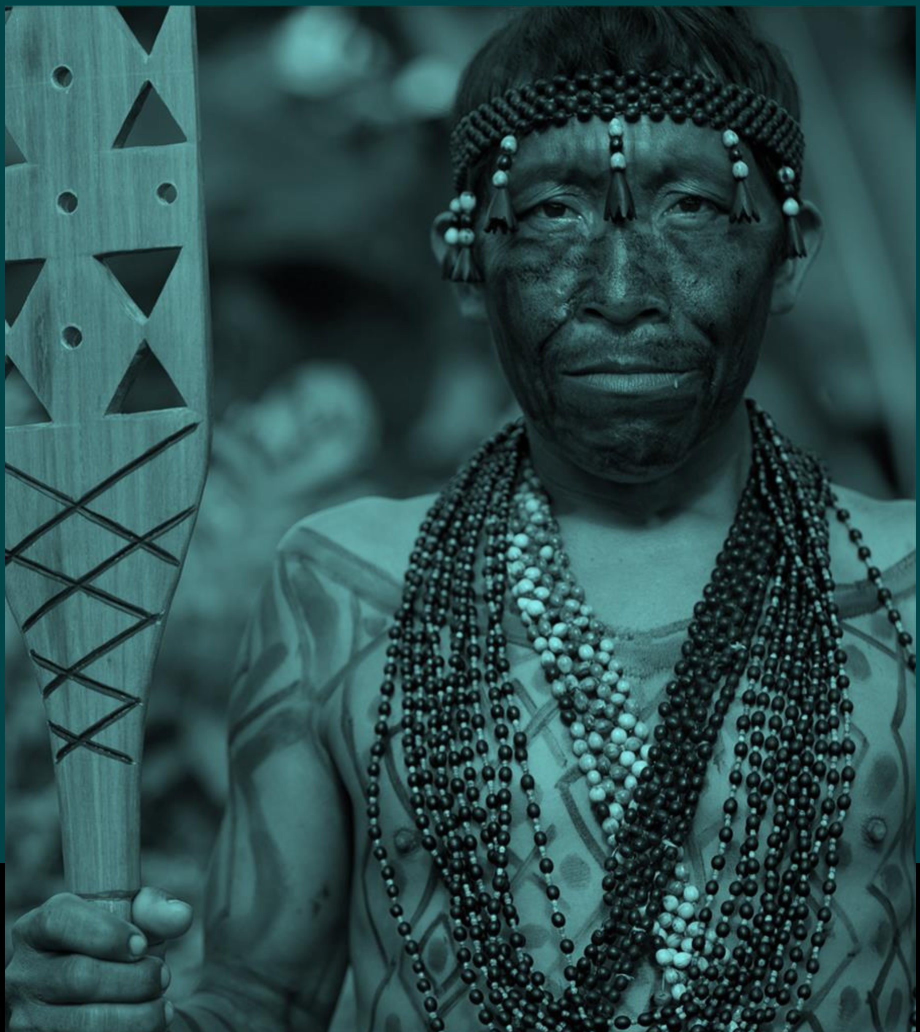
Amazon Assessment Report 2021

Chapter 8

Peoples of the Amazon before European Colonization



O cacique Adílio Kanamari , cujo nome na sua língua é Arabonã (Foto: Bruno Kelly/Amazônia Real)

THE AMAZON WE WANT

Science Panel for the Amazon

SUSTAINABLE DEVELOPMENT SOLUTIONS NETWORK

A GLOBAL INITIATIVE FOR THE UNITED NATIONS

About the Science Panel for the Amazon (SPA)

The Science Panel for the Amazon is an unprecedented initiative convened under the auspices of the United Nations Sustainable Development Solutions Network (SDSN). The SPA is composed of over 200 preeminent scientists and researchers from the eight Amazonian countries, French Guiana, and global partners. These experts came together to debate, analyze, and assemble the accumulated knowledge of the scientific community, Indigenous peoples, and other stakeholders that live and work in the Amazon.

The Panel is inspired by the Leticia Pact for the Amazon. This is a first-of-its-kind Report which provides a comprehensive, objective, open, transparent, systematic, and rigorous scientific assessment of the state of the Amazon's ecosystems, current trends, and their implications for the long-term well-being of the region, as well as opportunities and policy relevant options for conservation and sustainable development.

