

- Basin and surrounding areas during the Pleistocene. *Geologische en Mijnbouw* 51:641–643.
- . (1974): The Pleistocene changes of vegetation and climate in tropical South America. *Journal of Biogeography* 1:3–26.
- . (1982): Paleocology of tropical South America. In *Biological diversification in the tropics*, edited by G. T. Prance, 60–66. New York: Columbia University Press.
- Van der Hammen, T., L. E. Urrego, N. Espejo, J. F. Duivenvorden, and J. M. Lips (1990): Fluctuaciones del nivel del agua del río y de la velocidad de sedimentación durante los últimos 13,000 años en el área del medio Caquetá. *Colombia Amazónica* 5:91–118.
- Waters, M. R. (1992): *Principles of geoarchaeology: A North American perspective*. Tucson: University of Arizona Press.
- Wijmstra, T. A., and T. Van Der Hammen (1966): Palynological data on the history of tropical savannas in northern South America. *Liedse Geologische Mededelingen* 38:71–90.

Archaeological Hunter-Gatherers in Tropical Forests *A View from Colombia*

Santiago Mora and Cristóbal Gnecco

Until recently, the archaeology of tropical hunter-gatherers has relied on ethnographic depictions of present-day foragers. Thus, archaeological research in the tropical forests has often followed ecological and ethnographic variables to explain the past (e.g., resource distribution and availability, soil characteristics). Consequently, current forager features such as low population density, the use of relatively simple agricultural techniques, and forager-farmer interaction and interdependence have all been projected to our knowledge of the past (Mora, 1993). This frozen perspective of the past denies any dynamism and originality to past cultures and lifeways. Indeed, what we call “essentialism” has entirely dominated accepted views of archaeological hunter-gatherers in the tropics. Essentialism takes the notion of “hunter-gatherers” as a discrete, incontinent class of economic organization.¹ From this point of view, foraging societies are perceived as passive entities in the exploitation of the environment. Foragers would be resource users dependent on what nature can offer. This approach has been indirectly fueled by the idea that early hunter-gatherers of the Americas were large-game hunters. Foragers are not conceived as selective manipulators and modifiers of wild resources. As a result, the term “hunter-gatherers” is imprecise to refer to people who not only gathered and hunted but also altered nature to their benefit and increased the natural productivity of ecosystems.²

The occupation of tropical forests by hunter-gatherers has been considered the consequence of cultural degradation (Lathrap, 1968; Myers, 1988), the result of ethnic division of labor (Headland and Reid, 1989; Jolly, 1996; Junker, 1996) and strong interaction between farmers and hunter-gatherers in marginal ecosystems (Headland and Reid, 1989; Jolly, 1996; Junker, 1996). Forager-farmer interaction has been approached from different angles, whether archaeological (Junker, 1996), historical (Morey and Morey, 1973; Gordon, 1984; Solway and Lee, 1990), economical (Peterson, 1978a; Milton, 1984), or ideological (Jolly, 1996). Some scholars have also argued that

hunting-gathering as a way of life was impossible in tropical forests until after interaction with farmers (Milton, 1984; Bailey et al., 1989; Headland and Reid, 1989). Seasonal scarcity of carbohydrates and animal proteins have been supposed to prevent human occupation of tropical forests prior to agriculture (Lathrap, 1968; Myers, 1988; Bailey et al., 1989, 1991; Sponsel, 1989; Bailey and Headland, 1991).

Another proposition in the archaeology of tropical forest hunter-gatherers is economic specialization. Drawing on Paleoindian data from the North American grasslands, it was traditionally believed that the early hunter-gatherers of tropical America must have been cooperative, specialized, large-game hunters who lived in open environments. Tropical forests would not be attractive regions to these hunters (see Willey, 1971) because their animal biomass would be low to sustain their focal and specialized economies. Yet, new data depict a different scenario in which early hunter-gatherers colonized rain forests at very early ages and practiced generalist economic strategies and low residential mobility.

Paleoecological Insights and Hunter-Gatherer Archaeology

The idea of an early hunter-gatherer occupation of the Neotropical forest was considered an empirical and theoretical oddity, until recently, on the grounds that Paleoindian large-game hunters were not suited for rain forest settlement. The geographical barrier today posed by the Isthmus of Panama separating the South American forest from Central America led archaeologists to propose different colonization models for the early settlement of the southern cone. Thus, C. O. Sauer (1944) and S. K. Lothrop (1961) suggested the existence of an open corridor along the Pacific coast through which southbound hunter-gatherers entered South America (see also Lynch, 1967, 1978). Recent paleobotanical work has indicated, however, that this open corridor may have never existed (Bartlett and Barghoorn, 1973; Piperno, 1985; Colinvaux and Bush, 1991; Piperno et al., 1991a; Behling et al., 1998). Noting that the actual isthmus may have been forested in the past, A. J. Ranere (1980) suggested that early colonists relied on hunting the large mammals that inhabited the highlands; and, therefore, the occupation of tropical biomes south of Mesoamerica required little change in hunting strategies and tools. R. L. Kelly and L. C. Todd (1988) termed this strategy "technology-oriented" instead of "place-oriented." T. F. Lynch (1978: 473) opposed Ranere, realizing that there was not enough archaeological evidence to support his model and that the low biomass typical of the rain forest could not support specialized hunters. Lynch also believed that foraging in the South American forest was possible only after the onset of extensive forager-farmer interaction: "life in Ranere's forest would have

been difficult without substantial reliance on fishing or agriculture, both unknown in the Americas at 10,000 B.P." (Lynch, 1978: 473).

Ten thousand years ago, climate change transformed the weather patterns of Amazonia and the Andes. In the Ecuadorian Andes, pollen analysis shows that the local vegetation was affected by cooling (Colinvaux et al., 1997). Climatic change also brought dryer conditions to the lowlands and thus altered the nature and geographical distribution of the rain forest. Forest fragmentation was common during glacial times. Various climatic models suggest that the northern regions of South America supported botanical formations similar to today's tropical savannas with grassy and open landscapes and gallery forests. Large lakes such as Lake Valencia in Venezuela dried up at glacial times (Salgado-Labouriau, 1980). South of the equator, similar changes have been documented (Ledru et al., 1998). Yet, mounting archaeological evidence from Panama (Ranere and Cooke, 1991), Venezuela (Barse, 1990, 1995), Colombia (Cavelier et al., 1995; Gnecco and Mora, 1997; Gnecco, 2000), and Brazil (Roosevelt et al., 1996) indicates an early settlement of various types of rain forest environments, both open and dense, since the late Pleistocene. The two archaeological sites we discuss here were occupied in what at the time was tropical forest, although we are not saying that its composition was in any way identical to that of modern counterparts. Indeed, the species composition of late Pleistocene and early Holocene rain forests was unlike present-day formations (cf. Gnecco, 1995; see Dillehay, 2000).

Late Pleistocene to Holocene Sites in the Colombian Amazon

Two sites have been excavated recently by the authors: San Isidro and Peña Roja (figs. 9.1 and 9.2).

Peña Roja

This site is located on the Caquetá River, 50 km downstream from Aracua, in the Colombian Amazon region. Peña Roja lies at 170 m above sea level. Current average temperatures range from 24°C to 28°C. Annual rainfall averages 3500 mm. Present-day vegetation is tropical forest (Cavelier et al., 1995; C. Urrego et al., 1995; Gnecco and Mora, 1997). Sedimentological, geomorphological, and paleobotanical data from the region have been published elsewhere (L. E. Urrego, 1991, 1997; T. Van der Hammen et al., 1991a,b; M. C. Van der Hammen, 1992; Duivenvoorden and Lips, 1993; Duivenvoorden and Cleef, 1994; Behling et al., 1999).

