properties (Sánchez 1997:79).

Oenocarpus distribution might be important in understanding the dietary patterns of the ancient occupants of Peña Roja. *O. bataua*, the palm which has the highest frequency of unbroken seeds in Peña Roja's archaeological record (figure 6.5), evidences two trends in the archaeological sequence. In the preceramic levels it shows a high frequency in levels 22 and 24 and a some what lesser frequency in levels 31, 19,14 and 10. In the inferred agricultural levels, levels 10 through 1 inclusive, it has a very low frequency (see figure 6.7).

This palm, along with *Astrocaryum aculeatum*, is one of the most useful plants in Amazonia. Its seeds are used as food by most native Amazonians. For instance the Nukak, an Amazonian hunter-gather society, consume them with or without any preparation. After cutting down the palm's trunk they collect the seeds and eat them. Sometimes they climb the trunk to get the seeds without damaging the palm. If there are plenty of seeds, some are taken to the camp where they are boiled and smashed to prepare a beverage. Sometimes the seeds are cracked to extract the nuts. In addition to food, young *O. bataua* trunks provide spines that are used as blowgun darts, their leaves are used for basket manufacture roofing; old trunks are good for nursing larvae and cooking (smoking meat) (Cabrera et. al., 1999:249; Politis 1996:180-183). The Huitoto extract salt from the bark (Sánchez 1997:89) *O. bataua* pulp produces a very fine oil that can be used for lamps, or as a substitute for cooking oil. There are evidences of some harmful properties resulting from consumption by persons recovering from a particular disease (Wallace 1853:29).

O. mapora occurs within the preceramic levels in Peña Roja, showing its highest values in level 24; however, it has more or less similar values in all the preceramic levels. During the ceramic period it is rarely represented. Today Muinane and Huitoto use *O. mapora* seeds as food (Sánchez 1997:89) and its branches and leaves are used by the Nukak as raw material for basketmaking. *O. bataua* it is a good source of firewood (Cabrera et. al., 1999).

O. bacaba has its maximum frequency during levels 15 to 18; but it appears as early as level 25. It was not recorded in the ceramic levels (see figure 6.7). This palm attracts game such as *Tayassu tajacu*; *Tayassu pecari*; *Dasyprocta sp;* yacú (*Penelope marail*) and birds such as the Tucan (*Andigena nigrirostris*) and parrots (*Ara chloroptera*). Its fruits are used to prepare a "soup", which is prepared by cooking them in water and smashing the seeds to extract the pulp (Koch-Grunberg, 1995: 235 vol 1). In Peña Roja the archaeological sample of *O. bacaba* has a low frequency of unbroken preservation (see figure 6.5).

Mauritia flexuosa appears abundantly in the preceramic strata, with a maximum in level 21 (see figure 6.8). *Mauritia flexuosa* seeds are used as a food source everywhere in Amazonia and in the tropical savannas of the Llanos. The fermented juice is a common alcoholic beverage. The Muinane and Miraña also consume the shoots and use the bark as a source of salt, needed to prepare *ambil* - the liquid tobacco - that is consumed daily (Sánchez 1997:89). The leaves provide fibers for hammocks (Wallace 1853 48-49).

A. maripa and *A. insignis* have a similar pattern in the archaeological sequence, however, *A. maripa* is more abundant. They have their highest weight representation in level 21, but a significant percentage was registered in levels 30 and 33 (see figure 6.8). These two palms, as well as *A. racemosa*, which only appears in the preceramic - levels 22, 25, 26 and 28 in low quantities -, are good food sources. The Huitoto and Andoque consume *A. racemosa* nuts, which are considered a delicacy. The seeds are boiled for oil extraction (idem 1997:80).

Peña Roja macro-remains show a consistent set of palms that provide not only food to human groups but also raw materials for tools and shelter construction. A comparison between palm distribution in the preceramic and the ceramic levels suggests not only that there were different activities related to archaeological preservation - i.e., less burning during the ceramic levels - but also different conceptions of these resources. Probably during the preceramic, these palms were used and conserved in the archaeological site as part of the "cultural landscape" where social activities took place. Seeds introduced from other locations may have and enhanced possibilities for germination due to increased soil temperature resulting from human disturbance of the vegetation and increased exposure of the soil to direct sunlight. (see Chapter 8)

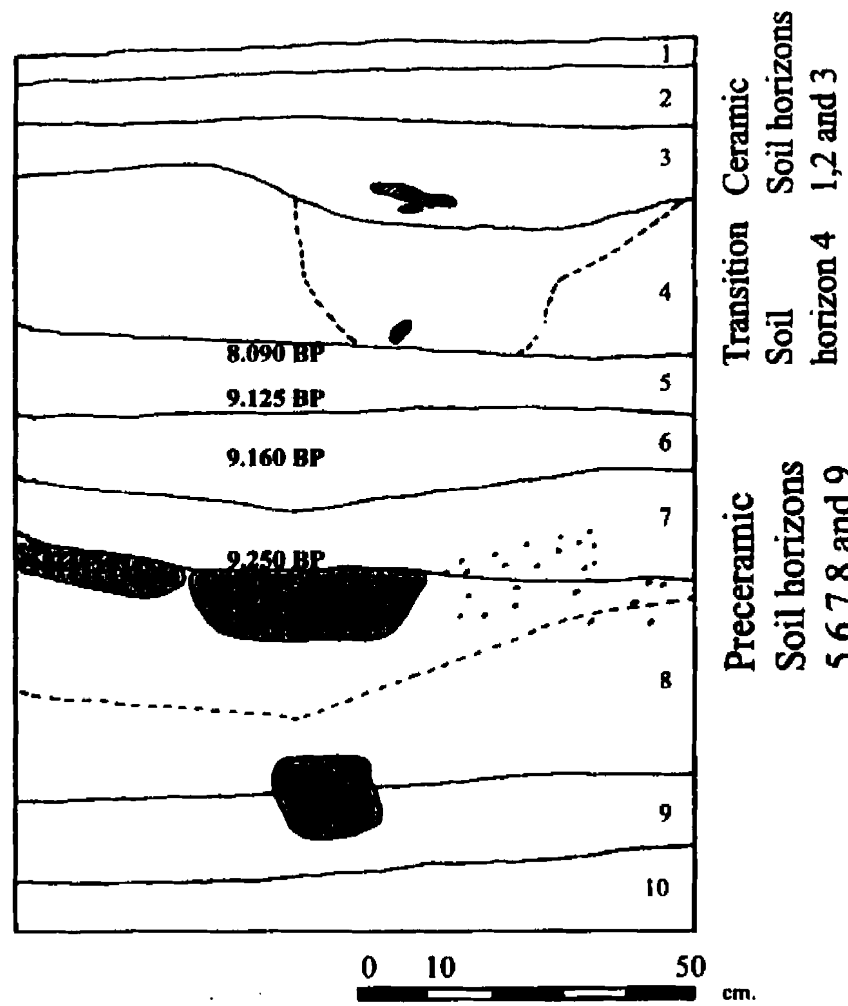
Phytoliths[1].

A total of 10 phytolith samples were analyzed from this archaeological site, each one representing one of the soil horizons in the Peña Roja 9 south wall (see figure 6.9). With the exception of samples 9 and 10 - the lowest part of the profile - all studied samples have abundant phytoliths

Peña Roja's phytolith analysis confirms paleoecological information obtained from the palynological study –(see Chapter 5) while adding new data on early agriculture in Amazonia. The majority of phytoliths recovered at Peña Roja were from trees, shrubs and herbs representative of lowland forest. Chrysobalanaceae, a family that today has multiple uses in house construction - i.e *Licania arachnoidea* and *Licania micratha* Huitoto; *Licania apetala* -Miraña and Muinane (Sánchez 1997) , or as food *Couepie Chrysocalyx* -Muinane-; *Couepia dolichopoda* Prance - Huitoto and Miraña (Sánchez 1997) - contributed more than 70% of the phytoliths. Grass phytoliths and other open forest floor plants like *Heliconia* were extremely low. Palmacea represent from 3% to 21% of the sample, having their high values in horizon 4 (figure 6.9), which belongs to the transition zone between the agriculturalist and the hunter-gather occupations. The carbonized macro-remains show a decrease in palm for this horizon,

[1] Pipemo (1999; 1998) did the Phytoliths analysis with samples collected in Peña Roja 9 south wall profile. Recently (1998) she has published her results, however, the current discussion is based mainly in her report to the Fundación Erigaie (1999)

Soil horizons	Depth	Color
1. Ap -	0-5 cm	10YR 2/1
2. A1b -	5-13 cm	10YR 2/2
3. A2b	13-22 cm	10YR 2/1
4. A3b	22-54 cm	5YR 5/2
5. A4b	54-68 cm	10YR 3/3
6. A5b	68-84 cm	10YR 2/2
7. A6b	84-122 cm	10YR 2/2
8. A7b	122-140 cm	10YR 3/2
9. 2AB	140-154 cm	10YR 5/3
10. 2B	154-164x cm	10YR 5/4



Evidence of post-depositional alteration

Figure 6.9 South profile. Peña Roja 9

whilephytoliths show an increase, suggesting preservation differences among the sources. Probably this differential preservation was caused by natural and cultural processes that included different resource management. Palm species identification based on phytoliths is difficult. In any case, this information confirms that Peña Roja's vegetation cover was dense during the occupation.

The samples from horizon 3 (A2b), 5 (A4b) and 6 (A5b) (see figure 6.9) yielded data related to the introduction of cultivated crops in the area. Indeed, phytoliths from *Cucurbita spp*, recovered in these samples have been considered to be domesticated squashes. Piperno (1999) based this inference on the size of the phytoliths. Peña Roja's Cucurbita phytolith average length is 71 µM, with a range from 52 - 120 µM. Usually the upper limit for this range is outside that of the wild *Cucurbita* (Piperno 1999). The most likely species of *Cucurbita* to be present at this time in the Amazon basin is *C. moschata*. Two other cultivated plants were identified based on the phytolith sample from horizon 5: bottle gourd (*Lagenaria siceraria*) and leren (*Calathea allouia*). Today the Huitoto and Miraña from the middle Caquetá river cultivate *Calathea allouia* for food. The rhizome is consumed cooked or roasted (Sánchez 1997:255). Other useful family plants detected by the phytolith analysis are Marantaceae and Zingiberaceae. The phytolith sample from horizon 5 was directly dated using radiocarbon. A determination of 8090 B.P. was obtained (see figure 5.1 and chart 5.1).

These three domesticated plants - *Lagenaria siceraria, Calathea allouia and Cucurbita spp* - are found together only in stratum A4b, - horizon 5 (figure 6.9). This fact suggests that by 8000 B.P. these tropical rain forest inhabitants had acquired some cultivars that they planted without significant clearings, as suggested by the absence of grass phytoliths (Piperno 1999). This information suggested that small-scale horticulture was practiced in house gardens at this time.

In summary, Peña Roja plant macro-remains and charcoal distributions suggest that an intense burning was practiced at this site during the preceramic occupation. However, fires were localized and did not involve extensive vegetation removal, as suggested by the phytolith sample. Furthermore, the carbonized seeds suggest specific activities related to food preparation and consumption. Even after the introduction of cultivars, by the end of horizon A4b, burning was controlled allowing plants to grow in a forest environment. Hence, horticulture was practiced in a highly altered forest: a humanized forest. Secondly, the archaeological data made it difficult to determine the limit between the "pure" hunter-gatherer and the agriculturists; horizons 7 -A6b- and 6 -A5b- have little, if any, evidence of any kind of horticulture. It looks like early horticulture did not substantially change the hunter-gatherer activities, at least as reflected in the archaeological record. The pre-horticulture inhabitants look pretty much the same as the horticulture inhabitants.

Environmental disturbance during the Peña Roja preceramic had a unique character.It imprinted in Peña Roja's landscape a unique feature that makes it, since the first human arrival at the Pleistocene/Holocene boundary, a special geographic location among the surrounding panorama. The natural vegetation composition was altered, giving way to important plants for human subsistence. Probably this humanized landscape was continuously redirected in each and every new occupation - i.e., seasonal camps -. This fact can explain, in part, successive occupations due to the fact that it became more attractive than other locations.

Less burning and a significant reduction of carbonized palm macroremains characterized Peña Roja's ceramic occupation. This fact can be interpreted in two ways. First, the way in which palms are used differs from one epoch to the other. The cultural practices, therefore, changed the rate of carbonization and consequently affected preservation. One implication of this is that ethnographic analogies can contribute little to our understanding of archaeological activities in this case. Second, during the ceramic occupation the lesser frequency of carbonized palm seeds is the result of a less intense use of these plants. Less intense use makes sense, considering that during the ceramic occupation agriculture also provided food sources. As well, soil structure during the ceramic occupation confirms intense agriculture, while during the preceramic soils lack structure. Palms, as suggested by the phytoliths, are important elements in Peña

Roja's ceramic landscape, but they are placed in a secondary position in relation to their use. Palms' economic value during the ceramic could be somehow similar to today's roll in native societies: they are indispensable resources used only from time to time for specific activities.

Lithic materials

Lithic classificatory schemes may vary depending on research questions and problems arising from a specific archaeological context. Peña Roja's preceramic component may contribute to our understanding of early tropical rain forest human occupation; however, many specific questions - that I did not address - can be formulated using these materials. Those questions are related to adaptation, logistical and residential mobility, and territoriality, to mention only a few. Peña Roja's lithic material analysis was an important task that took time and effort, in order to guarantee future usage of these materials. Not only was replicability of my own research the aim, but also the creation of a database that could be used to expand our knowledge in the future and allow new interpretations, and, if necessary, to change the current interpretations. The formal description of the lithic collection used in this research had been placed in a data base –Fundación Erigaie - in an electronic format. The electronic format chosen has advantages for storage, not to mention that with a few simple steps it can be exported to other applications in order to perform statistical analysis or to display results graphically. In the present case Microsoft Access and Microsoft Excel were used to create the graphics for this text.