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Graphical Abstract

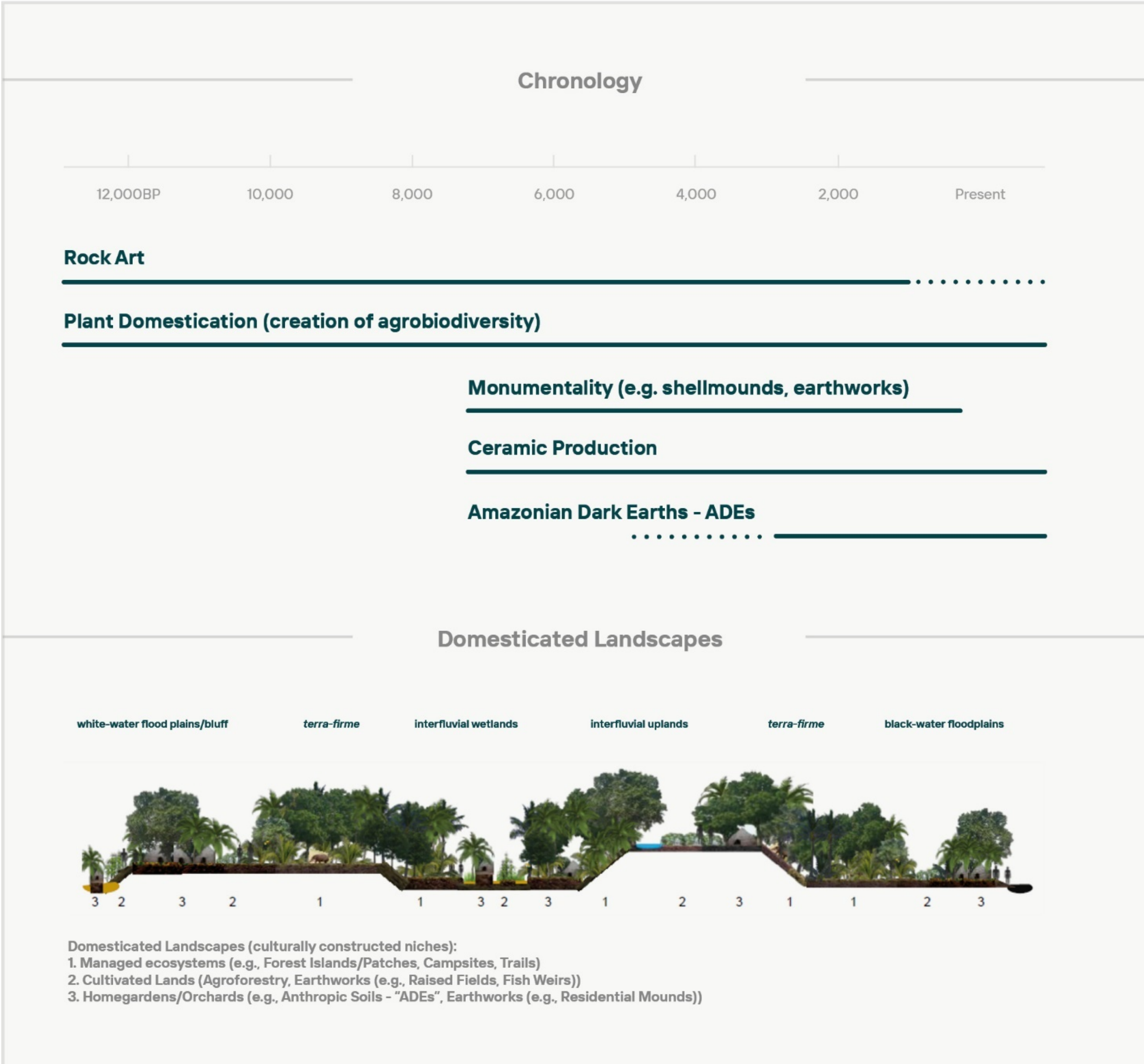

Figure 8.A Schematic representation of landscape transformations associated with the history of Indigenous occupation of the Amazon. Management practices and plant domestication intensifies with greater proximity to residential locations. (Source: Carolina Levis).

Peoples of the Amazon before European Colonization

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Key Messages

- The Amazon has been occupied by Indigenous people for over 12,000 years.
- During this long history, Amazonian Indigenous societies developed technologies that were highly adapted to local conditions and which optimized their development and the expansion of food production systems, including anthropic soils, raised fields, and agroforests.
- Such technologies have long-lasting impacts which are incorporated into contemporary Amazonian landscapes.
- These technologies can inspire new forms of urbanism, waste management, and land-use systems highly integrated with the Amazon's natural conditions, with the potential to boost sustainable solutions for Amazonian development.
- Amazonian archaeology shows how the early Indigenous history of the region is characterized by the production of cultural and agrobiological diversity.
- The Amazon was a major focus of cultural and technological innovation in South America. It is one of the world's few independent centers of plant domestication, and home to the earliest ceramics production in the Americas.
- The evolutionary history of Amazonian Biomes during the Holocene was significantly affected by Indigenous peoples' management practices.
- Strict-protection nature reserves whose interiors have been traditionally occupied should be reconfigured to allow traditional peoples to remain and continue their ways of life, preserving their natural-cultural heritage.
- Society at large must be made aware of the fundamental intellectual contributions of Amazonian peoples to both national and global development

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Abstract

Indigenous occupation of the Amazon started around 12,000 years ago. Archaeological evidence shows that these early settlers already exhibited cultural diversity, expressed in different rock art styles and stone artifacts. These early societies had diversified economies that included generalized consumption of different plants and animals, together with the early cultivation of plants. Such practices of plant cultivation transformed the Amazon as one of the independent centers of plant domestication in the world, as well as a cradle for the production of agrobiodiversity, embedded in systems of knowledge still kept by Indigenous and other traditional societies in the present. The Amazon was also a cradle for other cultural innovations, such as the production of the earliest ceramics in the Americas, early monumental architecture, and the dark fertile soils known as "*terras pretas*". Along this long history one sees the continuous expression of cultural differentiation manifested, for instance, in distinct ceramic styles with sophisticated iconographies and production technologies, as well as by the impressive number of different languages and families of languages spoken, which rank among the highest in the world. Archaeology tells us how Indigenous peoples transformed nature in the Amazon over millennia to the point that it is hard today to disentangle natural from cultural heritage there. It also shows that any kind of sustainable future has to take into account the rich Indigenous heritage manifested in archaeological sites, contemporary landscapes, and the contemporary knowledge of traditional societies.