The earliest settlers of Peña Roja arrived in the region prior to 9000 B.P., as indicated by carbon 14 dates in association with archaeological remains:

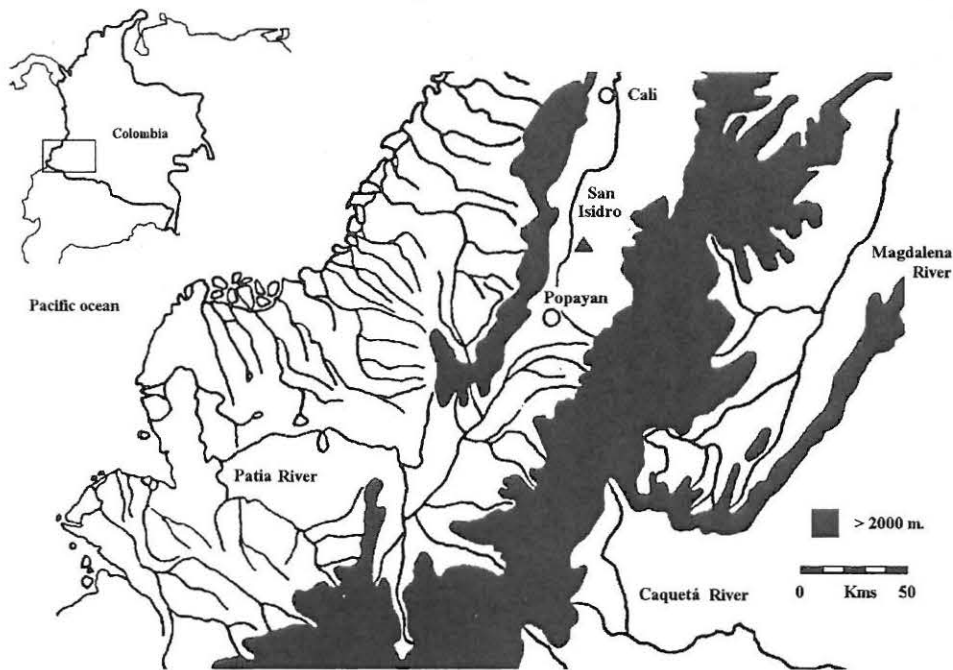


Fig. 9.1. Location of Peña Roja and San Isidro in southwestern Colombia

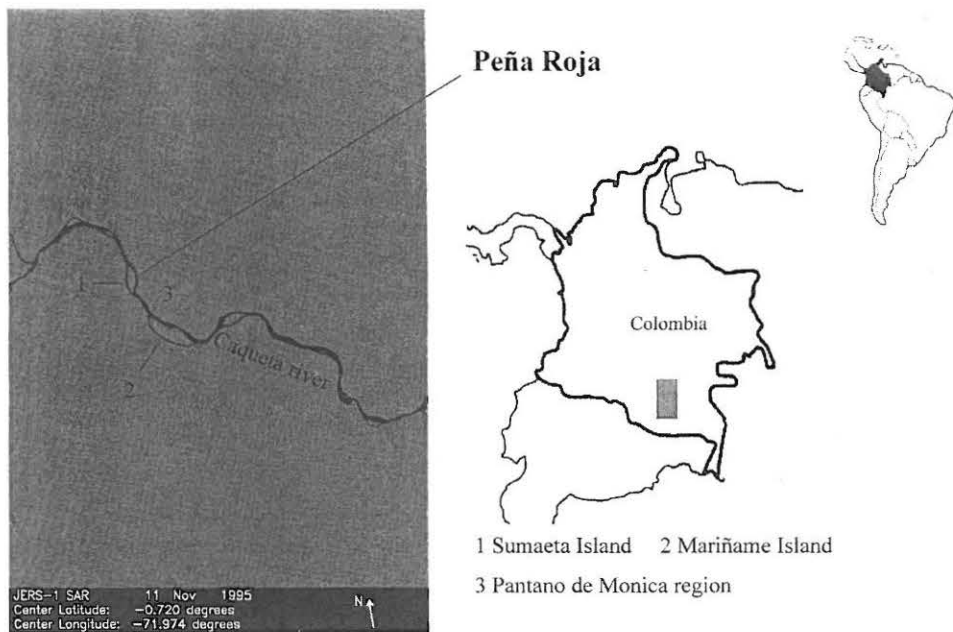


Fig. 9.2. Satellite image showing the Middle Caquetá River and the location of Peña Roja, Mariñame Island, and Pantano de Mónica

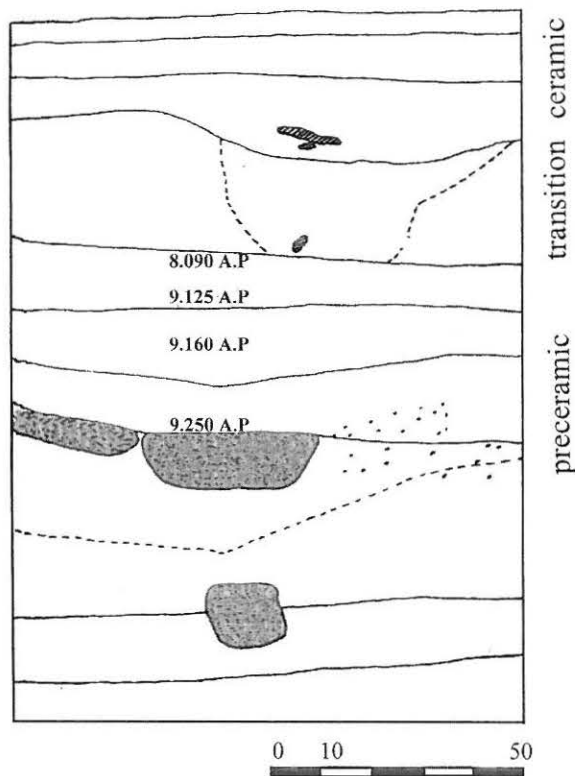
9125 \pm 250 B.P.; 9160 \pm 90 B.P.; 9250 \pm 140 B.P. (Cavelier et al., 1995; Gnecco and Mora, 1997); 8090 \pm 60 B.P. (Piperno and Pearsall, 1998: 204); 8510 \pm 110 B.P.; 8710 \pm 110 B.P. (Llanos, 1997: 14). Paleoclimatic and sedimentological data are indicative of vegetational change and major transformations in the Middle Caquetá River drainage system. Such geological and environmental changes triggered terrace formation and landscape remodeling as well as vegetational reassortment.

Pollen analysis at nearby lakes, such as Mariñame, 12 km southwest of Peña Roja, and Pantano de Mónica, 5 km to the south (fig. 9.2), provides reliable late Pleistocene to Holocene environmental data on which to base our reconstructions of the environment at the time of human occupation. The pollen data from the Mariñame core (L. E. Urrego, 1991; T. Van der Hammen et al., 1991a,b) show an increase in forest vegetation and a dramatic decrease in aquatic elements since 11,150 B.P.; *Mauritia flexuosa*, a palm tree that usually grows in swampy areas, was rare at this time. Trees from *Melastomataceae*, *Cecropia*, *Alchornea*, and *Euterpe* were also documented (L. E. Urrego, 1991). The Pantano de Mónica M1 pollen diagram (Behling et al., 1999) shows a continuous increase in palms (Arecaceae) in pollen zone 2. This zone corresponds with the initial human occupation of Peña Roja. Here, typical tropical forest elements such as the Anacardiaceae, Sapotaceae, and Malpighiaceae are all present (Behling et al., 1999). Palynological evidence, therefore, leaves no doubt that the initial occupation of Peña Roja took place in a rain forest context.