The format used to collect and organize the information includes common attributes used in lithic analysis such as length, thickness, weight, usewear and size (see Andrefsky 1998; Kooyman 2000). In this particular case it was developed with Anthony Ranere's (Temple University) aid. This format is a fundamental part of Fundación Erigaie's archaeological database (see Urrego 1995).

Macroscopic analysis was chosen over microscopic analysis. Both systems have advantages and disadvantages. The former is less time consuming; however, the detail that can be acquired in determining differences between types of tool-use, damage, and intentional retouching is less accurate. In this particular case some potential microscopic analytical procedures were hindered by other factors. For instance, difficulties in acquiring chemical substances needed to do analyses such as microwear[2] contributed to the decision to do macroscopic analysis. A 6X to 40X microscope was used in order to verify initial observations of wear on

[2] For instance acetone, needed to take acetate peels for usewear analysis, is a substance controlled by the Colombian army. Consequently, to obtain an authorization to buy even small acetone quantities can take years. On the other hand, to export a significant part of the collection to another country, were acetone is more accessible, was to expensive and problematic. Despite the value of microwear analysis to determine functions of Peña Roja's tools, it was impossible to undertake in these research.

some stone tools as well as to determine the presence of residues - mainly pigments – adhering to some artifacts.

Three criteria constituted the basis for sorting lithic materials for analysis: raw materials type; artifact morphology, and identification of wear patterns. Lithic remains were first sorted according to presence or absence of use traces; when an item with use traces was recognized, it was further sorted flaked or ground-stone implement categories. Hence, for the lithic tool analysis two categories were considered: flaked and ground stone. Llanos (1995; 1997) focused on the study of ground stone with a comparison between ground stone tools from the preceramic and ceramic levels in the Middle Caquetá River. His work is the basis for ground stone tool analysis at Peña Roja. He analyzed from this particular site a sample of 402 ground stone artifacts (Llanos 1997:35). For the flaked stone tools, the analysis of the assemblage from Peña Roja 9 established the basis for a more detailed study using a larger sample from Peña Roja 10. Peña Roja 9 stone tool results have been published (see Urrego et. al., 1995; Cavelier et. al., 1995). In both cases the emphasis was placed on artifact use.

The Peña Roja lithic assemblage consisted of ca 19,000 pieces (Cavelier et. al., 1995:41); however, we included in this analysis only 30%, from which only 42% are artifacts. The sample selection was based on a previous inspection of lithics that show use. A set of nearly 2400 artifacts is a representative collection that allows us to reach some conclusion about these ancient tropical rain forest inhabitants.

Stone tools: raw materials

It is possible to identify two raw material groups based on their abundance (figure 6.10). The first includes quartz - 14% - and chert -60% -. From a quantification point of view these groups are comparable with an unidentified raw material's group -19% (figure 6.10 and 6.11). The second group - comparatively less abundant raw material -7% of the total sample - included quartzite - 3% -, sandstone -2%-, diorite -1% - and diabase -1%. Notwithstanding that all of them have a lower representation in the Peña Roja industry (figure 6.12 and 6.13), they can provide important facts in the history of this archaeological site. Others like petrified wood and limolite are less than 0,5% of the sample.

Although it is well known that rocks are rare or absent in Amazonia, the most common raw materials used in Peña Roja - chert and quartz - can be obtained in the river banks and creeks at low water level in the Middle Caquetá region. Consequently, changes in raw material frequency can be considered to be a result of human preferences and not a raw material source problem. Figure 6.11 shows how chert, the most commonly used raw material, declined above level.

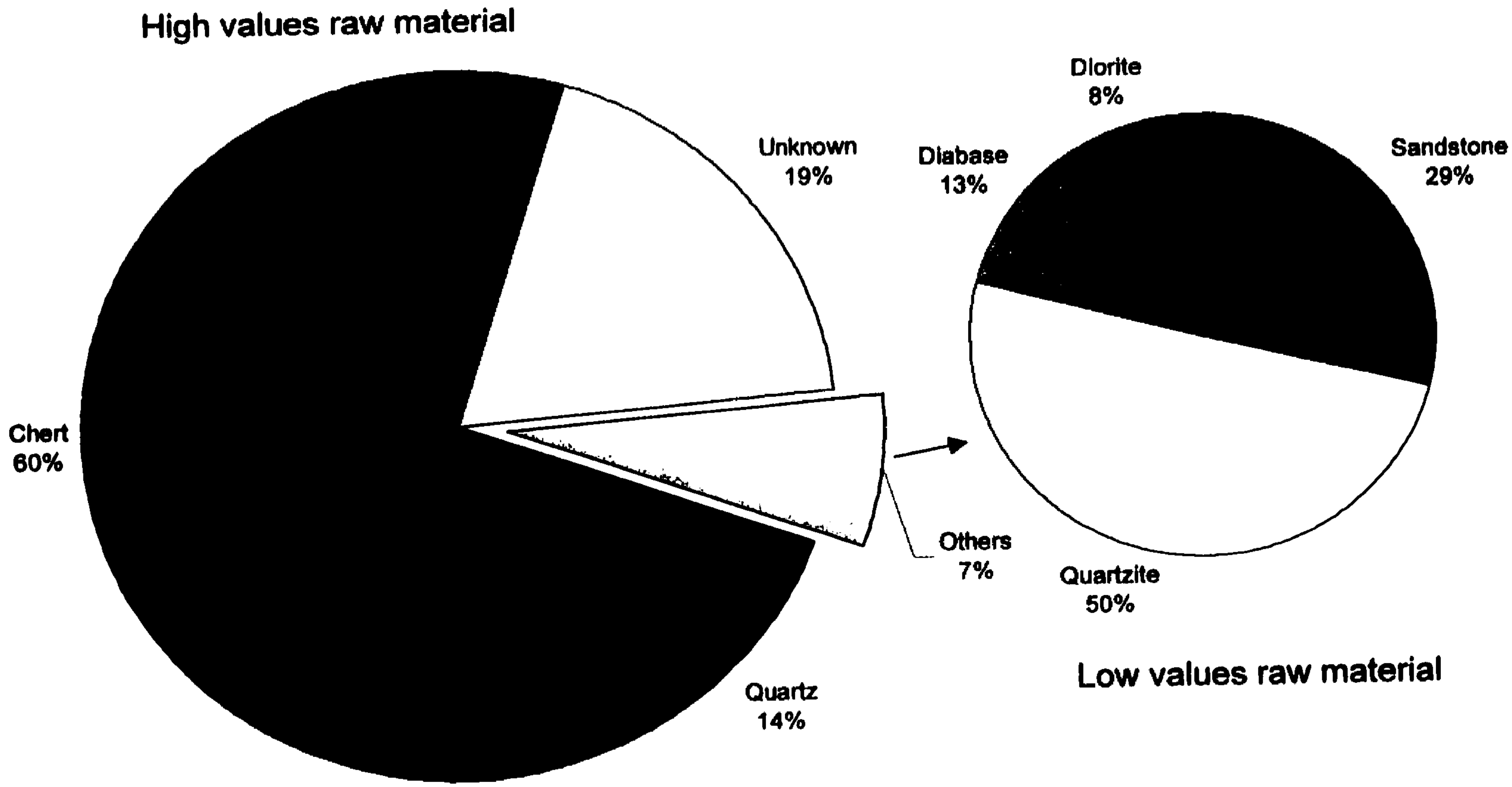


Figure 6.10 Stone tools: raw materials percentage. Peña Roja 10

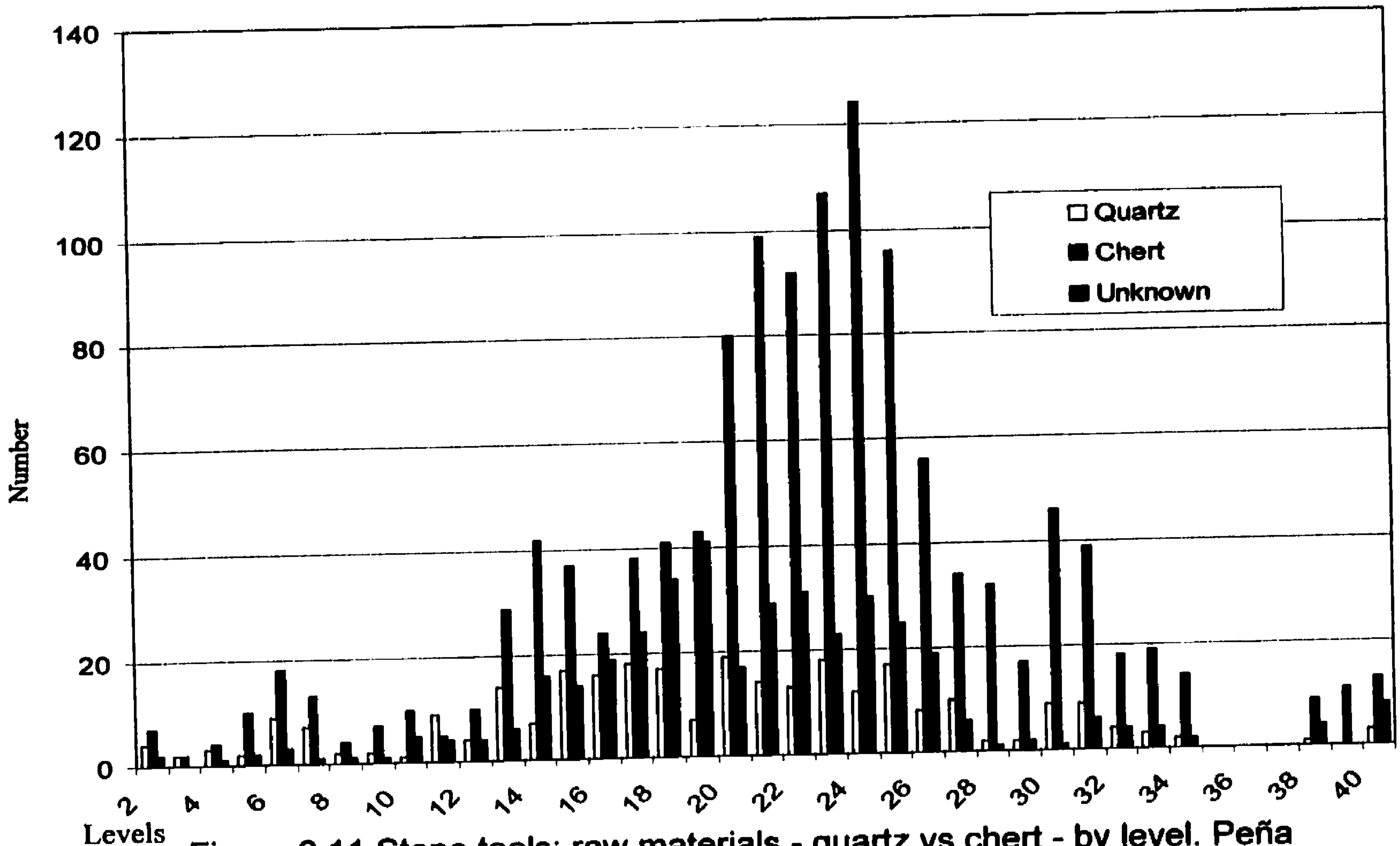


Figure 6.11 Stone tools: raw materials - quartz vs chert - by level. Peña Roja 10

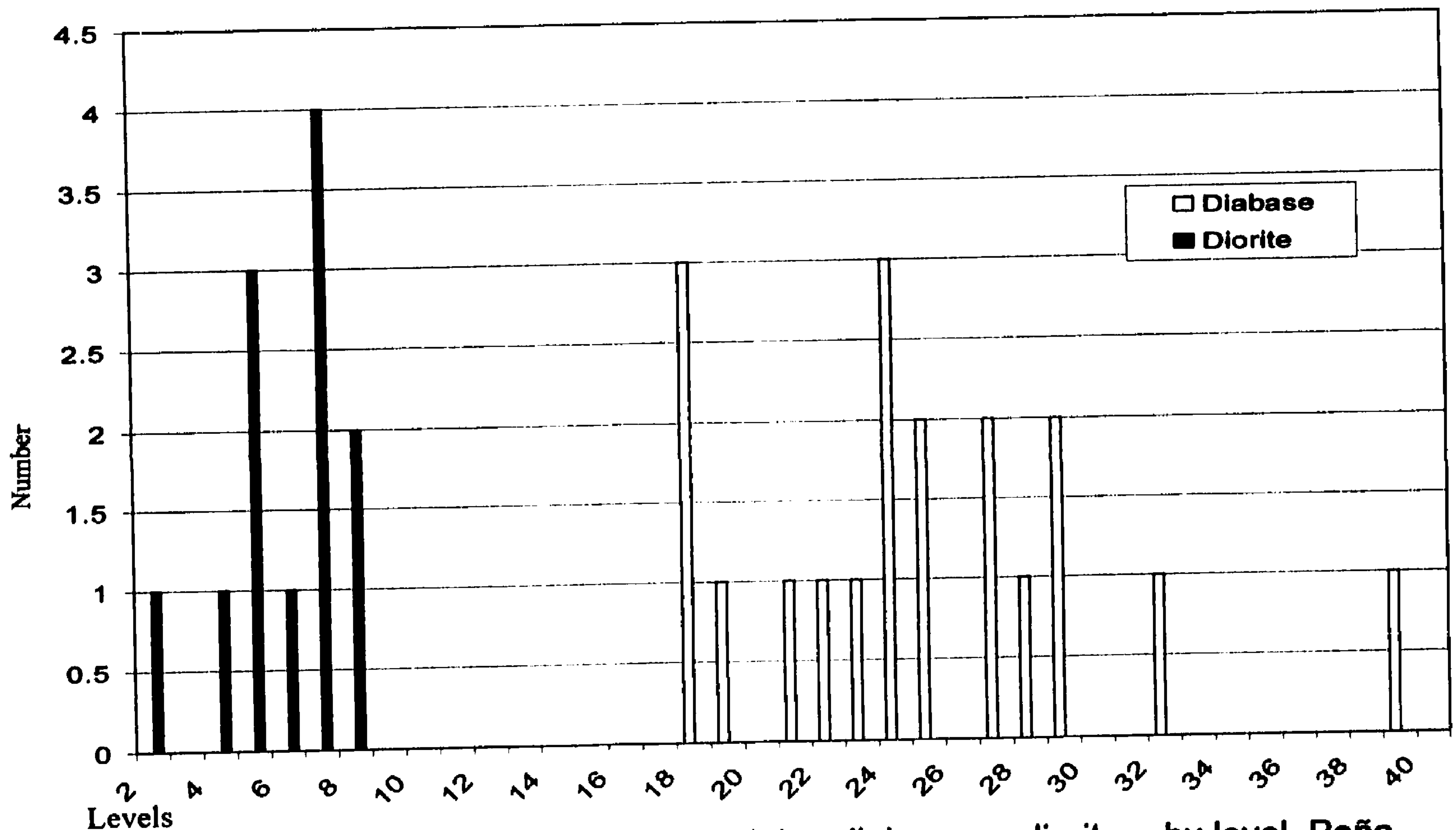


Figure 6.12 Stone tools: raw materials - diabase vs diorite - by level. Peña Roja 10