Keywords: Archaeology, deep history, forest peoples, landscape domestication, past cultural diversity, natural heritage as cultural heritage, traditional knowledge

8.1. Introduction

There are a number of ways to learn about the past. Ancient texts, documents, maps, and photographs, for instance, are traditionally considered the staple foods of history. But in the Amazon, the geographic and temporal scope of such sources is restricted to places visited or occupied by Europeans and their descendants; further, such items were often produced by these external actors, whose primary commitment was to the Catholic Church, colonial administrations, or, as the nineteenth century progressed, constructing national identities and/or an emerging ideal of science. In contrast, the oral histories of Indigenous peoples and local communities (IPLCs), based on collective human memory, counteract Eurocentric perspectives, even though many groups suffered demographic collapse after European conquest and colonization, interfering with the transmission of history between generations. Fortunately, contributions by Indigenous intellectuals are now mounting; these reflect on their past and present histories, climate change, and State policies directed at forest areas, among other issues (Kopenawa and Albert 2013; Krenak 2019, 2020; Baniwa 2006; Lima Barreto 2013; Benites 2014; Jacupe 2000). As the coronavirus pandemic has taken the lives of a large number of elders in a short space of time, much of this knowledge is still being lost.

By studying the material remains of human presence and actions, archaeology provides a singular opportunity for understanding the human past from its earliest manifestations up to the present, at several temporal and spatial scales, permitting us to examine continuities and historical processes that could otherwise elude observation (Heckenberger 2005). Interdisciplinary by nature, archaeological investigations can incorporate investigative methods and/or information from the fields of history, anthropology, linguistics, geology, biology, genetics, and ecology, among others, to further its understanding of the past.

Estimates indicate that the Indigenous population of the Amazon today is just a small fraction of what it was on the eve of European invasion (Koch et al 2019). By the sixteenth century, there were roughly 10 million people living in either small semi-permanent settlements or large permanent villages of over 50 hectares (Tamanaha 2018). Thanks to the construction of cultural niches, large populations were achieved without reaching environmental carrying capacity (Arroyo-Kalin and Riris 2020); or in other words, without the over-exploitation of resources.

Archaeological research in the Amazon has increased considerably during the last decades. Academic archaeology gained momentum in the region following the development of large international and interdisciplinary collaborations and the consolidation of Amazon-based research groups and university archaeology departments, all of which have contributed significantly to broadening and deepening our knowledge of the histories of Amazonian Indigenous populations (Figure 8.1). These developments resulted, in part, from an increase in contract archaeology, which expanded substantially in Brazil following a 2002 federal decree requiring archaeological inventories, impact studies, and rescue operations to be completed prior to construction of infrastructure projects. Both in Brazil and in other Amazonian countries,

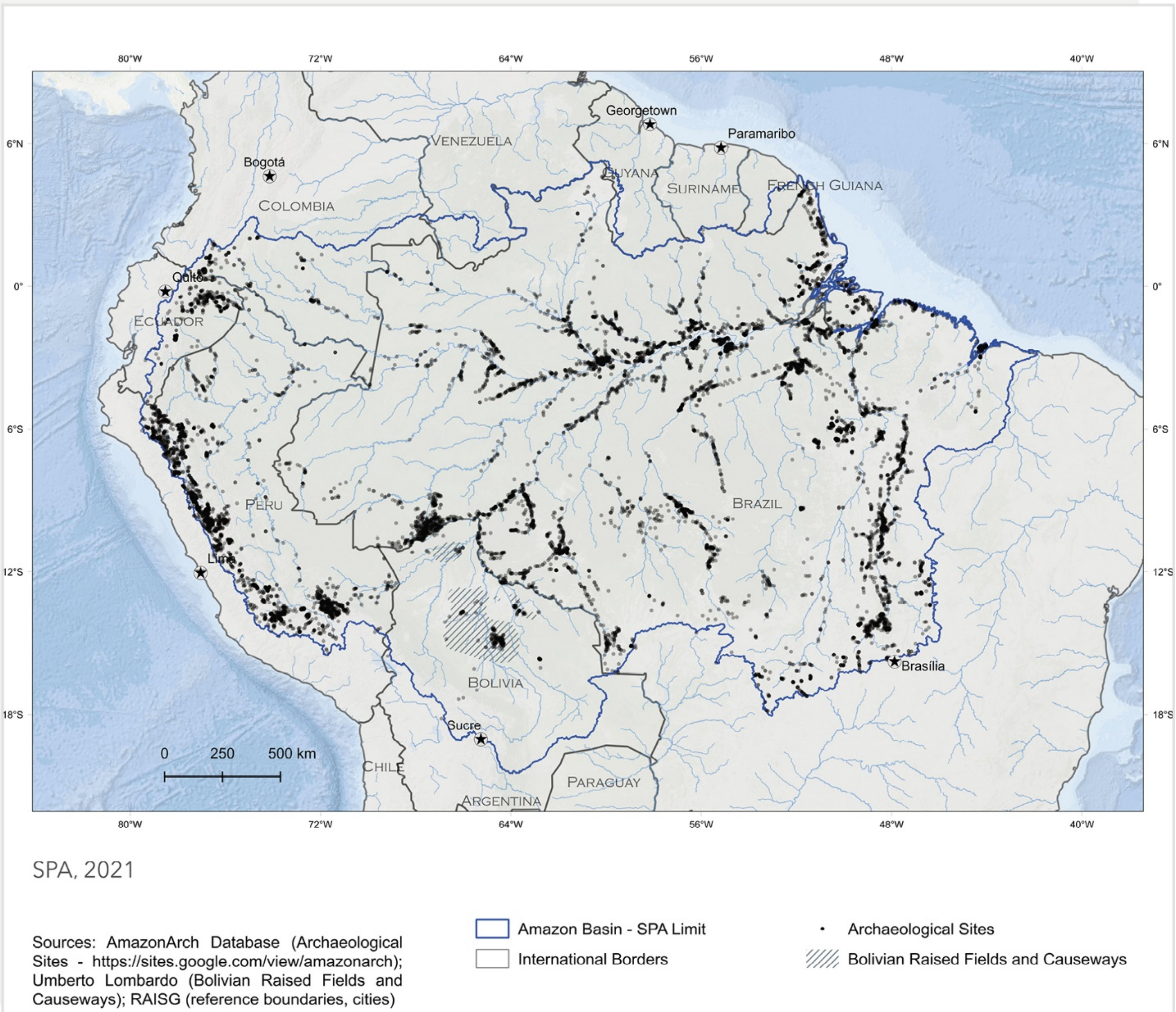

Figure 8.1 Archaeological sites of the Amazon (Source: AmazonArch).

such archaeological research has revealed thousands of archaeological sites, many of which have been documented prior to their destruction.