The site of Peña Roja has two occupation horizons (fig. 9.3). The first horizon corresponds to the agricultural and ceramic occupation of the site, comprising layers 2 and 3. Layer, or stratum, 4 has both ceramic and pre-ceramic materials. Strata 5, 6, 7, and 8 yield preceramic materials alone, and some bioturbation is present. The initial occupation of the site is located in layers 8a to 7b. The stone industry produced by the early inhabitants of the site consists of unifacial industries with little or no retouch (fig. 9.4). Chert is the main raw material. Tools include concave scrapers on thick flakes, wedges, notched flakes, and perforators. But unretouched flakes form the bulk of the artifactual evidence. Some of the unretouched materials bear use-wear. Ground stone technology is also present, with artifacts such as milling stones, flat mortars, and grinding stones, suggestive of seed and root consumption (Llanos, 1997). Overall, the tool kit from Peña Roja indicates a non-specialized extractive technology typical of broad-spectrum economies.

Several features within layers 6a to 5b suggest changing site function over time. Prior to this time, foragers displayed a predilection for chert as the main raw material to make their tools. From this time on, chert was less frequently used, relative to the frequency documented in lower layers. We also

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



South wall Peña Roja 9

Fig. 9.3. Stratigraphic section at Peña Roja showing strata, carbon-14 dates, and matrix color

noticed a reduction in charcoal representation, which may suggest fewer burning episodes. This reduction seems concomitant with the introduction of squashes (*Cucurbita spp.*). D. Piperno (1999), based on the size of the *Cucurbita* phytoliths from this site, has suggested that these squashes were cultivated plants. At a later time, gourd, *Lagenaria siceraria*, lerén, and *Calathea allouia* were also exploited (Piperno and Pearsall, 1998; Piperno, 1999). Lerén has an edible rhizome which is still eaten cooked or roasted in the middle Caquetá (Sánchez, 1997: 255). However, the introduction of these cultivars did not imply the creation of open landscapes or grasslands, since the phytolith evidence points to a forested environment (Piperno and Pearsall, 1998; Piperno, 1999).

Layer 4 shows evidence of stratigraphic discontinuity between the ceramic and preceramic levels at the site, as shown by soil texture (silt increases and clay decreases) and organic matter decrease. The stratigraphic discon-

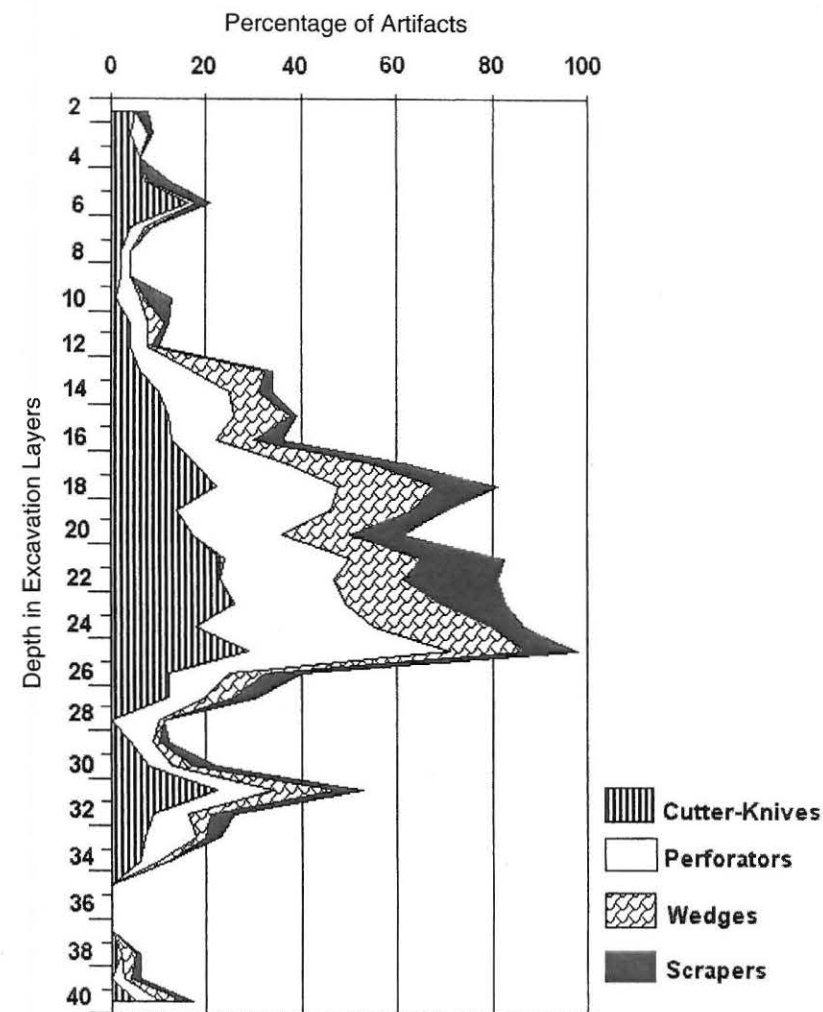
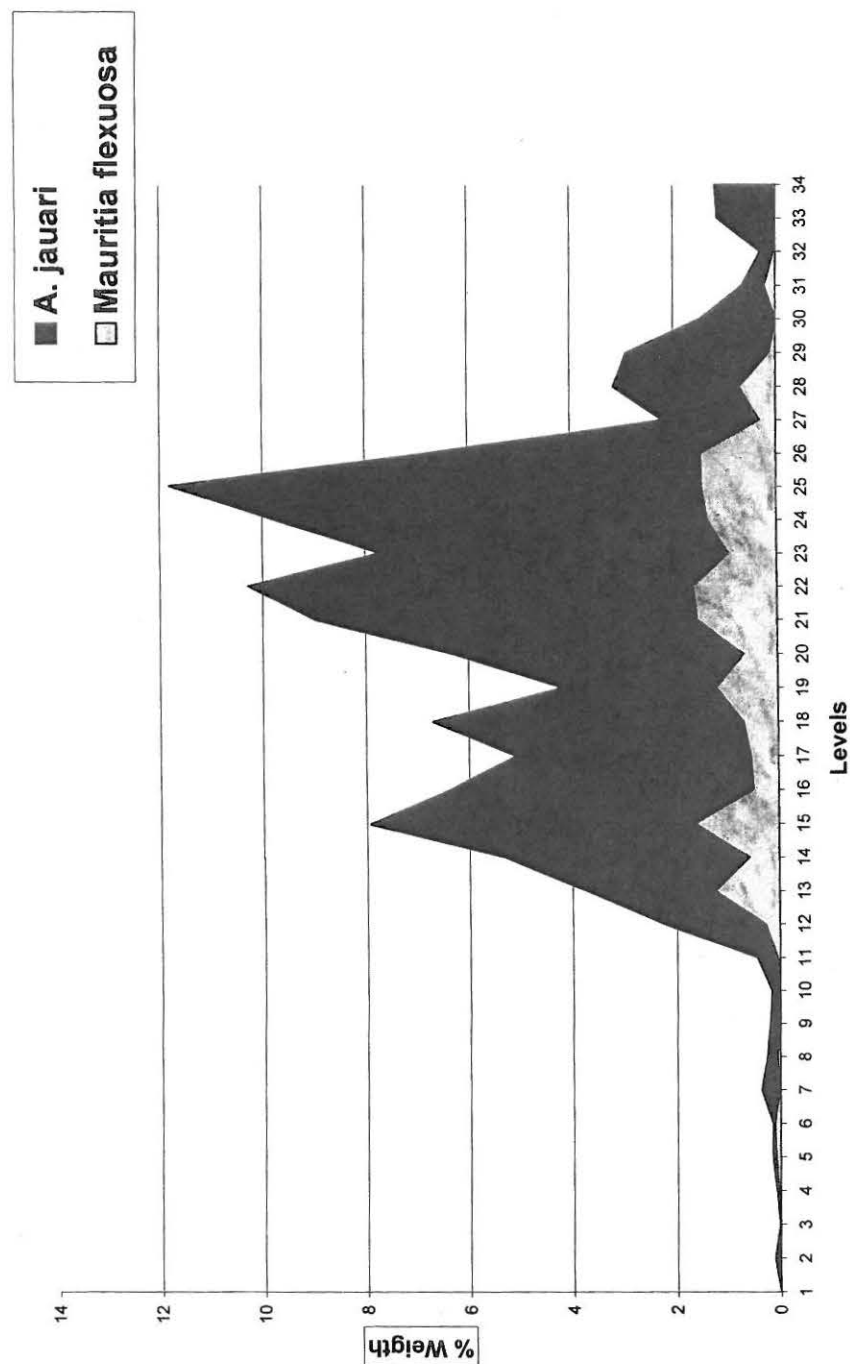