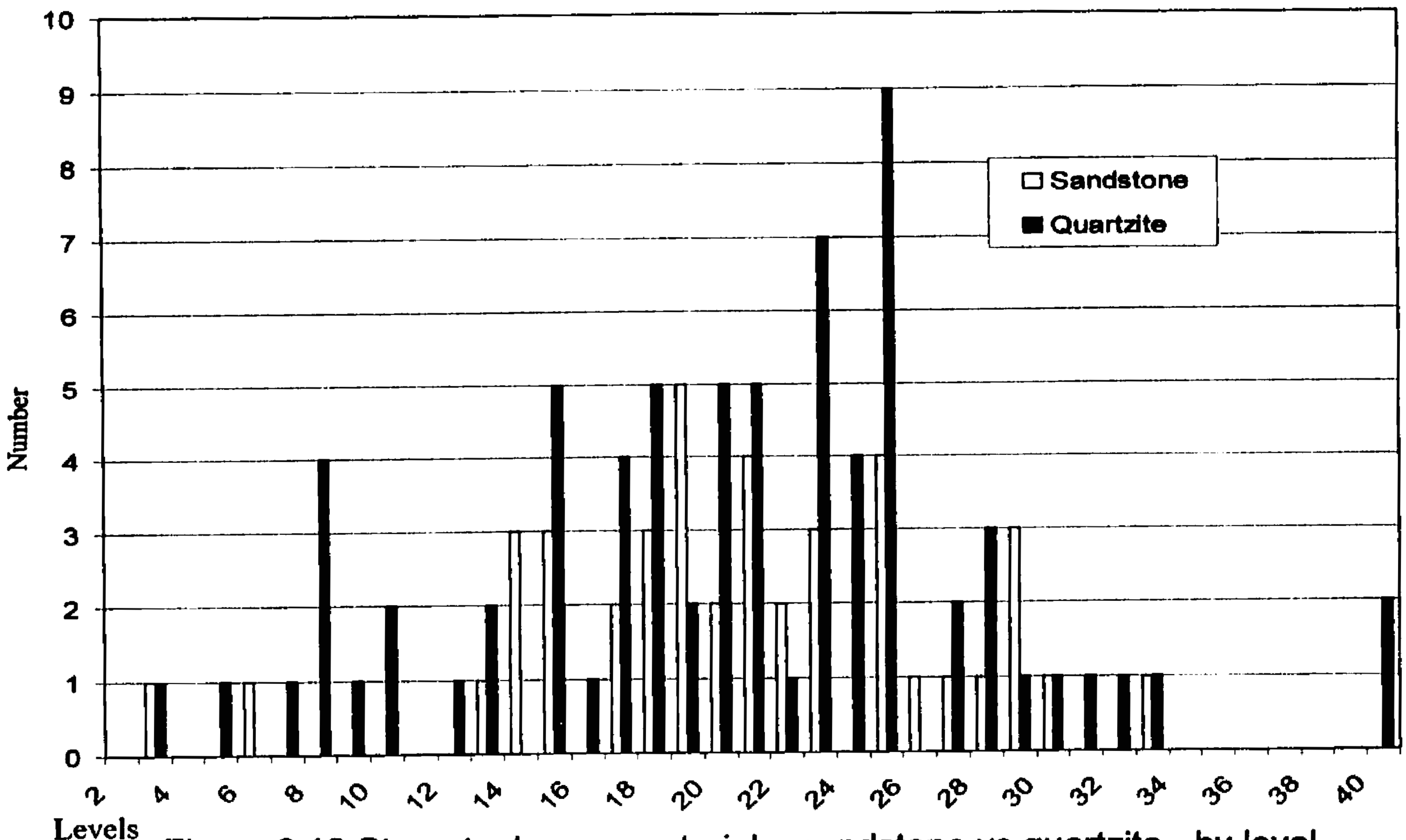


Figure 6.13 Stone tools: raw materials -sandstone vs quartzite - by level. Peña Roja 10

20. Indeed, the comparative percentage value by level shows an important change in raw material selection. In level 25 chert represents 69%, in 24, 74%, in 23, 72% in 22, 67%, and 69% in 21, dropping in level 19 to 47% and 44% in level 18. In level 16 it represented only 40%. These changes took place approximately at the beginning of pedological horizon 6 -A5b - (see figure 6.9). It is difficult to establish a direct relationship between this observed fact and other changes in the archaeological site at this time. However, it is important to notice, without implying a direct association, that horizon 6 yielded data related to the introduction of *Cucurbita spp*, - domesticated squashes - in the area.

Figure 6.12, on the other hand, shows some raw material was only used during Peña Roja's ceramic or preceramic occupation, but not in both. This is the case of diorite which appeared for the first time in level 9 - horizon 4 -A3b - but its first record as a raw material used for artifact production belongs to level 8. In Peña Roja 10, level 5 - horizon 3 -A2b - diorite reached a proportion even greater than quartz, one of the predominant raw materials in Peña Roja's lithic industry. This distribution suggests a strong association with the ceramic occupation. Diorite's total weight in Peña Roja is low, reaching only 177.7 grams. Probably diorite was imported during the ceramic occupation as raw material and worked at Peña Roja, as indicated by the fact that only 44% of the total diorite weight was used in artifacts. Diabase, on the contrary, is associated in Peña Roja with the preceramic. Despite its lower values, it appears only in the horizons belonging to this occupation (see figure 6.12). This material was mainly used for ground stone artifacts.

Ground stone industry

The main criterion used in this category was artifact morphology. Seven different tool types were identified: hoes; polishers; grinders; mortars; plates; hammers and *manos*. The distributions of these artifacts throughout Peña Roja 10 (figure 6.14) show a general tendency, a pattern also evident at Peña Roja 9. Each type distribution suggests different activities within the archaeological site through time.

Although hoes are present in Peña Roja's ceramic levels their highest frequencies occur in the preceramic lower levels - horizon 7 A6b. The earlier hoes are slightly different in shape compared to those of the agricultural period, having a rectangular or trapezoidal shape and a biconvex transverse section. Usually the broad area of the hoe shows usewear microflaked surfaces and occasional polishing at the extremity. The smaller end has marks that suggest that this tool was hafted.

Llanos (1997:37) established an average size - length, width, weight, surface and used surface- for these tools using three categories: small, medium and big (table 6.2). He suggested, based on the comparison of average size between preceramic and ceramic hoes, that the former were used to clean surfaces and open small holes in the ground, while during the ceramic period this tool was used to open more profound holes. The average size of used surface strongly supports this hypothesis. The studied sample suggests that there was a tendency for these tools to have middle body fracture, probably as a result of its use.

	Length Mm	Wide Mm	Thinness Mm	Weight Grams	Area Mm	Used area Mm
Small	42,2	29	7,5	20,7	1,480	80
Medium	56,6	42,2	13	71,3	2,680	160
Big	81	64	22	119	4,800	2.963,6

Table 6.2

Peña Roja hoe measurement. After Llanos 1997.

Polishers were found only in the ceramic and transitional levels of Peña Roja's horizons A1b, A2b and A3b (see figure 6.14). These tools are made from small-sized river rocks and were probably usually used in ceramic production processes, polishing or burnishing the pots before firing. Huitoto traditional pottery manufacture uses polishers in combination with natural resins to prevent leaking in liquid storage containers[3].