In this chapter, we provide a panorama of Amazonian history that stretches back at least 12,000 years. Although biased towards Brazil, where there is comparatively more research, we aim to bring in data from other Amazonian countries. Although found in the Amazon Basin, interesting and important archaeological sites and cultures, such as Machu Picchu and Chachapoyas (Kuelap) in Peru, or Samaipata in Bolivia, were not included because of their clear connection with the Andes, as well as lack of space.

We demonstrate how the region's human history is closely interwoven with important environmental transformations that affected the distribution of vital resources today. In this way, we introduce Amazonian peoples' remarkable cultural achievements and the deep history of their impressive linguistic and cultural diversity. To do this, we will employ certain concepts that we present below. Towards the end of the chapter, we consider how archaeology in the Amazon is alive and undertaken by IPLCs, and provides a privileged route to understand the history of the region from the distant past to the recent present. Although the focus of this chapter falls mostly on the periods prior to 1492, we aim to show that archaeology is an invaluable tool to assess the application of policies that affect IPLCs' territories. This leads us to recommendations for policy makers at the end of the chapter.

8.2. Initial Settlement of the Amazon

In the late 1980s, it was proposed that tropical rainforests could not have been occupied by hunter-gatherer groups before the advent of agriculture (Headland 1987; Bailey *et al*. 1989). It was also proposed that Amazonian hunter-gatherer societies today were descended from farmers that settled along the major rivers after being expelled from these areas to the hinterlands, resulting in the abandonment of farming due to environmental pressures (Lathrap 1968). The notion that environmental hostility and forces of nature triggered a process of decay in Amazonian populations goes back to the early 19th century and influenced the first archaeological research conducted in the mid-20th century. The high visibility of archaeological sites containing elaborate ceramics and monumental structures prompted suggestions of a late arrival of humans to the Amazon from more culturally 'advanced' areas, such as the Andes. These reconstructions have been falsified by data from diverse Amazonian regions that evidence human settlement since the Terminal Pleistocene, well before the advent of farming.

Records of these first colonists are still relatively scarce due to the fact that some of their settlements are either buried under meters of sediment or were carried away by fluvial erosion. To date, at least sixteen sites from the Terminal Pleistocene and Early Holocene have been recorded, especially in Brazil and Colombia (Figure 8.2). The archaeological evidence shows that at the Terminal Pleistocene and early Holocene (15,000-8,200 BP), small groups settled in rock shelters, whose walls are normally covered with paintings (See Box 8.1). From the outset, there was no single cultural tradition that could be associated with these early occupations, at least based on the lithic (stone tool) artefacts found at these sites. In the upper Guaporé Basin, the Abrigo do Sol rock shelter yielded radiocarbon dates between 14,700 and 8,930 BP (Miller 1987: 63-4), associated with a diversified unifacial lithic assemblage. Lithic remains from Pedra Pintada cave, in the lower Amazon region, yielded bifacial lithic artefacts dating to c. 11,200 BP (Roosevelt et al. 1996). At Cerro Azul, in the middle Guaviare River, in Colombia, lithic remains dating back to 10,200 BP were reported in an area with rock art of potentially the same age (Morcote-Ríos et al. 2020; Box 8.1). In Llanos de Mojos, Bolivia, there is evidence of Indigenous occupation and plant cultivation at 9,420 BP (Lombardo et al. 2020). In the middle Caquetá River, also in the Colombian Amazon, open-air sites of Peña Roja and San Isidro produced unifacial lithics dating to c. 9,000 BP (Gnecco and Mora 1997). In the Carajás hills of Pará, Eastern Amazonia, an unifacial lithic tradition found in rock shelters has been dated to c. 8,800 years BP (Magalhães 2016). In the upper Madeira Basin, there is a long record of production of unifacial lithic tools and flaked axes dating back to the early Holocene (Miller et al. 1992). In much of the Amazon, the availability of stone suitable for the manufacture of tools is unequal. This possibly led to a rapid dispersion of populations in search of these resources, and, at the same time, boosted other technological alternatives and strategies in the vast expanses where these resources were not available.

Faunal remains are found together with stone tools, including those of small- and medium-sized mammals, fish, reptiles, birds, and gastropods. Plant remains include palm fruits, legumes, and other fruit trees. In contrast to material culture differences, one notices a broad-spectrum dietary patterns among these popular-tions, contrary to some other places in the Americas where early settlers adopted specialized strategies. The high diversity of biomes within the Amazon was likely one of the drivers for the emergence of cultural diversity among the early settlers, establishing early on a pattern that prevailed throughout the Holocene.

