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Terras Pretas de Índio of the Caquetá-Japurá River (Colombian Amazonia)

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Abstract

Amazonian dark earths, or *terra preta*, constitute archaeological evidence of ancient human settlements. They are distributed throughout the Amazon basin, especially concentrated along its major rivers. In the region of La Pedrera, on the Caquetá (Japurá) River in Colombian Amazonia, archaeological studies have demonstrated the presence of these fertile soils extending over areas of 3 to 5 hectares with an anthropic horizon that varies from 70 cm to 1.2 m in depth. Associated with the sites are faunal remains from fish, turtles, and small rodents, as well as a high density of ceramic fragments and botanical remains, including phytoliths, charcoal, and seeds, the latter two dated to between 6500 and 1300 yBP. Archaeobotanical data (seeds and phytoliths) suggest intensive use of palms by pre-Columbian peoples. High sample densities were observed for the following species: canangucha/burití (*Mauritia flexuosa*), asái/açaí (*Enterpe precatória*), seje/batauí (*Oenocarpus batava*), milpesito/bacabinha (*O. bacaba*), chambira/tucuma (*Astrocaryum chambira*), palma real/inajai (*Attalea maripa*), puy/caraná (*Lepidocaryum tenue*), and species of the genus *Bactris*. Archaeological remains of manioc (*Manihot esculenta*), maize (*Zea mays*), and squash (*Cucurbita* sp.) were also identified, along with the following fruit species: *Annona* sp., ice cream bean/guama (*Inga edulis*), cocoa/cacau (*Theobroma cacao*), cupuaçu (*Theobroma grandiflorum*) and pineapple (*Ananas comosus*). Various herbaceous taxa, indicators of disturbed areas, were also identified, along with elements used in the elaboration of ceramics (*Licania* sp.). These preliminary results suggest that the Amazonian dark earths of La Pedrera were used for agricultural production and human habitation. We also note that their location, near rapids, is strategic for fishing and land management.

Introduction

In Amazonia, there is a type of soil that has been variously called *Terra Preta de Índio*, Indian Black Earth, Archaeological Black Earth, Amazonian Dark Earth, *Suelos antrópicos*, *Suelos Negros*, or *Suelos Antropogénicos* (Woods 2003). These soils occur over a large part of the Amazon Basin in *terra firme*, *várzea*, and *igapós* (Kern *et al.* 2003, Lehmann *et al.* 2003, Morcote 2008). In extension they vary in size from less than a hectare to hundreds of hectares, with depths ranging from 30 to 150 cm. *Terras pretas* (TP) are characterized by their dark color, high organic matter and charcoal (Neves *et al.* 2003), and high nutrient content. High fertility is maintained over decades or even centuries. TP are always associated with ancient human settlements and intensive agricultural use (Mora *et al.* 1991, Morcote and León 2010, Neves 2010). The earliest age estimates are in the range of 5000 years BP (Meggers and Miller 2006, Kipnis 2010).

A variety of socio-political factors have impeded the study of TP in the Colombian Amazon. For many TP sites in Colombia, the only recorded information is the locality; very few sites have been systematically investigated. In the 1970s and 1990s, the region of Araracuara and La Pedrera (Caquetá-Japurá River) was a focal point of systematic archaeological studies on TP and diverse hypotheses were generated about their origin, use, and antiquity (von Hildebrand 1976, Bray *et al.* 1977, von Hildebrand and Reichel 1982, Andrade 1986, Andrade and Botero 1984, Mora *et al.* 1991) (Figure 1).