[3] See Herrera et. al., 1989

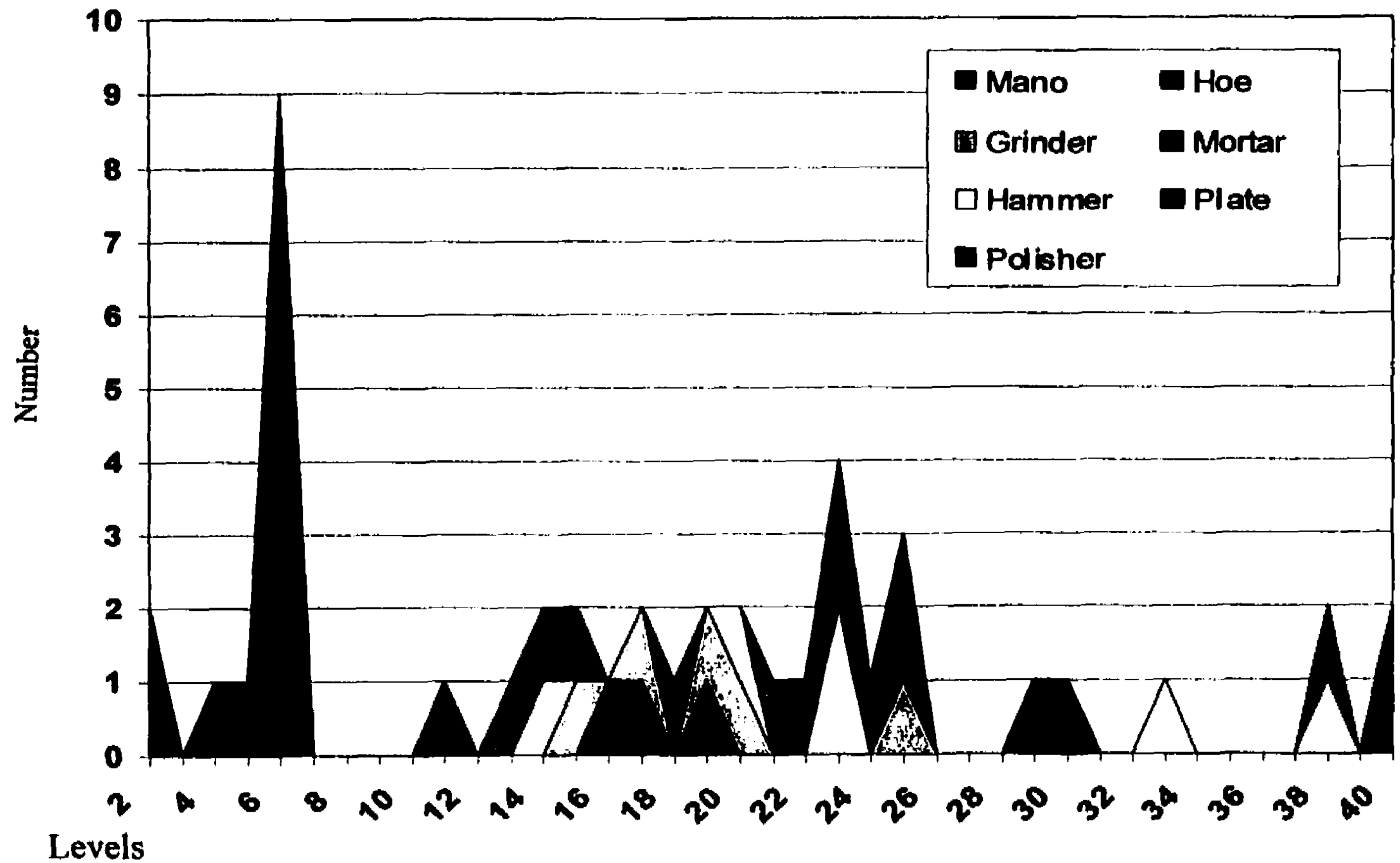


Figure 6. 14 Number of artifacts by level. Peña Roja 10

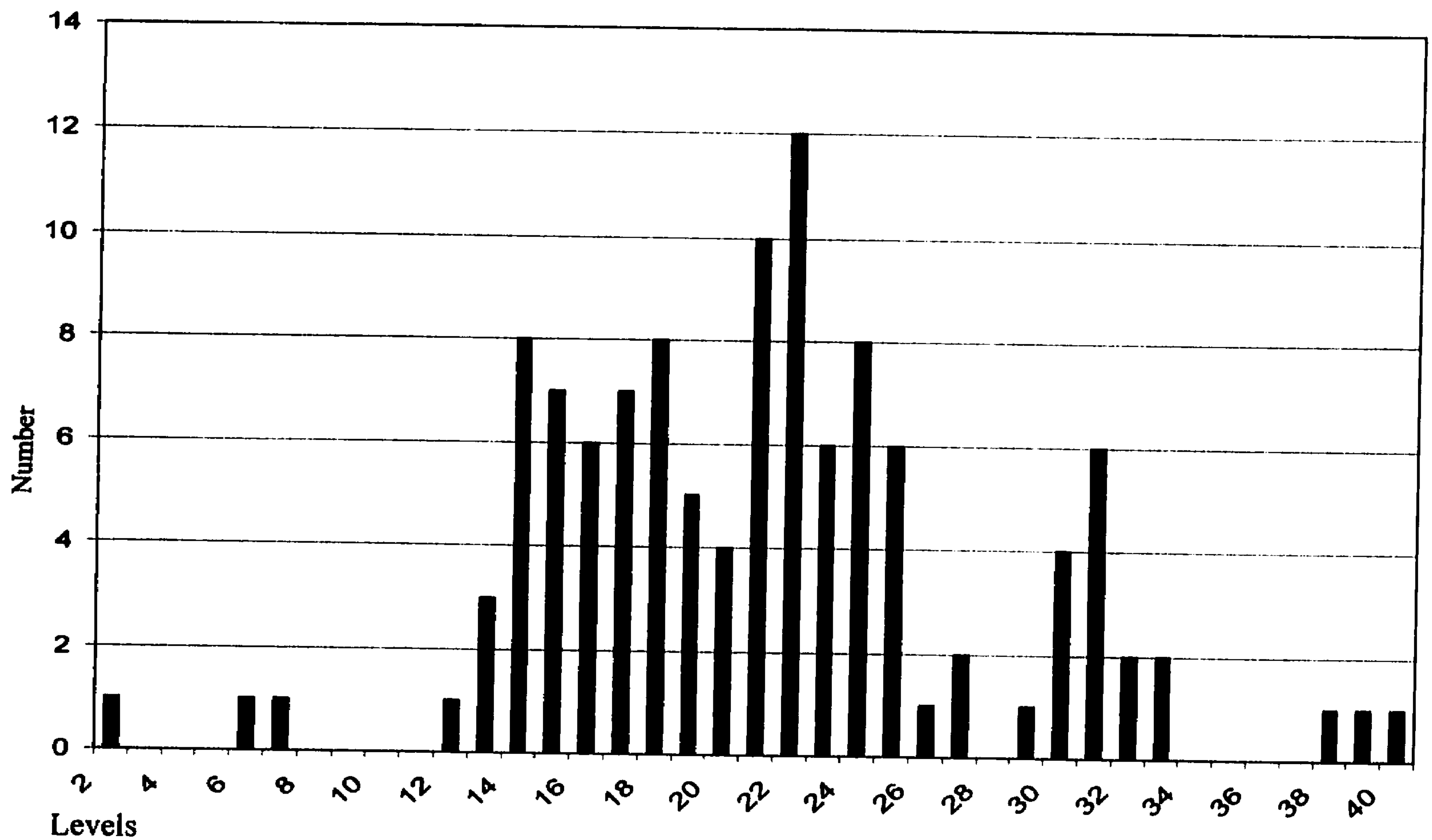


Figure 6.15 Stone tools: raw material heat treatment by level. Peña Roja 10

Buried ceramic production assemblages that include pigments, clay, and polishers are reported at Peña Roja (Herrera et.,al., 1987) and at Araracuara (Herrera, Bray & McEwan 1981). Usewear on ceramic polishers is distinguished by smooth shiny surfaces.

Two different grinding stone types were identified: those with lateral useware and those with polar usewear. Those belonging to the second group are larger and have larger useware areas (see table 6.3 and 6.4). Grinding stones have been recovered only in the preceramic levels of Peña Roja.

	Length Mm	Wide Mm	Thinness Mm	Weight Grams	Area Mm	Used area Mm
Small	39	35,5	17	52	2.666,6	297,3
Medium	64,7	50	26.2	----	3,900	1,882
Big	93	60	48	225,3	8,000	5,600

Table 6.3

Peña Roja polar grinders measurement. After Llanos 1997:42.

	Length Mm	Wide Mm	Thinness Mm	Weight Grams	Area Mm	Used area Mm
Small	63	42	14,2	44,3	1,450	59
Medium	81,5	58	22	82	3,000	1,300
Big	132,5	79	32	247	5,900	4,480

Table 6.4

Peña Roja lateral grinders measurement. After Llanos 1997:44.

Lateral grinding stones have an oval-shape and in general show a smaller use area, (as mentioned early; however, the usewear pattern identified in both of them is similar, suggesting analogous activities). Maceration of seeds and roots has been suggested as the probable activity associated with these tools as inferred by experimental maceration of these materials using analogous artifacts. No residues or phytoliths were recorded on these tools.

In Peña Roja's preceramic component the grinding stones are associated with mortars, that are, like the polar grinders, exclusively found in the preceramic. These artifacts are flat stones that have at least one surface with a concave usewear area. Generally this usewear area is one or two centimeters deep; diabase is the raw material selected for these artifacts.

	Length Mm	Wide Mm	Thinness Mm	Weight Grams	Area Mm	Used area Mm
Small	56,9	33,1	20.6	70	900	650
Medium	86,2	58,1	39,9	249,2	3.360	3.158,8
Big	113	86,7	74	860	8.057,1	7.350

Table 6.5

Peña Roja mortar measurement. After Llanos 1997:53.

Two kinds of plates were identified in Peña Roja: smooth plates and rough plates. The main difference among them is the raw material grain size, which gives the former a scabrous surface. Llanos (1997:59) identified one subset within the smooth plates: pigment plates. Mineral colored residues were found adhering to the plates. However, the general morphology as well as the size of those plates do not show any other special feature to justify this separation. Nonetheless, it is necessary to mention that plates with colored residues were only recovered in Peña Roja's transition and preceramic levels. Ceramic mortars with the same mineral colorants have been recovered from the Peña Roja ceramic levels, suggesting a technological replacement during this occupation (Herrera et. al., 1987). Llanos (1997:61) suggested that rouge plates were used to macerate palm seeds.

Australia's ethnographic record suggested that hunter-gatherers living in tropical forest environments may develop a special ground stone technology to use the rich vegetal resources of their environment. These lithic artifact includes axes and other special purpose tools. In Harris words.

> (They) ...very large stone axes used, for example, to lop off the fig tree buttresses, and two unique types of specialized nut-processing stone tools. The first of these was a large anvil stone pitted with small spherical depressions, accompanied by a small hammer stone, used to crack open the exceptionally hard nuts of the Queensland almond (*Elaeocarpus bancroftii*). The other was an ovate or rectangular grooved slab (the *morah*), used to macerate nut kernels, especially those of the yellow and black walnuts (*Beilschmiedia bancroftii* and *Endiandra palmerstonii*) (Harris 1987:359).

Peña Roja's ground stone technology may represent specific or generalist adaptation, depending on resource availability throughout time. However, it is difficult, based on the information at hand, to specified the resources associated with these lithic technology.

Hammers show an even distribution along Peña Roja's archaeological levels; however, they do not appear in Peña Roja 10's ceramic level sample (figure 6.14), but they were recovered during the field season of 1988 and 1989. The characteristic usewear of these artifacts is a small flake off; I suggest that they were used as hammers in stone tool production and for seed crushing.

A few manos were recovered at Peña Roja in levels 20 and 25. These artifacts have convex smooth surfaces. Occasionally they show small flake damage such as one would expect on hammers, but they are larger than hammers.

Flaked industry

Peña Roja flaking techniques were quite simple: direct chipping on chert cobbles, with slight retouch if any, producing abundant waste flakes with no indication of use. Technological characteristics, including flaking and retouch techniques, and wear patterns and used edges were considered for every item. Special flaking techniques such as bipolar chipping has been recognized, resulting in characteristic bipolar flakes; however, these techniques represented a small fraction of the sample. Unifacial tools, produced with a simple technique, predominated within the Peña Roja lithic assemblage.

Heat treatment to improve flaking quality of the raw material was rare, with only 5.6% of the studied tools showing evidence of such treatment. This technique was used mainly during the preceramic; the ceramic levels have only a few examples (see figure 6.15).

Stone tools are distributed throughout the archaeological levels with a gap between levels 35 and 37, which have no artifacts at all – (see figure 6.14 and 6.16). Important changes in charcoal distribution near these same levels were recorded and will be discussed later on. The major concentration of flaked stone tools is in levels 20 to 25. The levels comprising the transitional zone and the agricultural epoch have lower frequencies, as do levels 26 to 34 (see figure 6.16)-. Types based on morphology and function, include cutter-knives – (figure 6.18), perforators (figure 6.19), wedges – (figure 6.20), and scrapers – (figure 6.21), within chipped specimens, separating them from cores and debris were defined. Nearly 40% of the tools considered could not be identified as to type. Figure 6.17 shows the distribution of flaked stone tools by type.