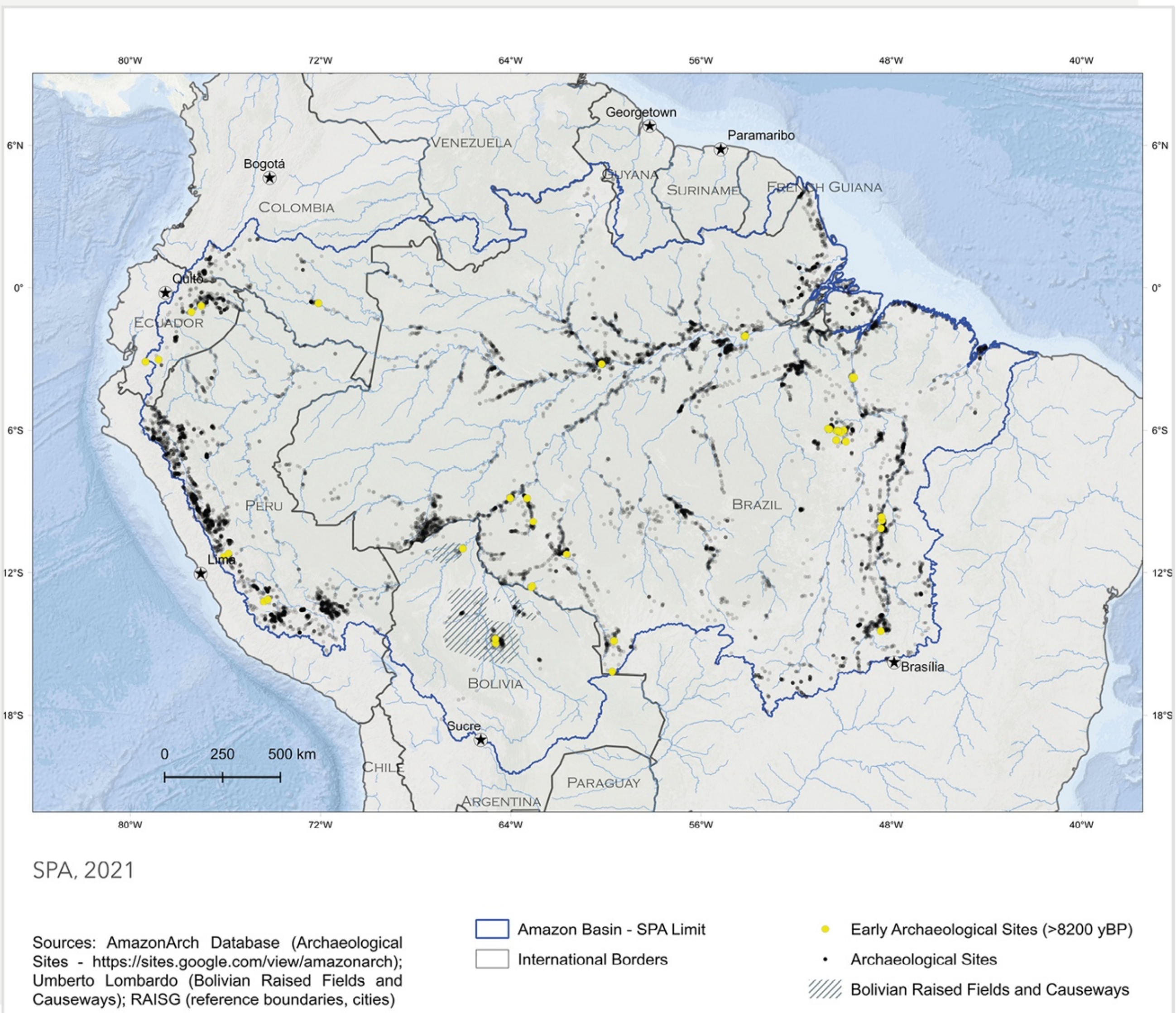

Figure 8.2 Terminal Pleistocene and Early Holocene Archaeological sites of the Amazon (source AmazonArch)

Box 8.1 Ancient Amazonian Rock Art

Rock art is the most ubiquitous manifestation of humankind's early history and is found all over the world but Antarctica. The oldest known paintings of recognizable objects go back to 45,500 years to paintings representing pigs found in a cave in Sulawesi, Indonesia (Brumm et al. 2021). Older records of abstract paintings are found in caves in Spain associated with neandertal occupations dating to 64,000 years (Hoffmann et al. 2018). Rock art sites are widespread all over the Amazon and some of them seem to be contemporary with initial occupation of the area.

Amazonian rock art was produced with two basic sets of techniques: painting and engraving (Pereira 2017). Engravings, also known as petroglyphs, are the most common type of rock art in the Amazon, and were produced by techniques that included scraping, fine-line and deep incisions, and picking. Petroglyphs are found in rocky outcrops along river rapids and falls and also in rock shelters and caves. The strong correlation between petroglyphs and rapids increases their archaeological visibility (Pereira 2017). Paintings were prepared with pigments made of natural minerals, such as iron oxide for red and yellow, carbon and manganese for black, and kaolin for white. These were pulverized and mixed with gelatinous bases made of organics such as resins, eggs, fat, and water. Paintings are normally found on exposed boulders, rock shelters, or caves, in the latter case in places away from and above water bodies.

Rock art sites are difficult to date with standard archaeological techniques. The establishment of the ages of petroglyphs is almost impossible at the moment, since engravings leave no organic trace that can be radiocarbon dated. Likewise, the organic materials that were mixed with pigments are normally found in trace levels, hindering the establishment of secure radiocarbon dates. Consequently, one form of dating paintings is to establish the age of carbonate crusts that grow on the top of them, or to date buried strata that have fallen blocks of painted rock embedded in them. Despite these shortcomings, some of the best-known manifestations of painted rock art from the Amazon come from places where the earliest secure evidence of Indigenous occupation is found; La Lindosa and Chiribiquete, in Colombia, and Monte Alegre, in Brazil (Morcote-Ríos et al. 2020; Roosevelt et al. 1996).