Fig. 9.4. Artifact percentages per depth at the site of Peña Roja

tinuity is also evident in the percentages of aluminum, with low values in the preceramic layers. Another sign of discontinuity is the presence of high phosphorus values above 350 ppm (Cavelier et al., 1995) only in the ceramic layers.

Macrobotanical remains from the site are dominated by eight species of palms from four genera (fig. 9.5, table 9.1): *Astrocaryum* (three species: *A. javari*, *A. aculeatum*, and *A. sciophilum*); *Oenocarpus* (three species: *O. bataua*, *O. bacaba*, and *O. mapora*); *Mauritia* (one species: *M. flexuosa*); and *Maximiliana* (one species: *M. maripa*). *Astrocaryum*, *Oenocarpus*, and *Mauritia* are restricted to preceramic levels. *Maximiliana maripa* has similar frequencies in

**Table 9.1.** Taxonomic Groups Identified in Peña Roja's Carbonized Macro Remains

Family	Species
Arecaceae	<i>Astrocaryum aculeatum</i>
	<i>Astrocaryum javari</i>
	<i>Astrocaryum sciophilum</i>
	<i>Attalea</i> spp
	<i>Attalea maripa</i>
	<i>Attalea insignis</i>
	<i>Attalea racemosa</i>
	<i>Mauritia flexuosa</i>
	<i>Oenocarpus bataua</i>
	<i>Oenocarpus mapora</i>
	<i>Oenocarpus bacaba</i>
Caryocaraceae	<i>Caryocar</i> aff. <i>Glabrum</i>
Humiriaceae	<i>Vantanea peruviana</i>
	<i>Humiriastrum</i> sp.
	<i>Sacoglottis</i> sp
Apocynaceae	<i>Macoubea guianensis</i>
Lauraceae	<i>Beilschmiedia brasiliensis</i>
Annonaceae	<i>Oxandra euneura</i>
Chrysobalanaceae	<i>Licania pyrifolia</i>
Leguminosae	<i>Parkia multijuga</i>
	<i>Inga</i> sp.

SOURCE: Based on Cavelier et al., 1995; Cavelier et al., 1999; Morcote 1994; Morcote et al., 1998.

both ceramic and preceramic levels (Morcote, 1994; Cavelier et al., 1995: 34; C. Urrego et al., 1995; Morcote et al., 1998). These palms are still widely used by local groups. For example, *A. javari* is presently exploited as fish bait. It is thus likely that palms were of economic value to local prehistoric groups (Morcote et al., 1998; Cabrera et al., 1999). In general, the macrobotanical evidence from Peña Roja suggests exploitation strategies very similar to those documented in eastern Brazil among late Pleistocene to Holocene tropical forest foragers (Prous, 1991; Magalhaes, 1994; Roosevelt et al., 1996).

Site location in an alluvial setting would indicate some emphasis on fish exploitation (Gragson, 1992; Rodríguez, 1992), while the surrounding hills would provide a good source of forest plants and animals (M. C. Van der

Fig. 9.5. Distribution of *M. flexuosa* versus *A. jauari* at Peña Roja

Hammen, 1992; Duivenvoorden and Lips, 1993). Nearby swamps with *Mauritia flexuosa* would contribute fruits, fibers, fish bait (Goulding, 1980), hunting prey (Walschburger and Von Hildebrand, 1988), and Coleoptera larvae (Dufour, 1987).

San Isidro

This site is within an inter-Andean valley, 50 km northwest of Popayán, in southwestern Colombia. San Isidro is at 1690 m above sea level. Present rainfall is 1800 mm. Natural forest vegetation has been preserved in parts of the region, and it can be classified as sub-Andean forest (*sensu* Cuatrecasas, 1958). Pollen and macrobotanical data indicate that by 10,000 B.P. the area supported a tropical forest that has no modern analogue (Gnecco, 2000). This site has one archaeological horizon only. We excavated 30% of this site (20 m²) with 1-by-1-m excavation units. Excavation spits were 5 cm thick, and the matrix was screened with a 5-mm mesh. Six kilograms of sediments from each level were floated.

The archaeological deposit stretches through 40 cm of matrix (from 20 to 60 cm below the surface), but cultural materials are scattered between 5 and 85 cm of depth. The highest concentration takes place from 5 to 40 cm below the present-day surface. This type of shallow preceramic deposit is not common in the Popayán Valley, where there is a slow rate of sediment buildup. The sediments at the site have a low percentage of organic matter and lack stratigraphic boundaries. Nonetheless, soil formation provides clear pedological horizons that may have masked the original stratigraphic boundaries at the site. The A horizon is composed of sandy loam without cultural materials and comprises layers 1 and 2. The AB horizon includes layers 3 and 4 and has a sandy texture. The preceramic occupation is restricted to layer 3. Lastly, the B horizon comprises strata 5 to 8, all of which have a clayey texture.

Our analysis indicates that the human occupation of this site took place in soils formed by intense weathering with biochemical activity that affected the pyroclastic materials in the matrix and with a slow sedimentary influx. Organic matter is scarce (10.0%), so is the amount of phosphorus (1.9%). Organic decomposition and/or low input of organic compounds by local foragers could be responsible for this pattern. It is important to note that this site lacks a midden and that human occupation is only evident through the existence of cultural material in what otherwise looks like a natural soil profile. Three radiocarbon dates indicate an early Holocene chronology: charcoal samples from the occupation horizon, dated at 9530 ± 100 B.P. and $10,050 \pm 100$ B.P., and charred seed, dated at $10,030 \pm 60$ B.P.