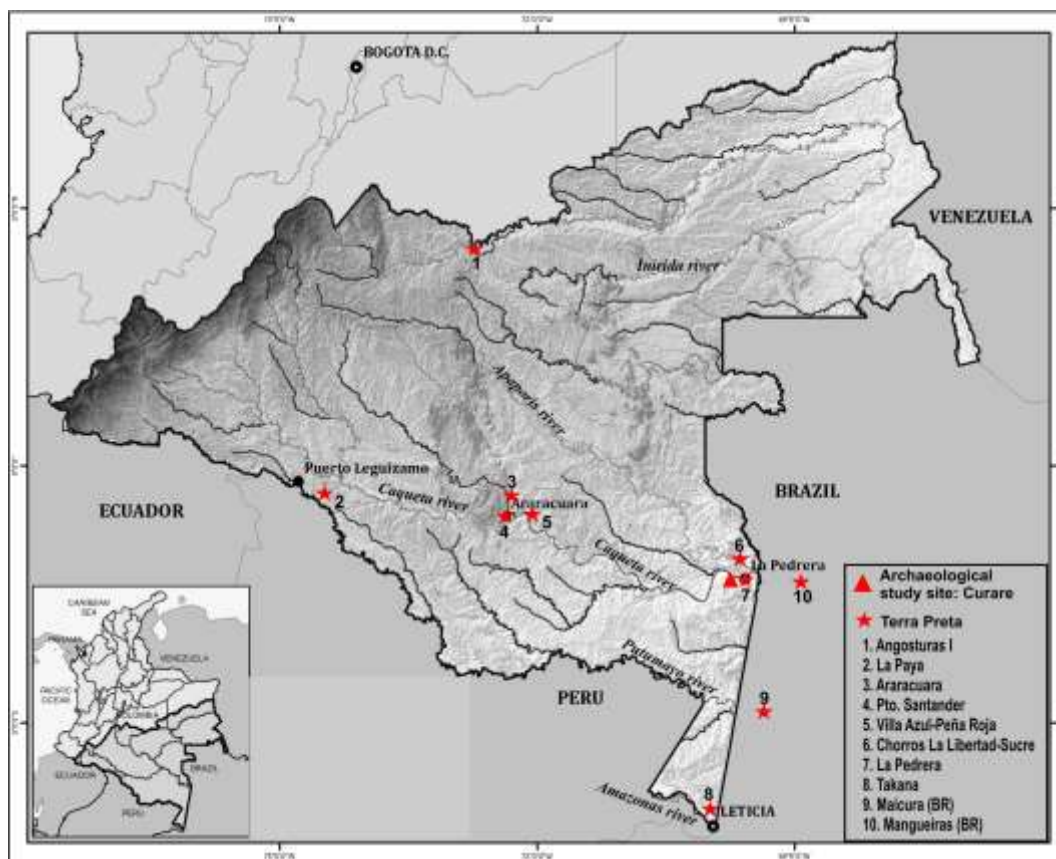


Figure 1. Archaeological sites associated with *Terra Preta* in the Colombian Amazon and adjacent areas in Brazil. Archaeological study site: COL. AM: La Pedrera - Curare Indigenous Reserve.

The present article is part of a larger regional study, the objectives of which are to verify the existence of *terras pretas* in the lower Caquetá River, map their extension, discover their antiquity, identify the associated botanical remains, especially of cultivated species, and where possible, to associate the *terras pretas* with specific ceramic types. Here we report our findings from Curare, one of five TP sites that have thus far been studied in the region.

Study site

The Curare Indigenous Reserve is located approximately 12 km upriver from La Pedrera on the Caquetá River, which has its headwaters in the Colombian Andes. The region is covered by dense, humid, tropical forest and in some areas, such as La Pedrera and Curare, large rock outcrops of the Guyana Shield are exposed. Average annual precipitation is 3900 mm and temperatures oscillate between 24° and 26°C.

Currently, the population of the indigenous reserve is composed of diverse ethnic groups (in italics) which belong to the following linguistic groups: Arawak: *Yucuna*, *Matapí*, and *Cavillari*; Carib: *Carijona*; Tukano-Oriental: *Tanimuka*; Language isolates: *Maku* and *Andoke*. In the region of La Pedrera, five areas associated with TP were identified; in four of these, one excavation site was dug and in the fifth area, two sites were dug. This article focuses on the study of both macro (seeds) and micro (phytoliths) paleobotanical remains recovered from an archaeological site (Curare 1 Site) with TP on the lower Caquetá River with the following coordinates: S1°18'01.5"; W 69°43'11.5" (Figure 1).