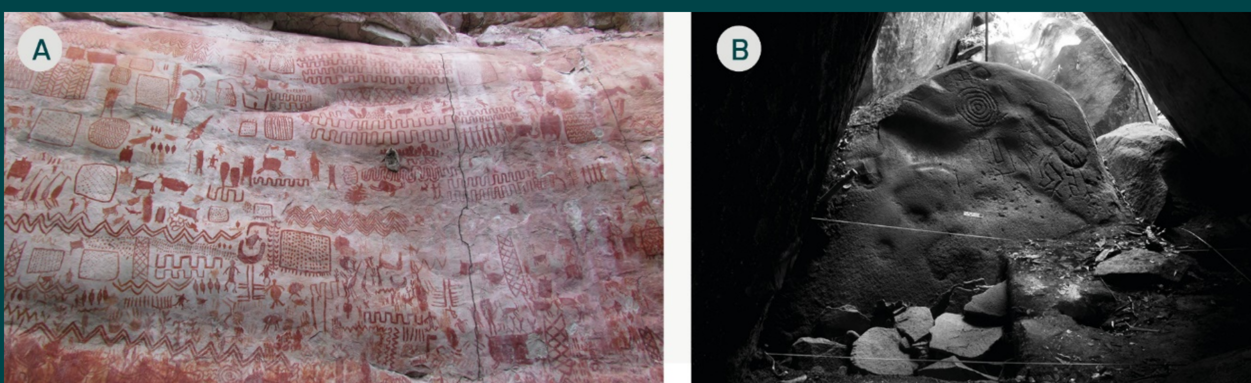

Figure 8.B1 A) Panel with zoomorphic, anthropomorphic, and geometric motifs dating from the Pleistocene/Holocene transition, Cerro Azul rockshelter, Guaviare river, Colombia (photo credit Gaspar Morcote-Ríos); B) Panel with geomoetric motifs (ca. 4,000 BP) Arara Vermelha site, Roraima, Brazil (credit Marta S. Cavallini)

In the now remote area of Chiribiquete, spectacular groups of painted motifs cover large areas of rock shelters. Most painting activities date back to 3,500 to 2,500 BP but here are contexts indirectly dated to 19,500 BP (Castaño-Uribe and Van der Hammen 2005). At Cerro Azul, in the Serranía La Lindosa area, a sandstone formation on the Guaviare River, there is tentative evidence of Indigen-

Box 8.1 ***continued***

ous occupation older that 20,000 years, but it is from ca. 12,100 years BP that one sees the onset of stable, repeated human presence (Morcote-Ríos et al. 2020: 6). Among the painted motifs found in this and other sites in the area are realistic depictions of extinct Pleistocene megafauna, such as giant sloth, mastodon, camelid, horse, and macrauchenia. This combination of factors suggests that the paintings date to the Terminal Pleistocene or Early Holocene.

Pedra Pintada (literally "Painted Rock") cave is in a sandstone massif that overlooks the Amazon River floodplain, near the city of Monte Alegre in the Lower Amazon. There, paint spalls on fallen blocks are found in a stratum dated to 11,200 BP (Roosevelt et al. 1996). Not far from the cave, there are beautiful polychrome paintings that were made on an exposed cliff face at Serra da Lua whose age is unknown. Detailed studies of the composition of the panels, the graphic motifs, and the presence of evidence of pigment production found in excavations suggest that rock art permeates the entire history of occupation in the region (Pereira and Moraes 2019). In some cases, the motifs painted on rocks and those on ceramics present striking similarities (Pereira 2010).

Rock art diversity in the Amazon echoes the diversity seen in other archaeological forms. Sites with painting are concentrated in areas far away from each other with their own independent artistic traditions. Petroglyphs, on the other hand, perhaps because many of them are located in rapids or waterfalls, have a more widespread distribution and display recurrent patterns including faces, whole human figures, adornments such as masks, and geometric motifs.

Although difficult to date, there are attempts to correlate petroglyphs in places such as the Caquetá, Negro, and Tapajós Rivers with the mythical narratives of Indigenous people that currently live there, such as the Tukanoans and the Munduruku (Urbina 2004; Valle 2012). Indeed, for many Indigenous people, rock art plays an important symbolic and political role today (Pereira 2017). In the Apaporis River in Colombia, there is the Nyi Rock site, whose engravings are sacred for the local Indigenous groups, as is the case for the Takana regarding the petroglyphs of Beni River, in Bolivia. In Roraima, Brazil, the Macuxi, Wapishana, and Taurepang living in the São Marcos Indigenous Land see a direct connection between local rock art and their ancestors, a fact used to support their territorial claims.

The recent wave of construction of massive hydroelectric power plants poses an immense threat to these sites. Although recorded by preventative archaeological work, petroglyphs have been flooded or literally exploded, as in the Upper Madeira River for the construction of the Santo Antonio dam. The same may also happen if other dam projects go ahead along the Bolivia-Brazil border in the Mamoré River.

This pattern correlates today with the large diversity of langua-ges, around 300, and genetic units (language families and isolated languages), around 50, found in the Amazon (Epps and Salanova 2013). Genetic data show that virtually all Indigenous American populations south of the Arctic Circle share the same genetic background derived from Northeast Asia, and this is the case of Amazonian Indigenous peoples as well (Posth et al. 2018).

8.3. Culture-climate interactions

Scholars sought early on to explain spatial and temporal variability within the archaeological record as a result of past climate and/or environ-mental change. Millennial- and decadal-scale droughts (and associated savanna expansion under the forest refuge hypothesis [Haffer 1969], now rejected [Bush 2017]) were hypothesized to have caused the diversification of Amazonian languages, as well as the rise and fall of different cultures (Meggers 1975, 1993).

Such theories lost favor with the recognition that past and contemporary Indigenous peoples use multiple strategies to overcome environmental constraints. Research programs combining archaeology and paleoecology allow the rethinking of people-climate-environment interactions in the Amazon.