San Isidro yielded more than 65,000 lithic specimens, out of which 752 have clear artifactual features. The majority of the lithic assemblage (98.0%)

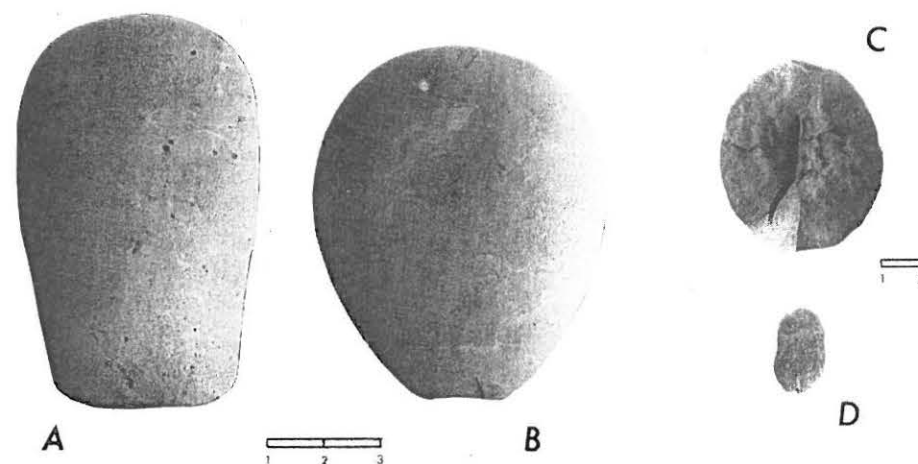


Fig. 9.6. Stone tools from San Isidro: a, beveled and polished tool; b, edge-ground cobble. Macrobotanical remains: c, from *Persea americana*, and d, from *Erythrina edulis*.

is microdebitage smaller than 1 cm in maximum length. Most of the artifacts are unretouched (38.6%) and 0.7% are cobble stone tools. Bifaces make up 22.0% of the artifacts. Eventually, local foragers produced projectile points. Use-wear analysis of the lithic assemblage (Gnecco, 2000) indicates that tools were used for game butchering and hide preparation and for sawing and grooving. Our lithic assemblage also includes hammer stones; mortars; beveled, polished tools; and edge-ground cobbles (fig. 9.6). Phytoliths and starch grains from economically useful plants, such as legumes, grasses, *Marantha*, and perhaps the edible *M. arundinacea*, were recovered from the surfaces and microfissures in two grinding tools (Dolores Piperno, personal communication), while *Podocarpus* wood was recovered from three small unifacial tools (Nieuwenhuis, 1996).

Almost 4000 carbonized macrobotanical remains were retrieved from this open-air site. A large majority of pieces (92%) are cortical fragments from spherical fruits. Their diameter ranges from 30 to 60 mm. We have reported these fruits as belonging to the Palmae (Gnecco and Mora, 1997: 687), but their final identification awaits in-depth comparative analysis: we are almost certain that this macrobotanical assemblage contains two tropical forest taxa: *Erythrina edulis* and *Persea americana* (fig. 9.6).

"Essentialism" under a New Light

Archaeological data from Peña Roja and San Isidro indicate that human impact and modification of forest ecosystems started before 10,000 B.P. Pollen data from San Isidro (table 9.2) includes pioneer taxa, grasses, and weeds, among a majority of primary forest trees. This suggests that these sites were

Table 9.2. Fossil pollen from San Isidro

Family/genus	N	%	Family/genus	N	%
Leguminosae	11	0.3	Solanaceae	13	3.8
Leguminosae	21	0.3	Cyatheaceae	8	2.3
Leguminosae	31	0.3	Fern	37	10.5
Proteaceae	12	3.5	Moss	2	0.6
Tiliaceae	1	0.3	Acrostichum	1	0.3
Myrtaceae	4	1.1	Alnus sp.	1	0.3
Palmae	14	1.1	Weinmannia sp.	9	2.6
Palmae	23	0.8	Trema sp.	1	0.3
Palmae	31	0.3	Hedyosmum sp.	1	0.3
Gramineae	15	1.4	Vallea sp.	1	0.3
Gramineae	215	4.3	Rapanea sp.	3	0.8
Bignoniaceae	31	9.0	Alchornea sp.	18	5.2
Compositae	97	28.2	Virola sp.	6	1.7
Labiatae	1	0.3	Piper sp.	2	0.6
Melastomataceae	79	23.0	Miconia sp.	4	1.1
Urticaceae/Plantago	1	0.3			
Moraceae	13	3.8	Spigelia type	2	0.6
Caryophyllaceae	4	1.1	Duroia type	6	1.7
Cyperaceae	1	0.3			

surrounded by a mosaic of forest and open spaces. However, the prevalence of mature forest species indicates that there never was a complete forest retreat. At present, we cannot determine whether these open domains were anthropogenic. Disturbance sometimes occurs unintentionally as a result of redundant human use of natural environments (Laden, 1992; Maloney, 1998). But it is also possible that humans contributed to opening the forest by maintaining gaps, perhaps through the use of fire (Piperno, 1999). It is possible that some of the beveled and polished tools found in Peña Roja and San Isidro (figure 9.6a) could be interpreted as tools created to open up the forest.

We also believe that, prior to farming, foragers promoted the artificial concentration of useful plants across their territory. This farming-like behavior focused on species that required little planting or tending (Cabrera et al., 1999) and resembles present-day practices among forager and incipient Amazonian farmer groups (Gutiérrez, 1996; Politis, 1996a; Posey, 1984). Posey indeed calls this type of exploitation "nomadic agriculture," in which humans allow the colonization of forest plots by useful plants such as medicinals and perennials with large edible roots and stems (Posey, 1983: 877–894, 1984: 114–117; see also Piperno, 1989: 541). This type of exploitation also favors artificial concentrations of useful animals, as noted by

O. F. Linares (1976) and others (see Posey, 1983, 1984; Cooke and Piperno, 1993: 30).

The *Persea* seeds (maximum length 6 cm) from San Isidro are likely to be from a cultivar (fig. 9.6c), as they are larger than the average size for specimens from a wild *Persea* population (see Smith, 1966, 1969). The same observation applies to *Erythrina edulis* specimens (fig. 9.6d). *Marantha* phytoliths found in grinding tools from San Isidro could also belong to a cultivar, perhaps *M. arundinacea*. Piperno believes that this root was domesticated 8600 years ago in Panama, as shown by phytoliths from this species retrieved from Cueva de los Vampiros (1995: 139–141; Piperno et al., 1991b: 238; Cooke 1992: 44). Gourd and *lerén* from Peña Roja could also represent early cultivars.

Discussion

C. Levi-Strauss (1950) noted that farming societies of South America complemented their farming economies with wild resources (Sponsel, 1989). If this was the case among ethnographic farmers, it is reasonable to assume that it was more the case with prehistoric hunter-gatherers with mixed forager-farming economies. We believe that late Pleistocene and early Holocene hunter-gatherers were efficient managers of tropical forests and enhanced the natural productivity of the ecosystems in which they lived. Tropical hunter-gatherers did not have to become sedentary farmers to increase the productivity of their resource base. South American tropical forest foragers hunted, gathered, and, somehow, produced their resources. Binford (1980) suggested that residential mobility among hunter-gatherers was almost exclusively contingent upon resource distribution. Yet, mobility was determined by many factors. If residential mobility among Peña Roja and San Isidro foragers influenced local resource distribution through intentional manipulation, then access to resources may not have been free for all individuals from all groups. Late Pleistocene to Holocene Amazonian foragers could have regulated access to resources and exercised some kind of territoriality (cf. Kelly, 1995: 14–15). It is possible that various forms of low residential mobility and territorial societies could have evolved in neighboring Andean societies since the late Pleistocene (Keefer et al., 1998; Sandweiss et al., 1998). R. C. Bailey and T. N. Headland (1991: 268) predicted that if foragers were living in tropical rain forests before the introduction of agriculture, they would have had to be more mobile than Pygmies, Agta, Batek, and Punan groups are today. We do not believe this holds true for the Colombian instance 10,000 years ago. Mobility is determined by the type of exploitation and control over local resources.