Archaeological prospecting and excavation

In 2009, an archaeological site with TP was identified and delimited in the Curare Reserve via prospecting studies (21 bore holes were dug, each to a depth of 1.2 m). The TP site was found to have an area of three hectares and a high density of ceramic and paleoecological remains (charred seeds, fragments of animal bones), and lithic artifacts at a lower density. The depth of the TP (black soil horizon) was 1.3 m. At this site a 3 x 2 m area was selected for excavation, and given the name "Site 1". Twelve levels were excavated, at 10 cm increments, for a total depth of 135 cm. At each level samples were collected of cultural material, floral and faunal remains.

Cultural Material

A total of 3698 ceramic fragments were recovered from Curare Site 1. The uppermost 40 cm of the excavated site were characterized by the presence of a very simple ceramic with inclusions of *caraipe* (*Licania* sp.); some of the fragments were painted red and black, and others had circular or triangular depressions on the rim. Also in this interval (10-40 cm) we found modeled fragments with red paint that can be associated with the Barranoid tradition, following Lathrap's criteria (2010), or the Japurá phase described by Hilbert (1962) (Figure 2). This same ceramic type was also found at other sites in the region, both by us (2009-2010) and by von Hildebrand and Reichel (1982).

From a nearby excavated archaeological site in Puerto Córdoba (La Pedrera), we obtained a radiocarbon date of Cal BP 630-600 (Beta 273955) at a depth of 34 cm in *terra preta*. At this site, we also found a Barranoid type of ceramic similar to that found in Curare Site 1, suggesting that the Curare site has a similar chronology.

In the 40-120 cm interval of Curare Site 1, abundant ceramic fragments were recovered and reconstructed as bowls. These are characterized by inclusions of fresh water spicules (*cauxi*: Spongillidae indet.) and some are decorated with fine, roughly drawn geometric lines, red paint, and anthropomorphic modeling. The latter designs are associated with deeper levels (80-120 cm) dated to Cal BP 3340-3070 (Figure 2).



Figure 2. a-e: Ceramic fragments with fine, roughly made geometric incisions, and tempered with *cauxi*; f: anthropomorphic figure tempered with *cauxi*; g-i: bowls with red paint, also tempered with *cauxi*; j-l: modeled fragments of the Barrancoid tradition; m: vessel with modeled concentric lines; n: base of vessel with inclusions of *cariapé*; o: rim with circular depressions and red paint externally.

Archaeological Seeds

Samples of archaeological seeds were hand collected during the excavation process and a total of 260 charred seed fragments were recovered in this way. Twenty-six sediment samples were also collected and in the flotation process 7867 fragments of charred seeds were recovered. This universe of macroremains is an important line of evidence for inferences about plant use among ancient societies, as well as the antiquity of the TP located in the region.

Archaeological Phytoliths

To obtain archaeological phytoliths, the East profile of Site 1 was selected for sampling because it presented clearly defined stratigraphic horizons and minimal signs of disturbance. Twenty-three cylinders of PVC (5 cm long and ½ cm diameter) were placed at 5 cm intervals along the length of the profile (Figure 3 2). These were extracted with their sediment cores, and later packed and labeled for detailed analysis of plant microremains associated with pre-Colombian settlement.