The climate during the Late Pleistocene, when humans first arrived in the Amazon, was ~5°C cooler and, in some places, up to 50% drier than today. Early settlers would have encountered drier forest or savanna vegetation in the more seasonal fringes of the Amazon Basin (Anhuf 2006; Piperno 2011), as well as megafauna, whose extinction (possibly aggravated by human predation) had a myriad of ecological consequences (Doughty et al. 2016). With the onset of the Holocene (11,200 BP), warmer, wetter conditions led to forest expansion, as human populations began increasing at a continental scale (Goldberg et al. 2016).

In the Mid Holocene (8,200-4,200 BP), cooling in the Northern Hemisphere led to changes in the South American Summer Monsoon (SASM), causing droughts in the western Amazon (Baker et al. 2001), a northward shift of the forest/savanna ecotone along the southern fringes (Pessenda et al. 2001), and wetter conditions in the eastern Amazon (Wang et al. 2017). This period is posited to be characterized by a continent-wide downturn in human populations (Riris and Arroyo-Kalin 2019).

Modern SASM parameters established during the Late Holocene resulted in a wetter climate and the expansion of humid evergreen forest, which reached its current southern limit in the Bolivian Amazon as recently as 2,000 years ago (Carson et al. 2014). Southward expansions of Tupi-Guarani-speaking, agroforestry-practicing groups into the La Plata basin between 2,000 and 500 years has also been linked to forest expansion (Noelli 1996; Iriarte et al. 2016).

In the last millennium, drying associated with the Medieval Climate Anomaly (950-700 BP) may have stimulated large-scale upheaval in the archaeological record of the Amazon (De Souza et al. 2019), while the atmospheric CO_2 increase behind global cooling during the Little Ice Age (450-100 BP) is postulated to have been triggered by the conversion of Indigenous settlements into forest after mass depopulation of the Americas following European contact (Koch et al. 2019), though not without controversy (Boretti 2020).

8.4. Transforming nature: The Amazon as a domestication hotspot

Studies of current practices among IPLCs and the biological assemblages that result from them provide archaeologists with clues to how past practices impacted biodiversity (Levis et al. 2017; Loughlin et al. 2018). Current plant communities result from the interplay between natural ecological processes (i.e., evolutionary forces and environmental selection pressures; e.g. ter Steege et al. 2006) and human activities (termed management practices), which together shape plant species' dispersal capacity, local environmental conditions, and biological interactions (Balée 1989a, 1989b, 2013; Clement et al. 2015; Levis et al. 2018).
By culturally constructing their niches, IPLCs have domesticated Amazonian landscapes by increasing food availability near their homes through practices including (1) removing unwanted plants, (2) protecting useful trees throughout their development, (3) attracting animal dispersers, (4) directly dispersing seeds, (5) selecting specific phenotypes, (6) managing fire, (7) cultivating useful plants, and (8) increasing soil fertility and structure such as creating anthropogenic soils and earthworks (Levis et al. 2018). Even relatively small groups with high mobility and a large dependence on gathered plants, such as the Nukak of Colombia, act to increase concentrations of species useful to them around campsites and along trails, creating

resource patches within their territories (Cabrera et al. 1999; Politis 2007).

Plant use and management by Indigenous peoples began over 12,000 years ago (Box 8.2). Archaeobotanical remains of fruits, seeds, and nuts, especially from arboreal plants such as nance (*Byrsonima* spp.), breadnut (*Brosimum* spp.), pequiá (*Caryocar* spp.), Brazil nut (*Bertholletia excelsa*), and palms (*Acrocomia* sp., *Astrocaryum* spp., *Attalea* spp., *Bactris* spp., *Euterpe* spp., *Mauritia flexuosa*, *Oenocarpus* spp., *Syagrus* spp.) are abundant in the earliest (>10 ka) archaeological sites of the Amazon (e.g. Pedra Pintada, Carajás, Cerro Azul, Peña Roja; Box 8.1) (Lombardo et al. 2020; Mora 2003; Morcote-Rios et al. 2014, 2017, 2020; Roosevelt 1998; Roosevelt et al. 1996; Shock and Moraes 2019). This pattern shows how tree and palm species were highly valued and that the use of plant resources was locally persistent enough to prompt redundant use of locales, resulting in places with high archaeological visibility (Shock and Moraes 2019). The collection, consumption, and discard of certain fruits (and their seeds), and the management practices that are implied by human occupation, such as the creation of mosaics of forested and open areas (Box 8.2), eventually created multi-species forest patches rich in resources and persistent consequences for the structure and function of biological communities. Archaeobotanical assemblages from Early- and Mid-Holocene sites located in transitional or ecotonal regions, e.g. Pedra Pintada (Roosevelt et al. 1996) and Monte Castelo (Furquim et al. 2021) show that different microenvironments were often managed concomitantly.

Genetics also tentatively place the wild ancestors of root/rhizome crops such as arrowroot (*Maranta arundinacea*), canna (*Canna indica*), yams (*Dioscorea trifida*), sweet potato (*Ipomoea batatas*) and leren, as well as squash (*Cucurbita moschata*), in the northern and northwestern peripheries of the Amazon. Leren, squash, and bottle gourd (*Lagenaria* sp.) were cultivated at Peña Roja in the Colombian Amazon by 9,000 BP, and several of these species have been documented in Early Holocene sites throughout the Andes, Caribbean, and Central America (Piperno 2011; Pagán-Jimenez et al. 2015, 2016; Aceituno and Loaiza 2018; Castillo and Aceituno 2014). In the Amazon, as well as in the global tropics overall (Denham et al. 2020), vegetatively reproduced plants with edible roots were among the earliest species cultivated by humans (Neves and Heckenberger 2019). These plants would have thrived in the more open forests in the peripheries of the Amazon during the Pleistocene/Holocene transition, making them an attractive resource to the first human settlers (Piperno and Pearsall 1998). By contrast, maize (*Zea mays*), one of only two indigenous cereals cultivated in the Amazon (the other being American rice; Hilbert et al. 2017), spread into South America from Mexico and was incorporated into food production systems much later (ca. 6,850 BP) (Lombardo et al. 2020). Nonetheless, the domestication of maize continued after its arrival in the southwestern Amazon and resulted in the creation of new landraces (Kistler et al. 2018).