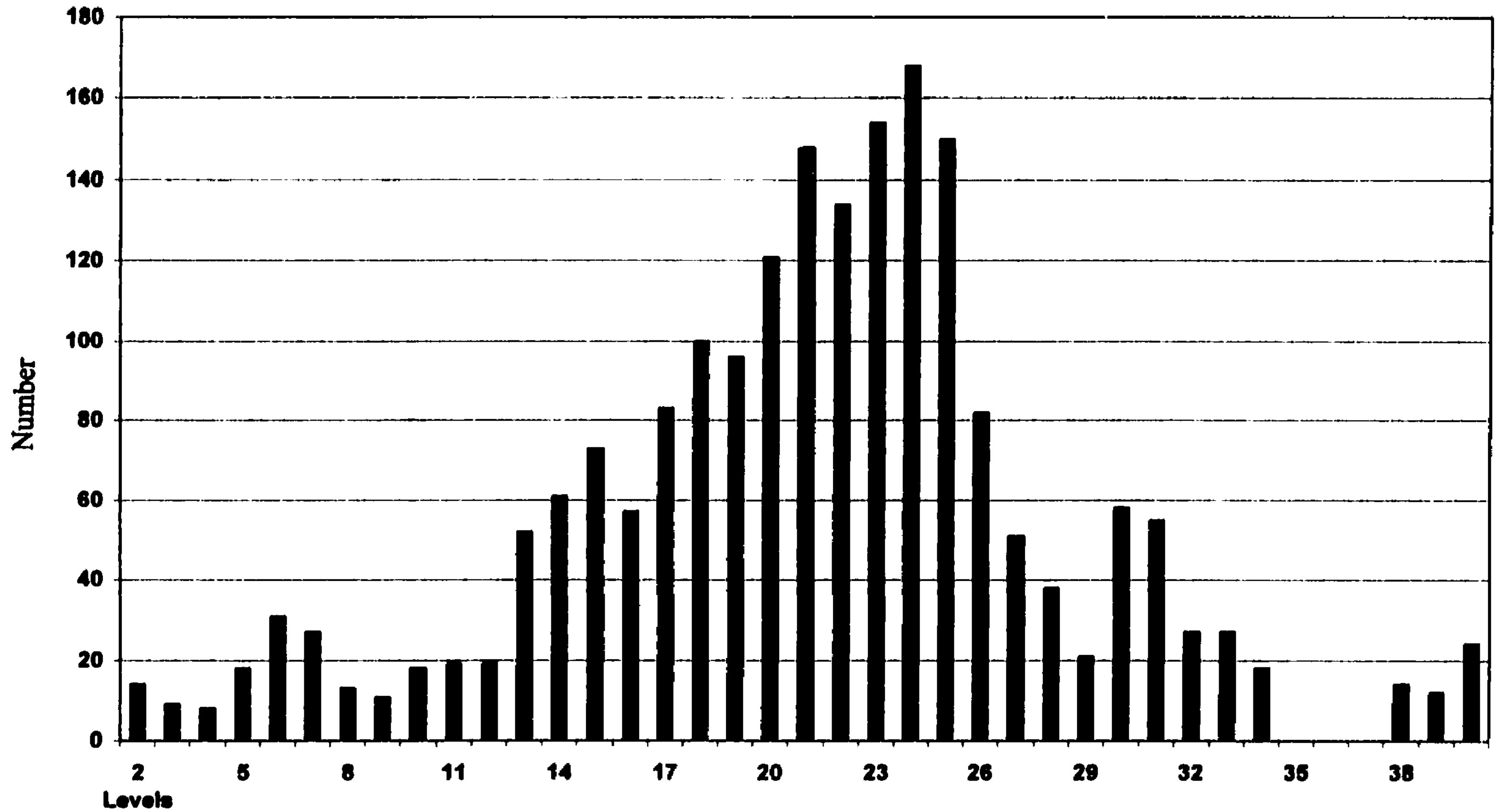


Figure 6.16 Flaked Artifacts by level. Peña Roja 10

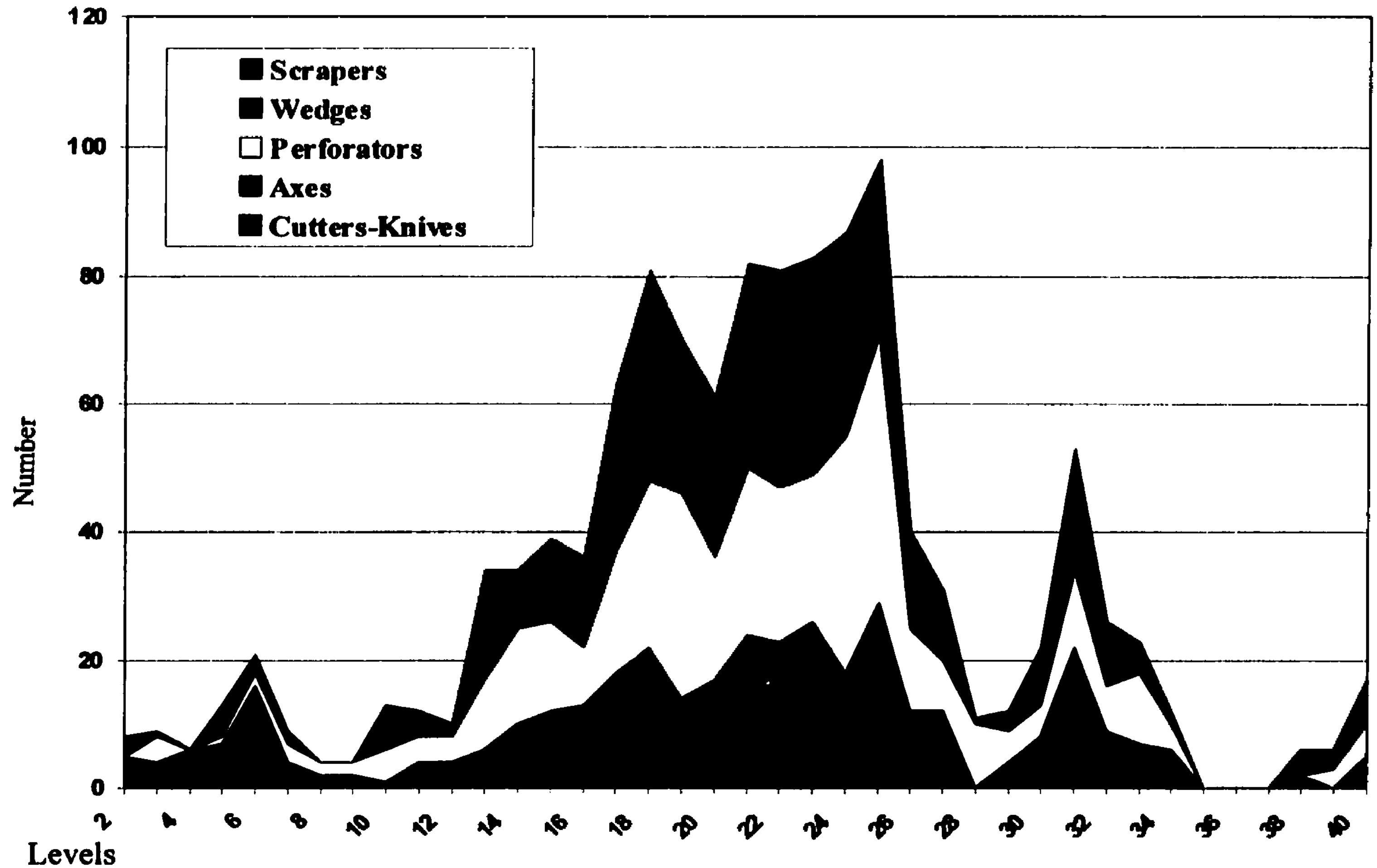


Figure 6. 17 Artifacts Peña Roja 10

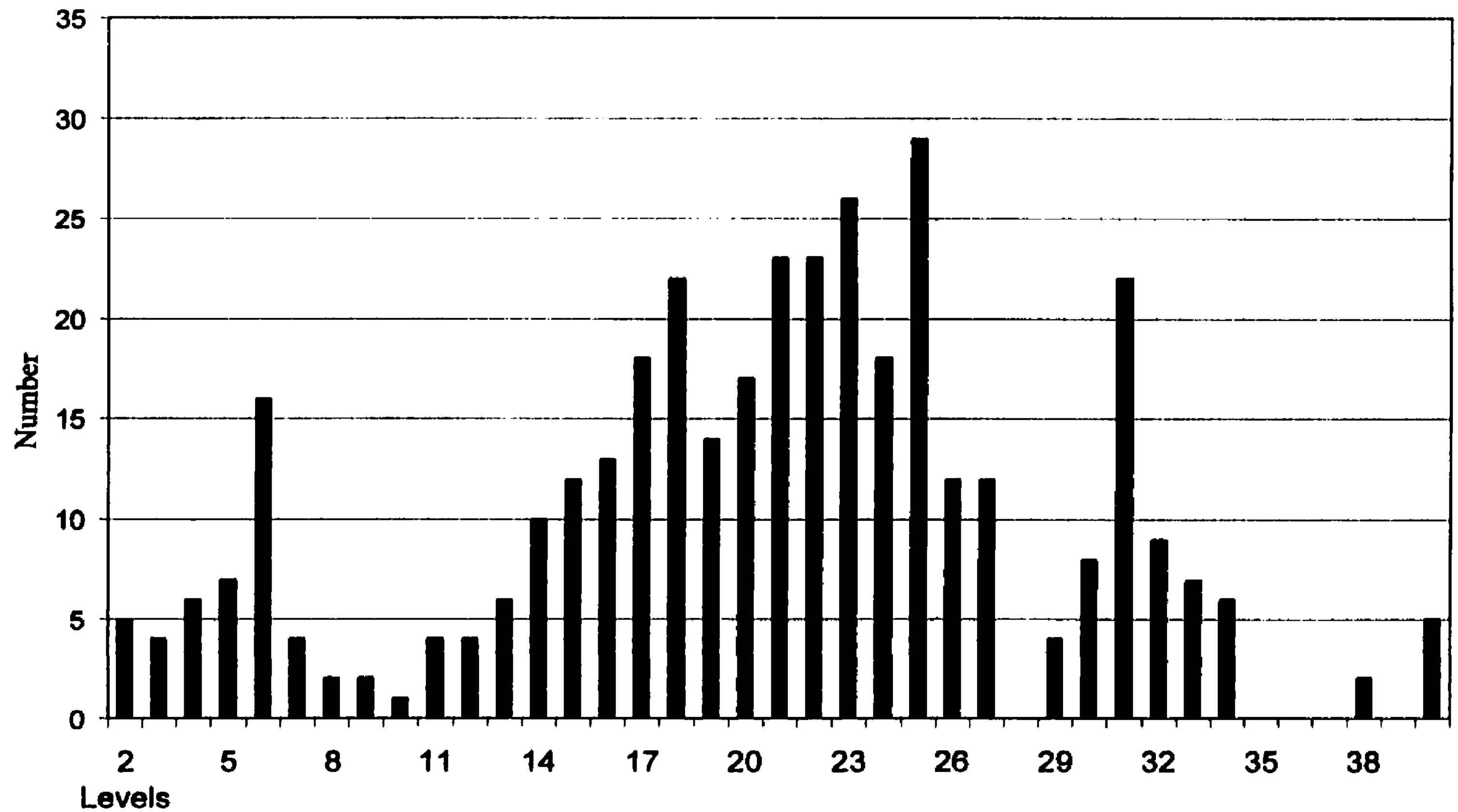


Figure 6.18 Cutter - Knives distribution by level. Peña Roja 10

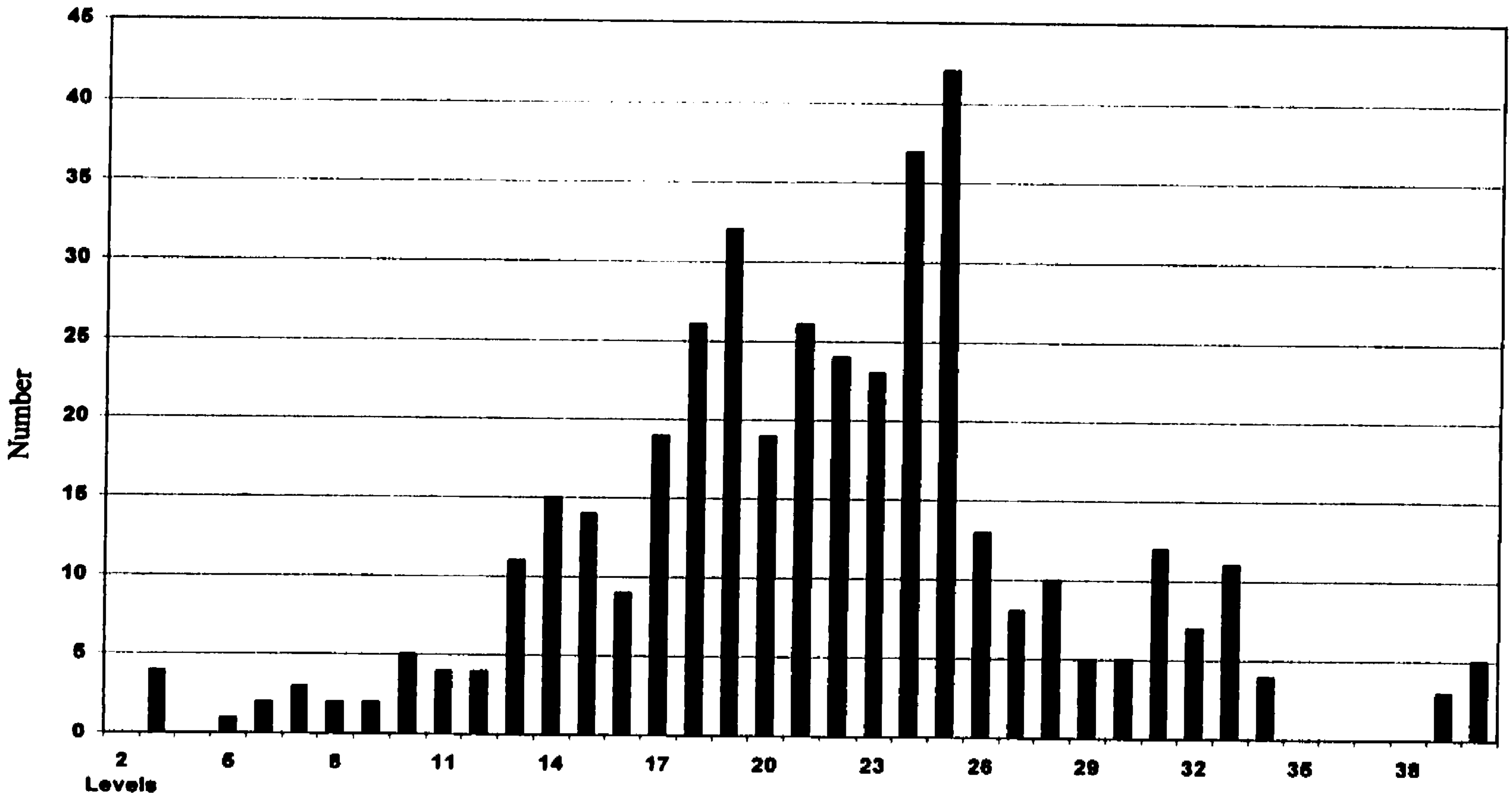


Figure 6.19 Perforator distribution by level. Peña Roja 10

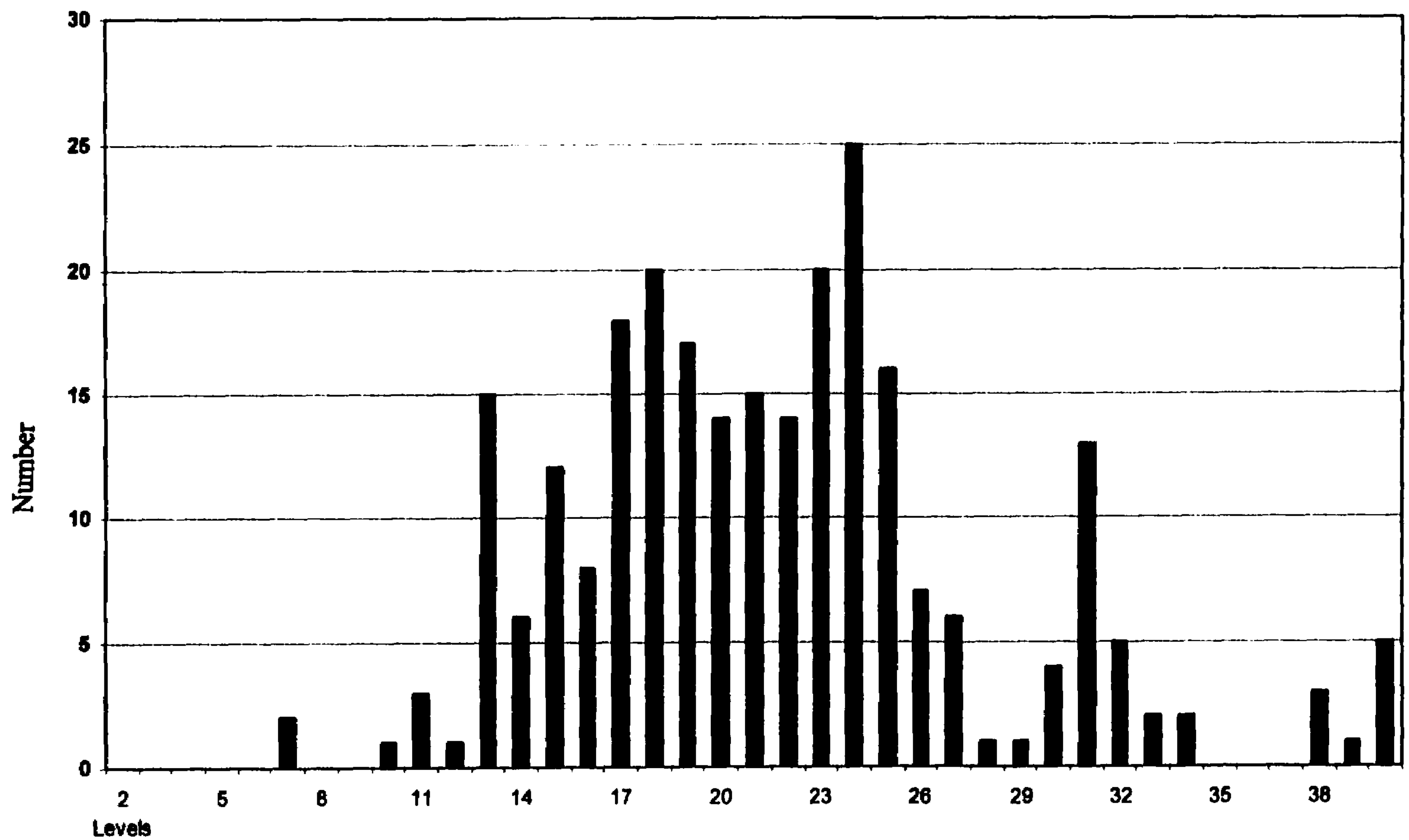


Figure 6.20 Wedge distribution by level. Peña Roja 10

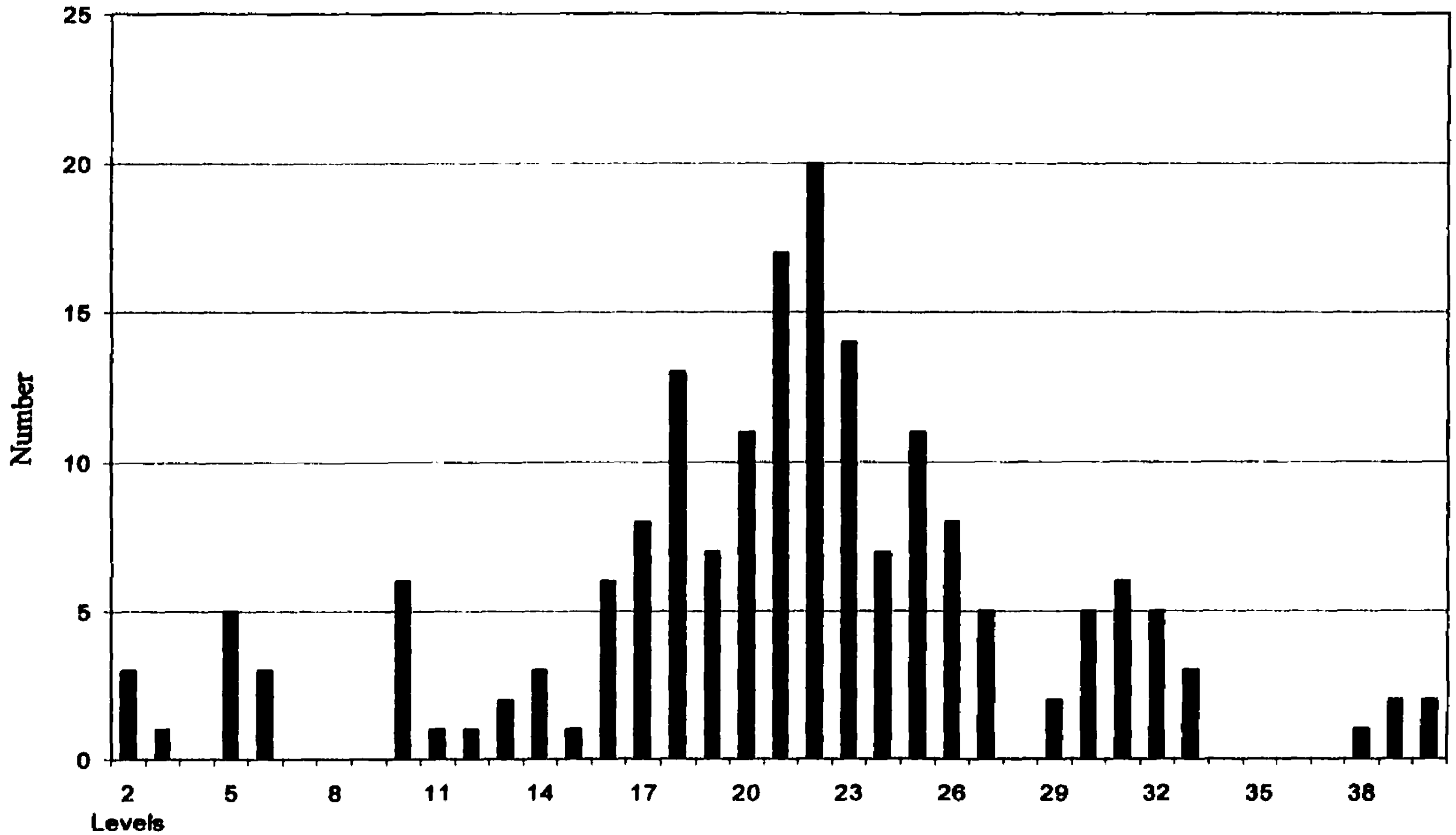


Figure 6.21 Scraper distribution by level Peña Roja 10

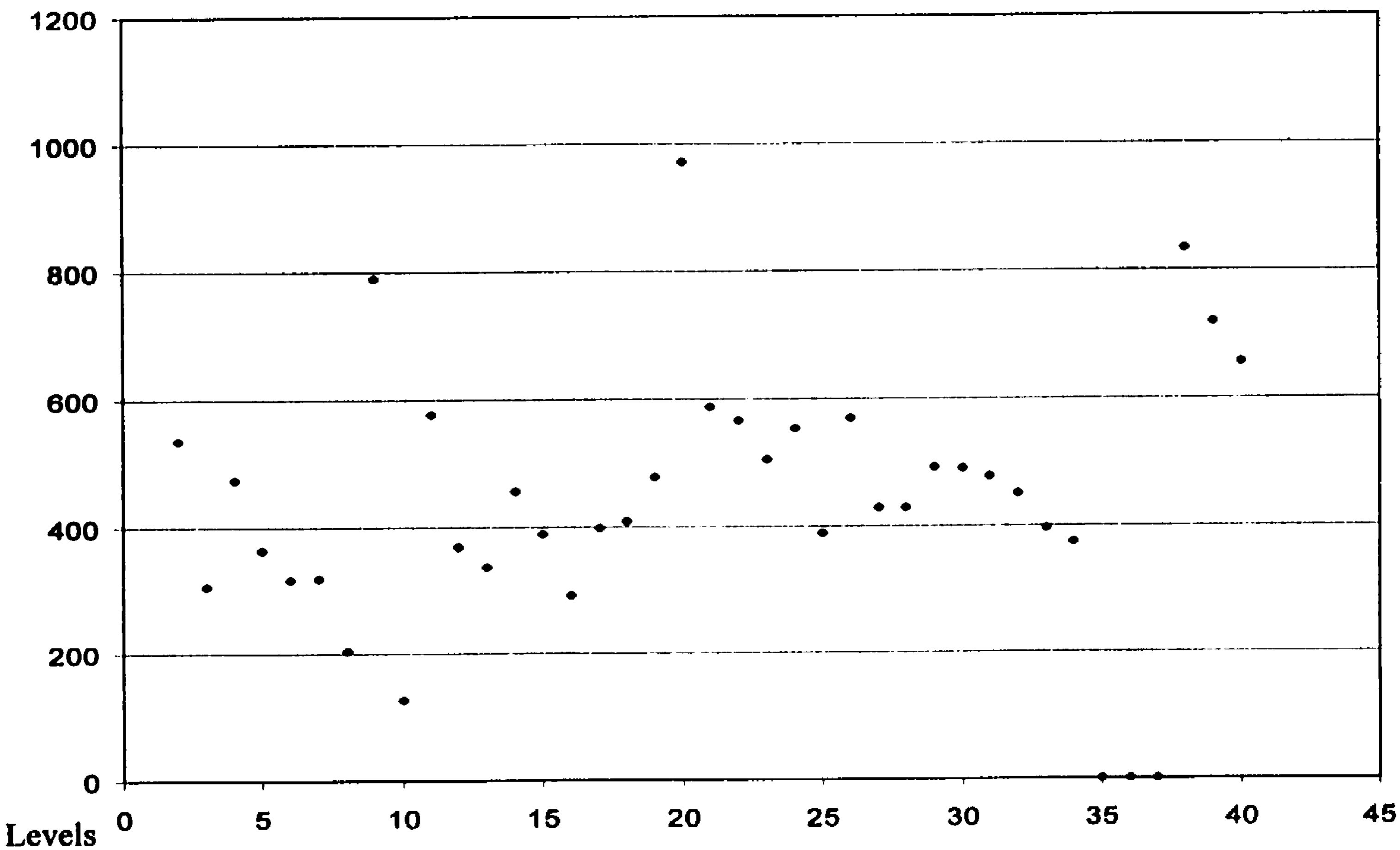


Figure 6.22 Flaked stone tools. Tool average area by level. Peña Roja 10

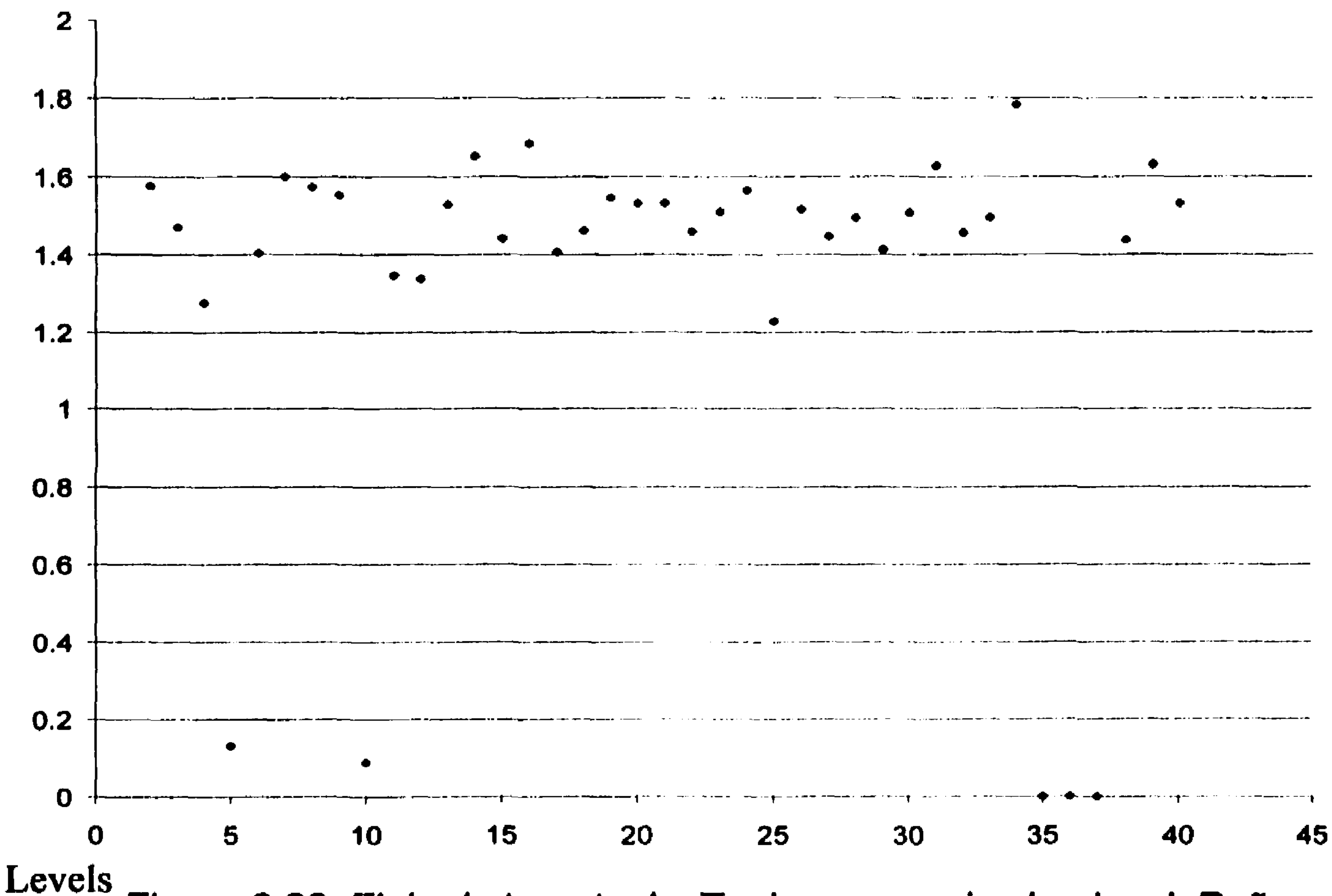


Figure 6.23 Flaked stone tools. Tool average size by level. Peña Roja 10

Axes appeared only in levels 21 and 22. Wedges – (figure 6.20) are present only during the transitional zone and in low percentages, while have important values during the preceramic.

The tools that occur during the preceramic are knives, scrapers, perforators and wedges, with knives and scrapers being the predominant tools. Differences noted between the preceramic and ceramic-occupation stone tool assemblages included polish, evidently produced by cutting soft materials such as skin and flesh, on some specimens from the ceramic levels and microflaking on some preceramic tools, possibly produced by scraping or otherwise using lithic tools against hard surfaces such as wood.

Based on the measurements of the stone tools, some indices were calculated. These indices may provide some clues about changes in stone tools through time, reflecting changes in cultural preferences, technological abilities, and possibly in their uses. The calculation of length times breadth was used as an index of area, and length divided by breadth as an index of size. A third index was calculated by dividing the breadth by the thickness. This last index, however, did not show any significant variance throughout the archaeological levels. Figures 6.22 and 6.23 show the averages of these indices by level in Peña Roja 10.