The authors of this chapter think that we need to reexamine currently accepted models of prehistoric forager societies in tropical environments. Decades ago Lathrap (1968) challenged the idea of pristine hunter-gatherer groups living in tropical forests based on the ecological information he possessed; he portrayed them as decultured farmers. At present, his hypothesis is increasingly unsustainable, especially in the light of the obvious diversity among prehistoric tropical forest groups and the questionable idea of "primitiveness" (see Headland and Reid, 1989: 43, 49–51; Sponsel, 1985: 96–97). Certainly, present-day forest dwellers interact with farmers, and it is likely that some prehistoric hunter-gatherers also did (Headland and Reid, 1989; Junker, 1996). This inter-ethnic division of labor, as A. Testart (1988: 7) calls it, cannot be denied (see Peterson, 1978a,b; Milton, 1984). Yet, we cannot accept the transhistorical nature of this division. Thus, the question is not whether hunter-gatherers ever existed in tropical forests without farmers, but how they lived in these ecosystems.

Conclusion

Colombian prehistoric hunter-gatherers used, managed, and enhanced the productivity of tropical forests. San Isidro and Peña Roja foragers changed the ecosystem through forest clearing, selective planting, and quasi-domestication (Rindos, 1984). This type of economic behavior has ecological and social repercussions and is linked to territoriality and low residential mobility. This type of forest society dates back to the late Pleistocene. Early foragers of the Colombian Amazon were forest managers who maximized the natural productivity of rain forests in ways that departed from earlier foraging strategies to enter a new cultural domain, that of complex hunter-gatherers.

Notes

1. The intentional definition of the type, as used by archaeologists, is exclusively economical, to the exclusion of alternative characteristics—social, political, ideological—explored by ethnographers.

2. Therefore, the use we make of this concept is purely conventional. See T. Ingold (1991) and R. Kelly (1995) for a critical evaluation of this concept.

References

- Bailey, R. C., and T. N. Headland (1991): The tropical rain forest: Is it a productive environment for human foragers? *Human Ecology* 19:261–285.
- Bailey, R. C., G. Head, M. Jenike, B. Owen, R. Rechtman, and E. Zechentes (1989): Hunting and gathering in tropical rain forest: Is it possible? *American Anthropologist* 91:59–82.
- Bailey, R. C., M. Jenike, and R. Rechtman (1991): Reply to Colinvaux and Bush. *American Anthropologist* 93:160–162.
- Bamforth, D. B. (1986): Technological efficiency and tool curation. *American Antiquity* 51:38–50.
- Barse, W. P. (1990): Preceramic occupations in the Orinoco River valley. *Science* 250:1388–1390.
- . (1995): El período arcaico en el Orinoco y su contexto en el norte de Sud América. In *Ambito y Ocupaciones Tempranas de la América Tropical*, edited by I. Cavelier and S. Mora, 99–113. Bogotá: Instituto Colombiano de Antropología-Fundación Erigaie.
- Bartlett, A. S., and E. S. Barghoorn (1973): Phytogeographic history of the Isthmus of Panama during the past 12,000 years (a history of vegetation, climate, and sea-level change). In *Vegetation and vegetational history of northern Latin America*, edited by A. Graham, 203–299. New York: Elsevier.
- Behling, H., H. Hooghiemstra, and A. J. Negret (1998): Holocene history of the Chocó rain forest from Laguna Piusbi, southern Pacific lowlands of Colombia. *Quaternary Research* 50:300–308.
- Behling, H., J. C. Berrio, and H. Hooghiemstra (1999): Late quaternary pollen records from the middle Caquetá River basin in central Colombian Amazon. *Palaeogeography, Palaeoclimatology, Palaeoecology* 145:193–213.
- Binford, L. R. (1973): Interassemblage variability—the Mousterian and the functional argument. In *The explanation of culture change*, edited by C. Renfrew, 227–254. London: Duckworth.
- . (1977): Forty-seven trips. In *Stone tools as cultural markers*, edited by R. V. Wright, 24–36. Canberra: Australian Institute of Aboriginal Studies.
- . (1980): Willow smoke and dog's tails: Hunter-gatherer settlement systems and archaeological site formation. *American Antiquity* 45:1–17.
- Cabrera, G., C. E. Calvo, and D. Mahecha (1999): *Los Nukak: Nómadas de la Amazonia Colombiana*. Bogotá: Universidad Nacional.
- Cavelier, I., C. Rodríguez, S. Mora, L. F. Herrera, and G. Morcote (1995): No sólo de caza vive el hombre: Ocupación del bosque amazónico, Holoceno temprano. In *Ambito y ocupaciones Tempranas de la América Tropical*, edited by I. Cavelier and S. Mora, 27–44. Bogotá: Instituto Colombiano de Antropología, Fundación Erigaie.
- Cavelier, I., L. F. Herrera, S. Rojas, and F. Montejo (1999): Las palmas como mediadoras en el origen de las plantas cultivadas en el Caquetá, noroeste amazónico. Paper presented to the I Congreso de Arqueología en Colombia, Manizales.
- Colinvaux, P. A., M. B. Bush, M. Steinitz-Kannan, and M. C. Miller (1997): Glacial and postglacial pollen records from the Ecuadorian Andes and Amazon. *Quaternary Research* 48:69–78.
- Colinvaux, P., and M. B. Bush (1991): The rain-forest ecosystem as a resource for hunting and gathering. *American Anthropologist* 93:153–162.