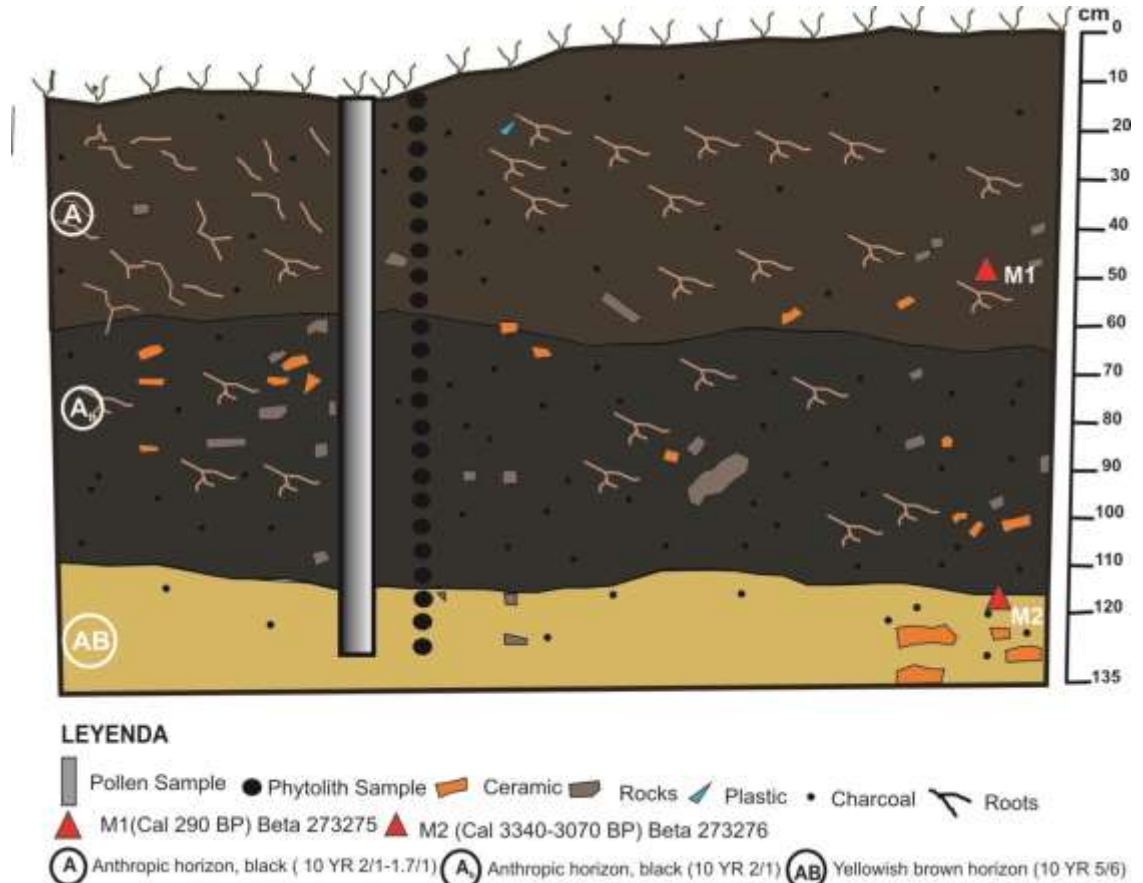


Figure 3. Stratigraphic profile of the eastern wall showing TP horizons and cultural and paleoecological content.

In the laboratory, the sediment samples were passed through a 0.5 mm mesh and washed with distilled water to remove sand grains and small stones. The samples were then treated with 200 ml 50% hydrogen peroxide (H_2O_2) at 16 hour intervals to eliminate any organic matter present. This procedure was repeated eight times until a translucent sample remained. Each of the samples was then washed in distilled water and centrifuged to eliminate all traces of H_2O_2 ; 8 ml of zinc chloride ($ZnCl_2$) of specific density 2.2 was subsequently added to each sample and centrifuged to separate the phytolith (silica) containing fraction from the soil matrix. Following this step, the phytoliths were mounted on glass slides in duplicate or triplicate, for subsequent description, counts and taxonomic determination (Piperno 1988, Pearsall 1989, Morcote 2008).

Chronological data (^{14}C)

Two botanical samples were selected for radiocarbon dating (Figure 3). These were dated using Accelerated Mass Spectrometry (AMS) by Beta Analytic Inc. (Table 1). The carbon sample that was obtained at a depth of 48 cm from Site 1 (Beta-273275) was dated to within the last 300 years. One of the possible explanations for such recent date at this depth is that elements from upper soil layers were displaced through bioperturbation, favored by the sandy texture and loose structure of the soil. In the top 30 cm, we observed the presence of modern materials (batteries, bottle caps, etc.) mixed with archaeological evidence (ceramic, floral and faunal remains). The second sample, collected from the lower stratum of Site 1 (Beta 273276), was dated to 3000 years BP.