An interpretative discussion of the results of the analyses of the archaeological materials is presented in next chapter.

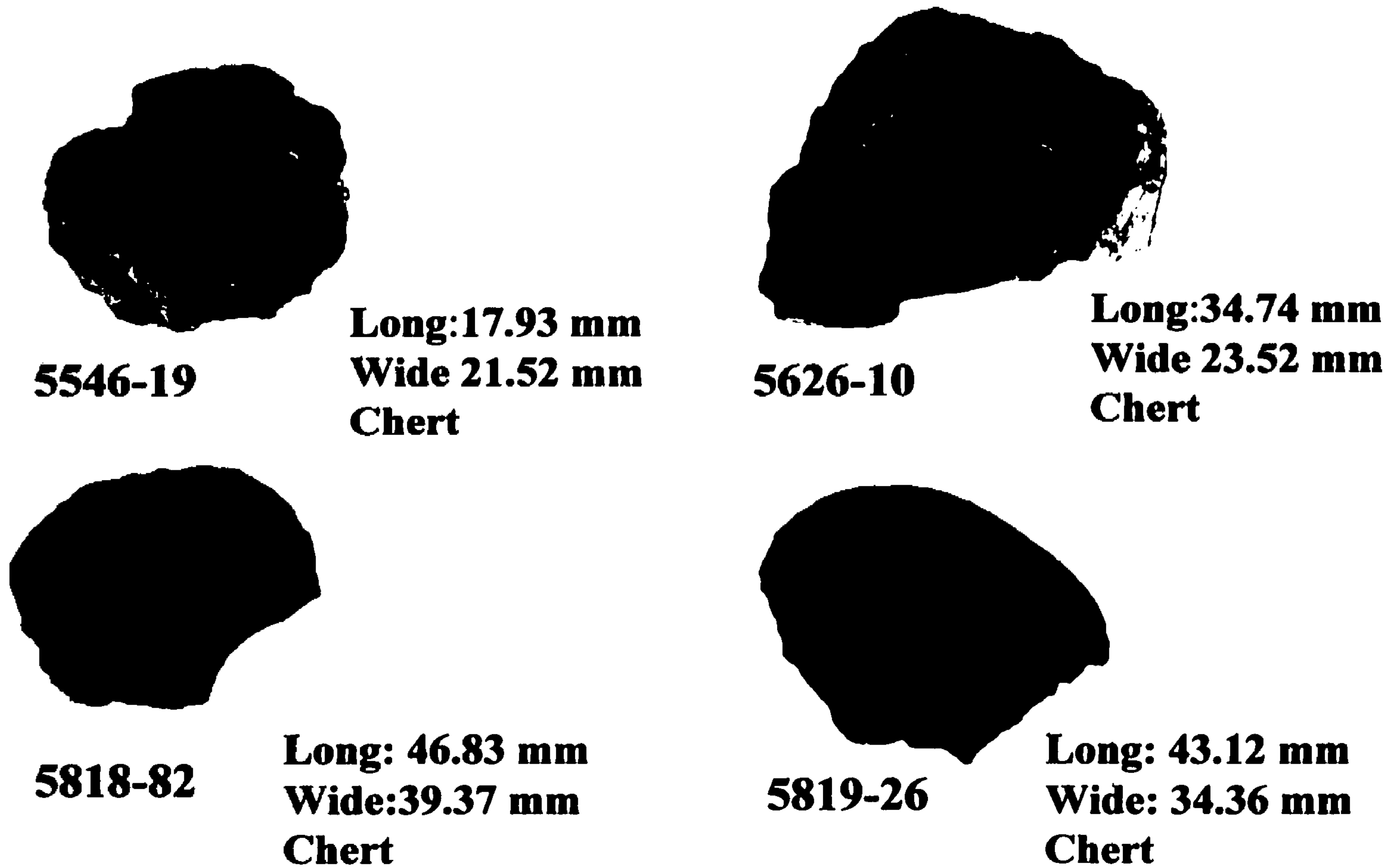
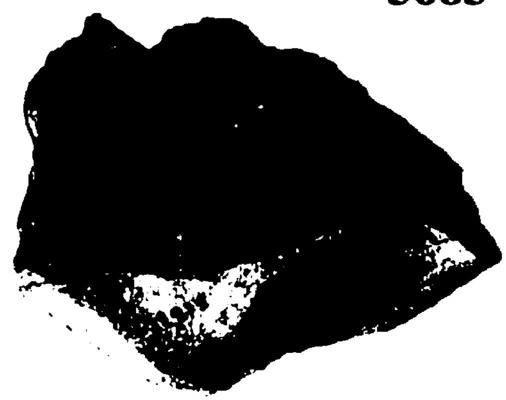


Figure 6.24 Peña Roja Site stone tools. 5546-19 and 5818-82 cutters. 5626-10 scraper. 5819-12 unknown.

5506-29

Long: 28.8 mm
Wide: 17.78 mm
Chert

5683-25



Long: 38.8 mm
Wide: 21 mm

Figure 6.25 Peña Roja Site stone tools. 5506-29 cutter and 5683-25 Unknown.

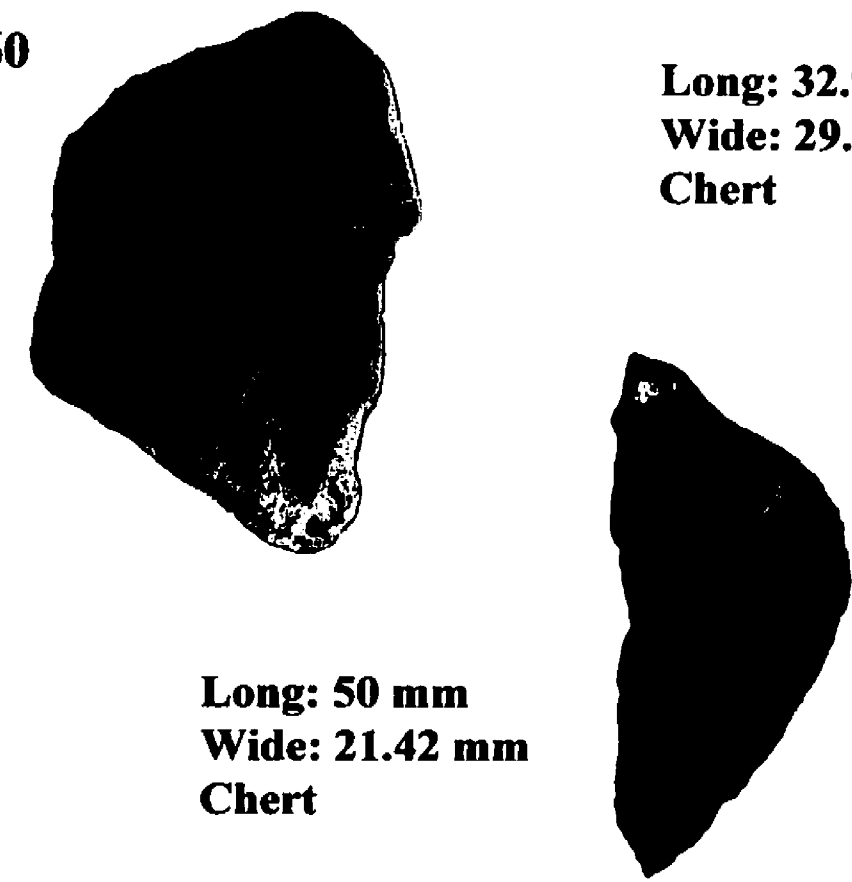


Figure 6.26 Peña Roja Site stone tools. 5666-160 and 5682-1 Perforators.

Long: 57.2 mm
Wide: 32.96 mm
Chert

5818-5

Long:54.46 mm
Wide 34.2 mm
Chert

5819-38

Figure 6.27 Peña Roja Site stone tools. 5818-5 scraper and 5819-38 cutter.

CHAPTER 7

AN INTERPRETATIVE REVIEW

Peña Roja Landscape and history

Different lines of evidence - palynological, archaeological, geomophological, botanical - presented in previous chapters helped in the reconstruction of Peña Roja's natural and cultural history since the beginning of the Holocene. In this chapter I will present a synthesis based on those data.

Circa ten thousand years ago a global transformation affected the climatic patterns in Amazonia and the Andes. Climatic change brought dryer and hotter conditions to the tropical lowlands, altering forest distribution. Forest fragmentation and replacement was common at that time. The northern and southern Amazonian regions suffered drastic changes. In the northern part of South America a vegetation cover similar to that of today's tropical savannas developed: scattered bush vegetation in an open, grass landscape contrasted markedly with gallery forests that grew along river and creek banks. The radical contrast between a long dry period, with dusty winds, and a short humid rainy season created a landscape quite different from a tropical rain forest. Immense lakes, such as Lake Valencia in Venezuela, dried up at this time. South of the

Equator a similar process has been documented. Nonetheless, some areas, in what is known today as Amazonia, had a dense forest cover. It is reasonable to assume that this forest may have had a different composition than today's tropical rain forest.

The climatic changes, however, not only altered the composition and distribution of the vegetation, but the river courses also were drastically transformed. It was at this time that the Caquetá river defined its present course. This process gave rise to terraces along the margins; low terraces, high terraces and floodplains gradually formed. The vegetation cover of these areas may have varied accordingly to flood frequencies and soil characteristics; however, there are reasons to think that a forest rich in palms was characteristic of this new landscape. We do not know much about the vegetation composition in Peña Roja at the time, but palms played an important role.

Not long before all these changes took place, humans moved into the new landscape for the first time. Caquetá riverbanks and particularly Peña Roja's terrace became a suitable location for human occupancy. The central area of this terrace was an ideal place to locate a camp, due to its elevation over the river which prevents flooding even during the worst rainy season.

The first evidence of settlers occurs in the stratigraphic column by the middle of horizon 8 - A7b - (see figure 6.9). Although there are some archaeological materials, including stone tools, in horizon 9, they are best explained as intrusive as a result of the activities of the inhabitants of horizon 8. Indeed, there are indications of disturbances of this lower horizon. On the other hand, it is not completely clear whether horizon 8 has one or two occupational episodes; artifact distribution - mainly flaked tools - shows a cluster around level 32 - see figure 6.17 - and above a cluster around level 25. This fact could be interpreted as two different occupations, at least in time. However, the archaeological characteristics of both are very similar.

What resources Peña Roja offered to the newcomers is still a topic of debate. We suppose that proximity to the river can be explained in part as a function of fishing activities. However, we do not have direct evidence of this. The abundance of some carbonized seeds of plants that are used today as fish bait can be interpreted as indirect evidence of fishing. On the other hand, there is no direct evidence of hunting; however, some stone tools suggest hide processing and wood work. Because of the poor conditions for preservation, it is unlikely that tools directly associated with hunting or fishing –e.g., projectile points, hooks, nets—would be recovered since they were likely made of wood, bone, fiber and other perishable materials. It makes sense to use the rich resources of the forest to produce tools that can be replaced almost immediately after their loss or damage. Other direct evidence like bones have an equally poor chance of surviving in the warm, tropical environment.

The stone plates, grinders and mortars recovered from these early occupational levels are probably associated with the preparation of palm seeds for consumption, a likely interpretation in the light of the Amazonian ethnographic record. In the same vein, edible rhizome consumption can be inferred at this time from the presence of hoes, probably used to extract the edible part.

The lithic industry at this time was simple. Mainly chert was used to produce artifacts including scrapers and wedges, worked by percussion and without much retouch. These were expedient tools. These unifacial tool assemblages could be associated with a life style characteristic of nomadic peoples, hunters, fishermen or people gathering and manipulating some plants. Either way, it suggests a broad spectrum economy, not specialized hunting.

By the beginning of horizon 6 - A5b - around levels 20 to 21 in Peña Roja 10 - some changes are revealed. The combination of these small changes suggests a different emphasis in the activities. Up to that time the occupants preferred chert as the raw material for their stone tools; however, at this site a sudden decrease in its popularity was recorded (figure 6.11). Another notable change is a reduction in the amount of charcoal, collected manually (figure 6.4) or by flotation techniques (figure 6.3) in the same levels. This momentary charcoal reduction is concomitant with the introduction of some cultivars such as squashes (*Cucurbita spp)*. Later on, but in the same level, gourd, *Lagenaria siceraria,* and leren, *Calathea allouia,* are recorded. This last plant has an edible rhizome. There is no evidence suggesting that the introduction of these early cultivars was associated with the creation of large open spaces. On the contrary, the phytolith samples suggest that a forest environment was present. It is worth mentioning that in level 21, for the first time, an axe was recorded in Peña Roja 10, and from level 20 onwards there was a steady decrease in the frequency of scrapers (see figure 6.21). The sedimentological data for level 21 show an increase in clay and a decrease in silt (see figure 6.1), which could be indicative of changes in human activities.

A more clear-cut change is apparent between the initial used of cultivars in horizons 5 and 6 and the transition zone - horizon 4 - below Peña Roja's ceramic component - horizons 3 and 2. As noted in Chapter 6, the reddish-brown transition zone contrasts with the soil horizons above and below it, and it contains a markedly lower frequency of cultural materials. Soil characteristics such as organic matter content and phosphorus values corroborate two different stages in the occupation of the site.

The lithic materials, in general, show more variety in tool types in the preceramic levels. Some artifacts like wedges, an unidentified flaked tool type, and polar grinders are particular to these strata. Mineral colorants were used during the preceramic in combination with stone plates, but not during the ceramic, where they have been found in association with ceramic mortars. Probably, during the preceramic, mineral pigments were an important part of body painting, a ritual and medicinal practice that some Amazonian native communities still preserve. All these tool types and residues represent specialized activities carried out at this site. These in combination with the abundance of stone tools and debitage suggest that Peña Roja was a campsite and a workshop. Probably, it was used in different opportunities in residential mobility; however, there are not known other archaeological sites with similar characteristics - tool assemblage and chronology - in the region to make comparison and identified activities.