- Cooke, R. (1992): Etapas tempranas de la producción de alimentos vegetales en la baja Centroamérica y partes de Colombia (región histórica Chibcha-Chocó). *Revista de Arqueología Americana* 6:35–70.
- Cooke, R., and D. R. Piperno (1993): Native American adaptations to the tropical forests of Central and South America before the European colonization. In *Tropical forest people and food: Biocultural interactions and applications to development*, edited by C. M. Hladik, A. Hladik, O. Linares, H. Pagezy, A. Semple, and M. Hadley, 25–36. Paris: Parthenon.
- Cuatrecasas, J. (1958): Aspectos de la vegetación natural de Colombia. *Revista de la Academia Colombiana de Ciencias Exactas, Físicas y Naturales* 10(4).
- Dillehay, T. (2000): *The settlement of the Americas*. New York: Basic Books.
- Dufour, D. (1987): Insects as food: A case study from the northwest Amazon. *American Anthropologist* 89:383–397.
- Duivenvoorden, J., and A. M. Cleef (1994): Amazonian savanna vegetation on the sandstone plateau near Araracuara, Colombia. *Phytocoenologia* 24:197–232.
- Duivenvoorden, J. F., and J. M. Lips (1993): *Ecología del Paisaje del Medio Caquetá: Estudios en la Amazonia Colombiana*. Bogotá: TropenBos.
- Gnecco, C. (1995): Paleoambientes, modelos individualistas y modelos colectivos en el norte de los Andes. *Gaceta Arqueológica Andina* 24:5–11.
- . (2000): *Ocupación Temprana de Selvas Tropicales de Montaña*. Popayán: Universidad del Cauca.
- Gnecco, C., and S. Mora (1997): Early occupations of the tropical forest of northern South America by hunter-gatherers. *Antiquity* 71:683–690.
- Gordon, R. J. (1984): The Kung in the Kalahari exchange: An ethnohistorical perspective. In *Past and present in hunter-gatherers studies*, edited by C. Schrire, 175–193. Orlando: Academic Press.
- Goulding, M. (1980): *The fish and the forest*. Los Angeles: University of California Press.
- Gragson, T. L. (1992): Fishing the water of Amazonia: Native subsistence economies in a tropical rain forest. *American Anthropologist* 94:428–440.
- Gutiérrez, R. (1996): Los Nukak y el uso de los recursos. *Diversa* 2:4–7.
- Headland, T. N., and L. A. Reid (1989): Hunter-gatherers and their neighbors from prehistory to the present. *Current Anthropology* 30:43–66.
- Ingold, T. (1991): Notes on the foraging mode of production. In *Hunters and gatherers: History, evolution, and social change*, vol. 1, edited by T. Ingold, D. Riches, and J. Woodburn, 269–285. Oxford: Berg.
- Jolly, P. (1996): Symbiotic interaction between black farmers and south-eastern San. *Current Anthropology* 37:277–306.
- Junker, L. L. (1996): Hunter-gatherer landscapes and lowland trade in the pre-hispanic Philippines. *World Archaeology* 27:389–410.
- Keefer, D. K., S. D. deFrance, M. E. Moseley, J. B. Richardson, D. R. Satterlee, and A. Day-Lewis (1998): Early maritime economy and El Niño events at quebrada Tacahuay. *Science* 281:1833–1835.
- Kelly, R. (1983): Hunter-gatherer mobility strategies. *Journal of Anthropological Research* 39:277–306.
- . (1995): *The foraging spectrum: Diversity in hunter-gatherer lifeways*. Washington, D.C.: Smithsonian.
- Kelly, R. L., and L. C. Todd (1988): Coming into the country: Early Paleoindian hunting and mobility. *American Antiquity* 53:231–244.
- Laden, G. (1992): Ethnoarchaeology and land-use ecology of the Efe (Pygmies) of the Ituri rain forest, Zaire: A behavioral ecological study of land-use patterns and foraging behavior. Ph.D. diss., Harvard University.
- Lathrap, D. W. (1968): The “hunting” economies of the tropical forest zone of South America: An attempt at historical perspective. In *Man the hunter*, edited by R. B. Lee and I. DeVore, 23–29. Chicago: Aldine.
- Ledru, M. P., M. L. Salgado-Labouriau, and M. L. Lorscheitter (1998): Vegetation dynamics in southern and central Brazil during the last 10,000 yr B.P. *Review of Palaeobotany and Palynology* 99:131–142.
- Levi-Strauss, C. (1950): The use of wild plants in tropical South America. In *Handbook of South American Indians*, vol. 6, edited by J. Steward, 465–486. Washington, D.C.: Bureau of American Ethnology, Smithsonian Institution.
- Linares, O. F. (1976): Garden hunting in the American tropics. *Human Ecology* 4:331–349.
- Llanos, J. M. (1997): Artefactos de molienda en la región del Medio río Caquetá (Amazonia Colombiana). *Boletín de Arqueología* 12(2):3–95.
- Lothrop, S. K. (1961): Early migrations to Central and South America: An anthropological problem in the light of other sciences. *Journal of the Royal Anthropological Institute* 91:97–123.
- Lynch, T. F. (1967): *The nature of the central Andean preceramic*. Pocatello: Occasional Papers of the Idaho State University Museum 21.
- . (1978): The South American Paleoindians. In *Ancient Native Americans*, edited by J. Jennings, 455–489. San Francisco: W. H. Freeman and Co.
- Magalhaes, M. (1994): *Archaeology of Carajas: The prehistoric presence of man in Amazonia*. Rio de Janeiro: Companhia Vale do Rio Doce.
- Maloney, B. (1998): The long-term history of human activity and rainforest development. In *Human activities and the tropical rainforest*, edited by B. Maloney, 65–85. The Hague: Kluwer Academic Publishers.
- Milton, K. (1984): Protein and carbohydrate resources of the Maku Indians of northwestern Amazonia. *American Anthropologist* 86:7–27.
- Mora, S. (1993): Cold and hot, green and yellow, dry and wet: Direct access to resources in Amazonia and the Andes. *Florida Journal of Anthropology* 18:51–60.
- Morcote, G. (1994): Estudio paleoetnobotánico en un yacimiento precerámico del medio río Caquetá, Amazonia colombiana. B.A. thesis, Universidad Nacional, Bogotá.
- Morcote, G., G. Cabrera, D. Mahecha, and I. Cavelier (1998): Las palmas entre los grupos cazadores-recolectores de la amazonia colombiana. *Caldasia* 20:57–74.
- Morey, N., and R. Morey (1973): Foragers and farmers: Differential consequences of Spanish contact. *Ethohistory* 20:229–246.
- Myers, T. (1988): Una visión de la prehistoria de la Amazonia superior. In *I seminario de investigaciones sociales en Amazonia*, 37–87. Iquitos: Editorial CETA.