Laboratory Sample No.	Sample Code	Depth (cm)	Sample Type	Chronology ¹⁴ C	¹⁴ C 2 Sigma calibrated 95% probability Cal BP 290-0
Beta 273275	4415	48 cm	Carbonized wood	240±40 BP	Cal BP 290-0
Beta 273276	4422	117 cm	Seed of <i>A. chambira</i> (Palmae)	3010±40 BP	Cal BP 3340-3070

Table 1: Radiocarbon analysis of two carbonized samples obtained at Site 1 in the Curare Indigenous Reserve, Caquetá River, Colombia

Determination of archaeological seeds

The taxonomic identification of archaeological seeds was based on the reference collection of contemporary seeds in the Archaeological Collections of the Instituto de Ciencias Naturales of the Universidad Nacional de Colombia. Seven species of palm (Arecaceae) were identified: *buriti* (*Mauritia flexuosa*), *asaí* (*Enterpe precatória*), peach palm (*Bactris gasipaes*), *chambira* (*Astrocaryum chambira*), *javari* (*Astrocaryum jauari*), *espinoso* (*Astrocaryum gynacanthum*), and African oil palm (*Elaeis guineensis*), this last species a recent introduction to the Amazon region. *Mauritia flexuosa*, *Astrocaryum chambira*, and *A. gynacanthus* are the most abundant species recovered from the archaeological site. Today, in the Middle and Lower Caquetá region, these species are intensively managed as food resources and as source materials for the fabrication of diverse implements (Galeano 1991, Sánchez 1997, Galeano and Bernal 2010).

The archaeological seed record shows that the majority of these species are represented throughout the entire period of human occupation. It is noteworthy that the peach palm, the only palm domesticated in the Americas and about which there has been much debate over its origin and domestication (see Morcote & Bernal 2001, Clement et al. 2010) was found in both the upper (10-20 cm) and lower levels (80-90 cm), which, in accordance with the dates obtained, could indicate an introduction to the region 2000 or 3000 years ago.

The archaeological determination of peach palm is based on morphological diagnostic characters, such as the width of the seed wall and the covering of flat fibers forming a reticulum. These characters distinguish the peach palm from other species of *Bactris* and *Astrocaryum* found at the site. It should be noted that *Bactris gasipaes* remains an actively managed food crop, with ongoing selection by indigenous groups in the NW Amazon. Culturally, this species also plays a central role in harvest festivals and origin myths.

Determination of archaeological phytoliths

Taxonomic identification of phytoliths was based on the reference collection of contemporary phytoliths of Amazonian plants in the Archaeological Collections of the Instituto de Ciencias Naturales of the Universidad Nacional de Colombia. At the Curare Archaeological Site, 31 taxa were identified and a further 15 morphotypes were described. Figure 4 shows the most representative taxa found at Site 1.

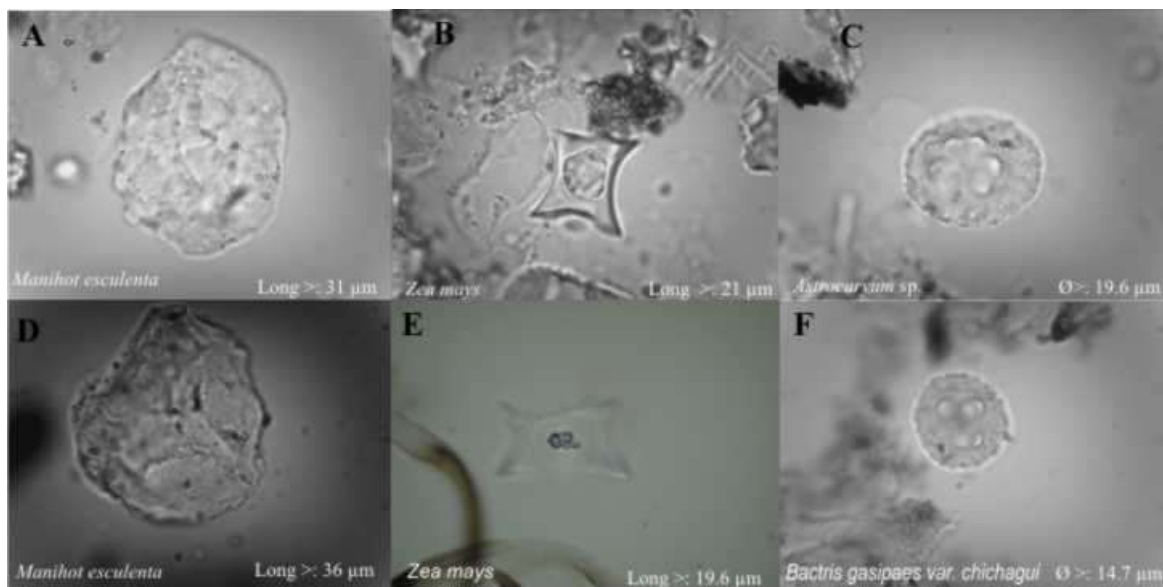


Figure 4. Top row: archaeological phytoliths found at the Curare 1 Archaeological Site, Caquetá River, Colombia; bottom row: modern phytoliths from the Universidad Nacional de Colombia's reference collection. A, D: *Manihot esculenta*, B, E: *Zea mays*, C: *Astrocaryum* sp., F: *Bactris gasipaes*.