During the ceramic occupation, ceramic polishers, knives, scrapers and perforators are the predominant stone tools. This may indicate an emphasis on cutting tools and ceramic production; conversely, during the preceramic, woodworking or other tasks related to forest resource use seem to have been emphasized. This, of course, does not mean that during the ceramic time wood working disappeared. The ethnographic record shows how sedentary villagers produced arrowheads, bows, macanas, canoes, fermenting troughs, wooden matates using wood but only that it was different. A further difference is evident in the use-area index (length x width) for the flaked stone tools, with the ceramic levels showing markedly greater variability than the preceramic levels (figure 6.22). The average size of the stone tools, however, does not change much throughout time (figure 6.23).

The plant remains provide information on the diet. Protein-rich, nutritious palm fruits like *Oenocarpus bataua, O. mapora* and *O. bacaba* are present in all archaeological levels. They seem to have been of primary important during the preceramic occupation. However, during the ceramic occupation their frequency dropped dramatically. One possible explanation is that agricultural production reduced the dependency on this "wild" resource. *Mauritia flexuosa*, a source of carbohydrates, was an important food resource during the preceramic, and continued as an important food and during the reoccupation (figure 6.8). *Attalea racemosa*, in contrast, occurs exclusively in the preceramic. Preservation, of course, is an important issue concerning carbonized plant macro remains and must be taken into account when interpreting the frequency record. The pattern at Peña Roja may reflect either changes in the ways that palms were used or prepared for consumption - utilization that may or may not contribute to their preservation - or in use abandonment. Edible rhizomes of plants like *Calathea allouia* provided other important carbohydrates.

In short, Peña Roja's archaeological evidence shows a long history of at least four economic, social, and ecological arrangements. The oldest is characterized by a broad-spectrum economy, based on the use of natural resources. The exploitation of game and fish, as well as fruits and roots, comprised the subsistence base. The second one was not very different in quantitative terms, but introduced some important qualitative changes. Plant experimentation, associated with the introduction of at least one cultivar, is indicative of a change in human-plant interaction at this time. These processes were probably associated with other changes in activities such as the abandonment of *Attalea racemosa* as part of the diet, or at least changes in the way it was used, or a new emphasis in other raw material sources for tool production. Evidently, these reoccupation settlers belonged to groups moving in and out of the riparian zone of the Caquetá river, and probably had social ties with other communities in the region. Hence, it is hard to conceive of them as early human colonists exploring a new territory. Peña Roja at the time must have been a very well known location, with specific resources, and was probably within a traditional social territory. Peña Roja did not yield abundant evidence of early agriculture in the area; however, palynological samples from an archaeological site 50 kilometers upstream show that corn - *Zea mays* - was cultivated in the region ca. 4500 BP. (see Mora et. al., 1991). Later, agriculture was introduced in Peña Roja. The groups that introduced it were full-time agriculturists that produced a complex ceramic style - Nofurei. Those groups improved their agricultural productivity based on the use of anthropic soils, as suggested by some authors (see Mora et. al., 1991). Finally, the modern native population established a communal house and some peasant type dwellings at Peŕ Roja.

The relationship between the early agriculturists from the preceramic Tubaboniba period and those from the ceramic period, Méidote, is unclear. The communities associated with the ceramic production, however, spread progressively over the region of the middle Caquetá river as early as 2000 BP. The earliest recorded dates for their presence at Peña Roja are ca. 1400 BP. At that time they established a permanent occupancy of the area that lasted ca. 1000 years. The economy, social organization and environmental impact as well as landscape transformation that they produced has been studied from a regional perspective. This work suggests that social transformation led to the rise of complex societies in the area, supported by intensive agricultural production. By the late 17th century, when we have the earliest European historical accounts of the Caqueta populations, there were no complex native societies in the region. The populations of the Caquetá, and most of the other people living along the major Amazonian rivers, apparently suffered a severe demographic decline in the early years after the Hispanic conquest of South America. After the European colonization of the Caquetá the natives, described mainly as savages, were soon enslaved. The aftermath of the civilization crusade destroyed the old native population. In the last half of the 19^{th} century the rubber boom brought new occupants to Peña Roja: the last survivors of an ancient tribe arrived looking for a refuge to rebuild their culture.

Peña Roja's history opens many new questions. Why did Peña Roja become an important location for the early occupants? Where did they come from? What landscape processes did human intervention in the area trigger? How did these processes affect later occupancy at Peña Roja? More archaeological data is needed to address these questions; however, the ethnographic record of modern hunter-gatherers could produce some valuable clues. Those "narratives" have to be considered as critical tales and illustrative processes; otherwise they will become the confirmation of our own present and take us to the dead end of hypotheses such as the dependence of hunter-gatherers on agriculturists in the tropical rain forest.

CHAPTER 8

THE ANCIENT AND THE MODERN AMAZONIAN HUNTER GATHERERS

In 1988 a group of hunter-gatherers arrived into a small town in the Colombian Northeast Amazon. Naked or wearing a small loin cloth, carrying their belongings in baskets, equipped with a rudimentary technology and speaking an unknown language, they soon became the vivid picture of the savages for Colombians. They were, as explained later, wandering in the forest while seeking for other nomads registered in their oral tradition (Reina 1988; 1992; Zambrano 1994). This unexpected encounter with unknown forest people created a national commotion; in a short time, they became the center of attention of newspapers, radio programs and TV shows. Every reporter in the country wanted a picture of this "prehistoric" people. Soon they became the focus of anthropological debates in that country.

Since then, numerous research projects have been conducted by anthropologists, archaeologists and biologists attempting to understand the way in which this group, the Nukak, adapt to and handle a nomadic existence in the tropical rain forest (i.e. Ardila 1992; Franky, Cabrera & Mahecha 1995; Gutiérrez 1996; Morcote, Cabrera, Mahecha & Cavelier 1998; Politis 1996, 1996a; Politis & Rodríguez 1994) and the consequences of their contact with Colombian society (Ardila & Politis 1992; Mahecha Franky & Cabrera 1997; Caycedo 1993). The data collected by these projects is relevant in understanding the ecological and social arrangement of tropical hunter-gatherers and the way they transform their environment, they also contribute to an explanation of Peña Roja's reoccupation.

The Nukak practiced a non-intensive agriculture in plots strategically located near the paths used during their residential movements. Most of the agricultural work takes place during the dry season, when trees are chopped down, woody materials burned and fields are cleaned and planted (Cabrera et. al., 1999:242). Their agriculture follows the general pattern described for slash and burn agriculture in other tropical areas (i.e. Conklin 1959) as well as in the Northeast Amazonia (i.e. Eden & Andrade, 1987; Andrade 1990; Vélez & Vélez 1999). This small agricultural plot, however, is not exclusively Nukak; similar plots are used by native Amazonian agriculturists when they trekked for hunting and fishing during the dry season (see Werner 1983; 1984 for the Mekranoti example).

Among the Nukak's cultivated plants the most important are hot pepper -*Capsicum chinense*-, bananas -*Musa paradisiaca*-, peach palm -*Bactris gasipaes*-, sugar cane -*Saccaharum spp*-, manihot -*Manihot esculenta Crants*-, "achiote" -Bixa orellana-, sweet potatoes -*Dioscorea sp*-, and papaya -*Carica papaya*- (Politis 1996:178 Politis & Rodríguez 1994:186). Other common useful plants are give in table 8.1. The list of manipulated and used plants, however, is as high as 113 - seventy-six of these species are edible plants - from which ninety are not cultivated and twenty-three are cultivated (Politis 1999:109).

Palms, among the non-cultivated plants, have a special place in the Nukak economy. They are one of the most important species for their subsistence, as for many other Amazonian societies (see Wallace 1853; Baleé 1988; Gragson 1992; Prance 1972). Nearly fifteen palm species - Arecaceae - are presently used by the Nukak (Politis 1999:109). Palms provide, in the Nukak's economy, a year round source of food as well as raw material for tools. Within the annual economic cycle they collect the fruits of *Attalea maripa*, *Oenocarpus bataua*, *Oenocarpus bacaba*, *Oenocarpus mapora*, *Mauritia flexuosa*, *Astrocaryum gynacanthum*, *Astrocaryum aculeatum* and *Bactris gasipaes*. Only the last one - *Bactris gasipaes* - can be considered as domesticated in the sense that it has been genetically altered, while the others are just manipulated (Cabrera et. al., 1999; Politis 1999:109; 1996b, 1996a;). This manipulation includes protection, transplanting, selective cutting and planting, accordingly to the species' needs and the Nukak's usage of space.

But not only the fruits are attractive in palms. Palm grubs - mainly *Rynchophorus palmatarum* - from *Bactris gasipaes, Mauritia flexuosa*, seje (Politis 1996:196) are considered a delicacy which is collected almost every day during the rainy season (Politis 1999:108). Consumption of Palm flowers is common, too, in some areas of the Northwest Amazonia (see Koch-Grunberg vol 1, 1995:352). Other palm uses have been mentioned in Amazonia in relation to their fibers for bow strings and ropes, as Koch-Grunberg (Vol 1.1995:130; 185) observed in relation to *Astrocaryum*, wood used for canoe construction - *Iriartea ventricosa* (Koch-Grunberg vol 1, 1995: 233), boxes to collect insects for consumption (Koch-Grunberg vol 2. 1995: 30), fishing trident and harpoons (Koch-Grunberg Vol 2 1995: 39) as well as to build small walls made of *Iriarte exorrhiza* in creeks for fishing.

Palms used by native people in Amazonia are unlimited. Palms have been documented ethnobotanically focussing particularly on their uses and productivity. Recently ethnographic data have demonstrated the relationship between the distribution of palms and human population (i.e Baleé 1987a; Cabrera et. al., 1999:252). These works suggest that palm manipulation is an important factor in landscape transformation and in the creation of what Baleé (1987a) calls the "Cultural Forest".

Scientific name	Common name	Reference
Abuta	Bejuuco para curare	Politis & Rodríguez 1994
Attalea spp.		Politis & Rodríguez 1994
Ceiba petranda linn		Politis & Rodríguez 1994
Helicastylis sp		Politis & Rodríguez 1994
Inga sp.	Guama Montañera	Politis & Rodríguez 1994
Iryanthera ulei Warb		Politis & Rodríguez 1994
Mauritia flexuosa	Moriche	Politis & Rodríguez 1994
Maximiliana elegans	Palma Real	Politis & Rodríguez 1994
Naucleopsis mello-barretoi		Politis & Rodríguez 1994
Oenocarpus bataua		Politis & Rodríguez 1994
Oenocarpus sp.		Politis & Rodríguez 1994
Passiflora foetida		Politis & Rodríguez 1994
Perebea sp.		Politis & Rodríguez 1994
Phenakospermun guayanense	Tarriago/platanillo	Politis & Rodríguez 1994
Protium sp.		Politis & Rodríguez 1994
Pseudolmedia laevigata trecul		Politis & Rodríguez 1994
Reedia madruno		Politis & Rodríguez 1994
Rollinia sp.		Politis & Rodríguez 1994

Table 8.1 Plants used by the Nukak.

Cabrera and Maecha (unpublished manuscript) have recently documented how the Nukak create some patches with a high concentration of *Oenocarpus bataua*. Similar processes could have occurred in the past and potentially explain the reoccupation of Peña Roja. After *Oenocarpus bataua* fruits are carried to the camp, they are cooked in order to separate the mesocarp from the seed. Then, the seeds are thrown into the garbage that is located within the area previously cleaned, at the time of the construction of the camp. These seeds are eventually mixed with other organic waist like ashes, shells, intestines, bones, and other materials that act as fertiliser. These media and the availability of sun light, due to camp construction, create ideal conditions for *Oenocarpus bataua's* germination. If we consider the size of the camp, which can reach between nine and twelve square meters and the camp's use frequency - Nukak residential mobility creates at least 68 different camps per year - the impact of this simple activity can be enormous on the tropical rain forest. Additionally, new camps are located near old camps, but never in the same spot. These behaviours contribute to increasing the size of the transformed area even more while imprinting very specific characteristics to it.

Similar processes of concentration of important economic and ritual plants must have taken place in Peña Roja during the early occupation of the terrace. Consequently, Peña Roja's history can be framed as part of the process of resource concentration due to human use, which contributes to creating areas with high concentrations of resources.

The Nukak ethnographic data can be used to understand some processes that may have changed the distribution of resources in the past, adding new perspectives to our view of tropical rain forest history. In such perspectives culture and nature are part of the same history. Consequently human societies can not be studied as the "takers" of the resources and nature as a passive "generator" of them. Nature can only be understood as complex sets of interactions through time. Ethnography and archaeology, as Lathrap suggested some years ago, have an important role in the reconstruction of these interactions. However, ethnography has to overcome its obsession with generalising history based on present facts and archaeology has to abandon rigid ecological models that define resources only in terms of their natural distribution.

I have attempted to prove in the last pages that early tropical rain forest occupation was possible prior to the introduction of agriculture in Amazonia. The archaeological data supports this idea. But it also shows an important diversity in the way hunter-gatherers adapted to this environment. The idea of the rigid adaptation used in our models to explain the occupation of the continent or the use of a specific area have to give way to more flexible conceptions of such adaptations. It looks like the specialised hunter-gathers have no room in this landscape. On the other hand, the data concerning the usage of cultivars at Peña Roja questions the limits between the agricultural societies and pure foragers. A continuum between these two types of societies seems to be more appropriate.

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