- Nieuwenhuis, C. J. (1996): Microwear analysis of a sample of stone artefacts from San Isidro. Manuscript, Departamento de Antropología, Universidad del Cauca, Popayán.
- Peterson, J. (1978a): *The ecology of social boundaries: Agta foragers of the Philippines*. Urbana: University of Illinois Press.
- . (1978b): Hunter-gather/farmer exchange. *American Anthropologist* 80: 335–351.
- Piperno, D. (1985): Phytolith analysis of geological sediments from Panamá. *Antiquity* 59:13–19.
- . (1989): Non-affluent foragers: Resource availability, seasonal shortages, and the emergence of agriculture in Panamanian tropical forests. In *Foraging and farming: The evolution of plant exploitation*, edited by D. R. Harris and G. C. Hillman, 538–554. London: Unwin Hyman.
- . (1990): Paleoenvironments and human occupation in late-glacial Panamá. *Quaternary Research* 33:108–116.
- . (1995): Plant microfossils and their application in the New World tropics. In *Archaeology in the lowland American tropics*, edited by P. W. Stahl, 130–153. Cambridge: Cambridge University Press.
- . (1999): Report on phytoliths from the site of Peña Roja, western Amazon basin. Manuscript, Fundación Eriagie, Bogotá.
- Piperno, D., and D. Pearsall (1998): *The origins of agriculture in the lowland Neotropics*. Orlando: Academic Press.
- Piperno, D. R., M. B. Bush, and P. A. Colinvaux (1991a): Paleoecological perspectives on human adaptation in Panama I. The Pleistocene. *Geoarchaeology* 6: 201–226.
- . (1991b): Paleoecological perspectives on human adaptation in central Panama I. The Holocene. *Geoarchaeology* 6:227–250.
- Politis, G. (1996a): Moving to produce: Nukak mobility and settlement patterns in Amazonia. *World Archaeology* 27:492–511.
- . (1996b): *Nukak*. Bogotá: SINCHI.
- Posey, D. A. (1983): Indigenous knowledge and development: An ideological bridge to the future. *Ciencia e Cultura* 35:877–894.
- . (1984): A preliminary report on diversified management of tropical forests by the Kayapo Indians of the Brazilian Amazon. *Advances in Economic Botany* 1:112–126.
- . (1993): The importance of semi-domesticated species in post-contact Amazonia: Effects of the Kayapo Indians on the dispersal of flora and fauna. In *Tropical forest people and food: Biocultural interactions and applications to development*, edited by C. M. Hladik, A. Hladik, O. Linares, H. Pagezy, A. Semple, and M. Hadley, 63–71. Paris: Parthenon.
- Prous, A. (1991): Fouilles de L'abri du Boquete, Minas Gerais, Brasil. *Journal de la Société des Americanistes* 77:77–109.
- Ranere, A. J. (1980): Stone tools and their interpretation. In *Adaptive radiations in prehistoric Panama*, edited by O. Linares and A. J. Ranere, 118–138. Cambridge: Peabody Museum Monographs 5, Harvard University Press.
- Ranere, A. J., and R. Cook (1991): Paleoindian occupation in the Central American tropics. In *Clovis: Origins and adaptations*, edited by R. Bonnicksen and K. L. Turnmire, 237–253. Corvallis: Center for the Study of the First Americans, Oregon State University.
- Rindos, D. (1984): *The origins of agriculture: An evolutionary perspective*. San Diego: Academic Press.
- Rodríguez, C. A. (1992): *Bagres, Malleros y Cuaderos en el Bajo Río Caquetá*. Bogotá: TropenBos.
- Roosevelt, A. C., M. Lima, C. Lopes, M. Michab, N. Mercier, H. Valladas, J. Feathers, W. Barnett, M. Imazio, A. Henderson, J. Sliva, B. Chernoff, D. S. Reese, J. A. Holman, N. Toth, and K. Schick (1996): Paleoindian cave dwellers in the Amazon: The peopling of the Americas. *Science* 272:373–384.
- Salgado-Labouriau, M. (1980): A pollen diagram of the Pleistocene-Holocene boundary of Lake Valencia, Venezuela. *Review of Palaeobotany and Palynology* 30: 297–312.
- Sánchez, M. (1997): *Catálogo Preliminar Comentado de la Flora del Medio Caquetá*. Bogotá: TropenBos.
- Sandweiss, D. H., H. McInnis, R. L. Burger, A. Cano, B. Ojeda, R. Paredes, M. C. Sandweiss, and M. D. Glascock (1998): Quebrada Jaguay: Early South American maritime adaptations. *Science* 281:1830–1832.
- Sauer, C. O. (1944): A geographic sketch of early man in America. *The Geographical Review* 34:529–573.
- Shott, M. J. (1996): An exegesis of the curation concept. *Journal of Anthropological Research* 52:259–280.
- Smith, C. E. (1966): Archaeological evidence for selection in avocado. *Economic Botany* 20:169–175.
- . (1969): Additional notes on pre-conquest avocados in Mexico. *Economic Botany* 23:135–140.
- Solway, J. S., and R. B. Lee (1990): Foragers, genuine or spurious? *Current Anthropology* 33:187–224.
- Sponsel, L. E. (1985): Ecology, anthropology, and values in Amazonia. In *Cultural values and human ecology in Southeast Asia*, edited by K. L. Hutterer, A. T. Rambo, and G. Lovelace, 77–121. Ann Arbor: Michigan Papers on South and Southeast Asia 27, University of Michigan Press.
- . (1989): Farming and foraging: A necessary complementarity in Amazonia? In *Farmers as hunters: The implications of sedentism*, edited by S. Kent, 37–45. Cambridge: Cambridge University Press.
- Testart, A. (1988): Some major problems in the social anthropology of hunter-gatherers. *Current Anthropology* 29:1–31.
- Torrence, R. (1983): Time budgeting and hunter-gatherer technology. In *Pleistocene hunters and gatherers in Europe*, edited by G. Bailey, 11–22. Cambridge: Cambridge University Press.
- Urrego, C., L. F. Herrera, S. Mora, and I. Cavelier (1995): *Informática y arqueología: Un modelo para el Manejo de Datos Básicos*. Bogotá: Colcultura.
- Urrego, L. E. (1991): Sucesión holocénica de un bosque de Maurita flexuosa L. F.

- en el valle del río Caquetá (Amazonia Colombiana). *Colombia Amazonica* 5(2): 99–118.
- . (1997): Los Bosques Inundables del Medio Caquetá: Caracterización y sucesión. Bogotá: TropenBos.
- Van der Hammen, M. C. (1992): *El Manejo del Mundo: Naturaleza y sociedad entre los Yukuna de la Amazonia Colombiana*. Bogotá: TropenBos.
- Van der Hammen, T., L. E. Urrego, N. Espejo, J. F. Duivenvorden, and J. M. Lips (1991a): El cuaternario tardío del rea del medio Caquetá (Amazonia Colombiana). *Colombia Amazónica* 5(1):91–118.
- . (1991b): Fluctuaciones del nivel del agua del río y de la velocidad de sedimentación durante los últimos 13,000 años en el área de medio Caquetá (Amazonia Colombiana). *Colombia Amazónica* 5(1):119–130.
- Walschburger, T., and P. Von Hildebrand (1988): Observaciones sobre la utilización estacional del bosque húmedo tropical por los indígenas del río Mirití. *Colombia Amazonica* 3:51–73.
- Willey, G. R. (1971): *An introduction to American archaeology*. Vol. 2. Englewood Cliffs: Prentice Hall.

Hunter-Gatherers in Amazonia during the Pleistocene-Holocene Transition

Betty J. Meggers and Eurico Th. Miller

Amazonia is the largest expanse of tropical rain forest on the planet and the least known archeologically. Survey along the major tributaries has identified hundreds of habitation sites with ceramics, but little evidence of earlier occupation. Lithics encountered during survey along power-line transects and riverbanks and in three rock shelters testify to the presence of humans in widely separated parts of the lowlands by at least 13,000 B.P., but establishing whether these locations were within the rain forest and were colonized prior to the adoption of agriculture requires identifying the extent of the forest during the Pleistocene-Holocene transition and the antiquity of plant domestication. In contrast to the acceptance of periods of rain forest reduction in tropical Africa, the existence, magnitude, timing, duration, and character of Amazonian fluctuations remain disputed. Establishing the antiquity of dependence on cultigens is inhibited by the perishable nature of the primary domesticates, manioc and sweet potatoes. On the positive side, the biogeographic interpretation of the distributions of linguistic, genetic, and ethnographic traits and the observations of the subsistence behavior of surviving hunter-gatherers provide independent sets of data that can be compared with the paleoenvironmental and archeological reconstructions.

After a brief summary of the modern ecosystem, discussion will focus on four general topics: (1) the environment between circa 15,000 and 7000 B.P.; (2) the archeological evidence for early human presence; (3) the antiquity of subsistence agriculture, and (4) the ethnographical evidence for the productivity of wild food resources. We conclude that the Amazonian rain forest was colonized by small groups of foragers as early as other parts of South America.

The Present Environment of Amazonia

Tropical rain forest is now the dominant vegetation east of the Andes below about 1000 m elevation, where average monthly temperature varies less than 2.5°C, annual precipitation exceeds 1500 mm, the dry season lasts less than three months, and relative humidity normally exceeds 80% (Meggers, 1996). Bisection by the equator produces alternating rainy seasons north and south