Among the taxa that could be determined were cultigens, such as cassava (*Manihot esculenta*), maize (*Zea mays*), and squash (*Cucurbita* cf. *pepo*), and what is probably a cultivar of the American yam (*Dioscorea* cf. *trifida*). Among the palms, six species were identified: *Astrocaryum chambira*, *Attalea maripa*, *Euterpe precatoria*, *Lepidocaryum tenue*, *Mauritia flexuosa*, and *Oenocarpus batana*; and two genera: *Astrocaryum* and *Bactris*. Representative tree species found at the site include *Licania* sp. and *Cecropia* sp. In the category of fruit trees the following taxa were identified: papaya (*Carica papaya*), soursop (*Annona* sp.), ice cream bean (*Inga edulis*), pineapple (*Ananas comosus*), cupuaçu, and cacao (*Theobroma grandiflorum* and *T. cacao*).

Description of the Phytolith Diagram – Site 1

The phytolith diagram (Figure 5) shows that palms are abundantly represented over the entire period of human occupation at this site. This pattern is repeated in many archaeological sites in the Amazon, and is attributable to the fact that palms are among the most important plants used by humans in the Amazon and have been for more than 10,000 years (Morcote and Bernal 2001). The abundance of *buriti* and *asaí* (*M. flexuosa* and *E. precatoria*) phytoliths suggests these were preferred species.

Among the cultivated species that were identified, cassava (*M. esculenta*) is the most abundant at the site, particularly at depths of 55-100 cm, which coincides with an abundance of charred seeds and ceramic vestiges at the same depths. Other cultigens present at the site, although less abundant, are maize, squash, and yam, the latter particularly important in the lowland humid tropics. Based on our experience to date, phytoliths of *Dioscorea trifida* do not possess many diagnostic characters; however, other micro-anatomical structures persist in sediments over long periods of time and are useful in the identification of this species.

Phytoliths identified from fruit tree species are poorly represented in the sample. It is possible that fruit trees such as papaya and the species of cacao represent more recent introductions, especially the *T. grandiflorum*, which is native in eastern Amazonia (Clement et al. 2010).

Another important species identified at the site is *cariapé* (*Licania* sp.). A high concentration of phytoliths of this taxon was found in the 0-60 cm interval, coinciding with the presence, at the same depth, of ceramic vestiges with *cariapé* fibers embedded. The abundance of the phytoliths is probably associated with

the ceramic manufacturing process in which *cariapé* is added to the clay. The presence of *Cecropia* sp. in the archaeological record might be an indicator of secondary vegetation. However, another possibility also exists. Our ethnographic observations of indigenous groups in the Colombian Amazon show that leaves of several different species of *Cecropia* are burnt and the ashes mixed with coca leaves (*Erythroxylum coca* var. *ipadu*) in the preparation of *mambe*, a substance that is consumed in ritual and everyday contexts.

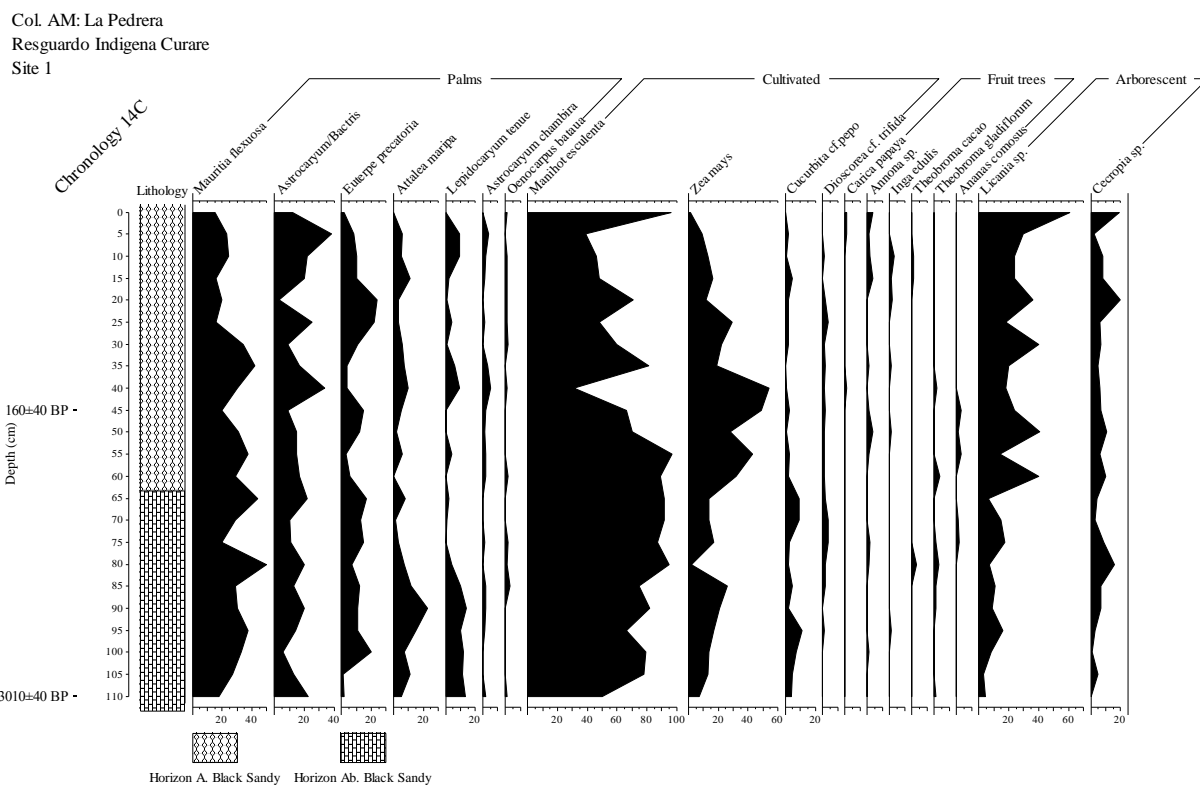


Figure 5. Phytolith diagram with a selection of the most important taxa identified from Curare 1 Archaeological Site 1, Caquetá River, Colombia.

Conclusions

The creation of a phytolith reference collection of contemporary Amazonian species has been fundamental for the study of archaeological phytoliths, making possible the identification of ancient plant remains. Continuing to build this reference collection is of vital importance for archaeological studies in the Amazon.

The TP sites in the Colombian Amazon that we have studied thus far all have in common the absence of fossil pollen. Nevertheless, at these sites, charred seeds and archaeological phytoliths are well preserved and relatively abundant, making them important research tools for understanding the relationships between ancient peoples and plants or ancient human impacts on landscapes.

The results of archaeological prospecting and excavation of the Curare 1 Site indicate that the TP there are up to 3000 years old. Two ceramic traditions have been identified from the site: the upper strata are associated with the Barrancoid Tradition, while the lower (older) strata are characterized by ceramics made with *cauxi* (Spongillidae indet.) and anthropomorphic and geometric motifs. We recognize the limitations of having only two radiocarbon dates for this site, but ceramic types identified here are consistent with our findings at similar depths at other sites in the lower Caquetá region (Morcote-Ríos et al., in prep.).

Associated with TP and with these cultural traditions, various cultivated plants have been identified, the most ancient of which are cassava, maize, squash, peach palm, and two species of palm whose populations have been manipulated by humans: *buriti* and *asaí*. These six species were probably the basis of

the diet of the peoples who inhabited this region. Additional data are needed to demonstrate when maize was introduced to the region and when agriculture was first adopted. These questions will be addressed in future studies.

Finally, we highlight the need to carry out detailed radiocarbon analyses and microstratigraphic studies at this archaeological site in order to define and contextualize the diverse human occupations that have occurred in the area and document changes in subsistence agriculture over time.

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