Until now we have evidence of only one domesticated animal in the Amazon, the muscovy duck (*Cairina moschata*), the remains of which are found in Late Holocene sites in the southwestern Amazon (Driesch and Hutterer 2012; Stahl 2005). Other animals may have received care from humans without becoming domesticated; for example, there is extensive documentation of turtle corrals in colonial accounts and archaeological remains of artificial ponds in Marajó island and the Llanos de Mojos (Prestes-Carneiro et al. 2020; Schaan 2010). Late Pleistocene/Early Holocene sites from the Colombian Amazon (e.g., Cerro Azul, (Morcote-Ríos et al. 2017, 2020) demonstrate a broad spectrum of animal consumption, including fish, reptiles, and small mammals. The Middle Holocene record of the Monte Castelo shell mound in the southwestern Amazon shows predominantly fish (80% of the vertebrate taxa), specifically drought-tolerant species adapted to the seasonal drying of the surrounding wetlands (Prestes-Carneiro et al. 2020). Predominant exploitation of diverse aquatic resources is also documented in sites along the Amazon River in the Mid to Late Holocene (e.g., Taperinha and Hatahara) (Prestes-Carneiro et al. 2015; Roosevelt

Box 8.2 Archaeobotanical remains

Plants that human populations utilized in the past can be preserved in the archaeological record in the form of different macro- and microscopic remains. Starch grains and phytoliths can be found adhering to the surfaces of artifacts, while phytoliths and charred plant parts, including seeds and wood, preserve in sediments both within and outside archaeological sites. These proxies originate in different ways; starch grains are left by the use or processing of carbohydrate rich plants (Torrence and Barton 2006), phytoliths are deposited after the plants that produce them decompose (Piperno 2006), and charred remains are created under low oxygen combustion, with higher temperatures selecting for plant parts with greater lignin (Pearsall 2015). Pollen, phytoliths, and charcoal found in lake cores can also be indicative of past resource management practices (e.g., Maezumi et al. 2018; Whitney et al. 2013).

We know based on today's Indigenous peoples that early Amazonians would have had varied diets and material culture in different areas of the Amazon, and thus the plants utilized were not all the same at any given time. Food choices depend upon local customs and the presence of environments where different species grow best. Beyond everyday nutrition, plants are also sought for medicine, psychoactivity, hygiene, construction, artefacts, and magic/ritual purposes (Prance et al. 1987; Noelli et al. 2020). Much of this biodiversity remains to be studied in the archaeobotanical record, which is still heavily biased toward routinely-used plants.

Variation in archaeobotanical assemblages is also influenced by the differential presence, preservation, and taxonomic resolution of each proxy; in general, diagnostic starch grains are limited to storage organs (i.e. roots and tubers) and seeds; phytoliths are more frequent and diagnostic in monocot families, such as grasses and palms, but are either undiagnostic or absent in the majority of woody dicotyledon families; hard fruit pits and seed coats are often represented in charred remains; and pollen is more plentiful from wind pollinated taxa, but only preserves in anoxic conditions. Some of the understudied or under-preserved diversity is found in sites with exceptional preservation outside of the Amazon, as is the case for psychoactive plants found in northern Chile (Ogalde et al. 2009) or the Middle Holocene use of chili peppers on the Pacific coast of Peru (Chiou et al. 2014), while more can be estimated about toxic, entheogenic, and medicinal plants from modern documentation or by chemical techniques such as chromatography (e.g., Miller et al. 2019).

Table 8.1 provides a summary of archaeobotanical data so far available for the Amazon which, given all the above factors, likely represents a very small fraction of the true diversity of species utilized in these sites and in the Amazon in general. The larger diversity of plant families present in Late Holocene sites might reveal an actual pattern, but is likely also the result of a much larger sample size (33 sites, compared to 6 Mid Holocene and 7 Early Holocene sites). Likewise, the apparent dip in diversity in the Mid Holocene is likely a result of sample size, as well as the fact that some Late Pleistocene/Early Holocene sites (e.g., Pedra Pintada and Cerro Azul) have exceptional preservation of carbonized remains. Furthermore, the few root, tuber, and rhizome remains from earlier periods likely reflect the difficulty with which these remains carbonize and are preserved in the archaeological record, as well as the relative lack of starch grain studies from these sites.

Taxonomic identification of archaeological plant remains relies upon anatomical and morphological comparisons with modern plant material, and determining which characteristics are unique to different taxa at the level of plant species, genera, or families. Species absent from reference collections cannot be identified archaeologically. The collection and processing of modern species to create reference collections of phytoliths (e.g., Piperno 2006; Morcote-Rios et al. 2016, 2017; Watling et al. 2020a), starch grains (e.g., Pagán-Jiménez 2015), pollen (Flantua et al. 2015), and charred seeds and fruits (e.g., Silva et al., 2015) is a long and continual process, due to the thousands of species that should compose them. The relatively few collections that exist today for this vast region demonstrate better than anything how

Box 8.2 *(continued)*

Amazonian archaeobotany is still an emerging discipline whose true potential for understanding people-plant relationships has not yet been reached.

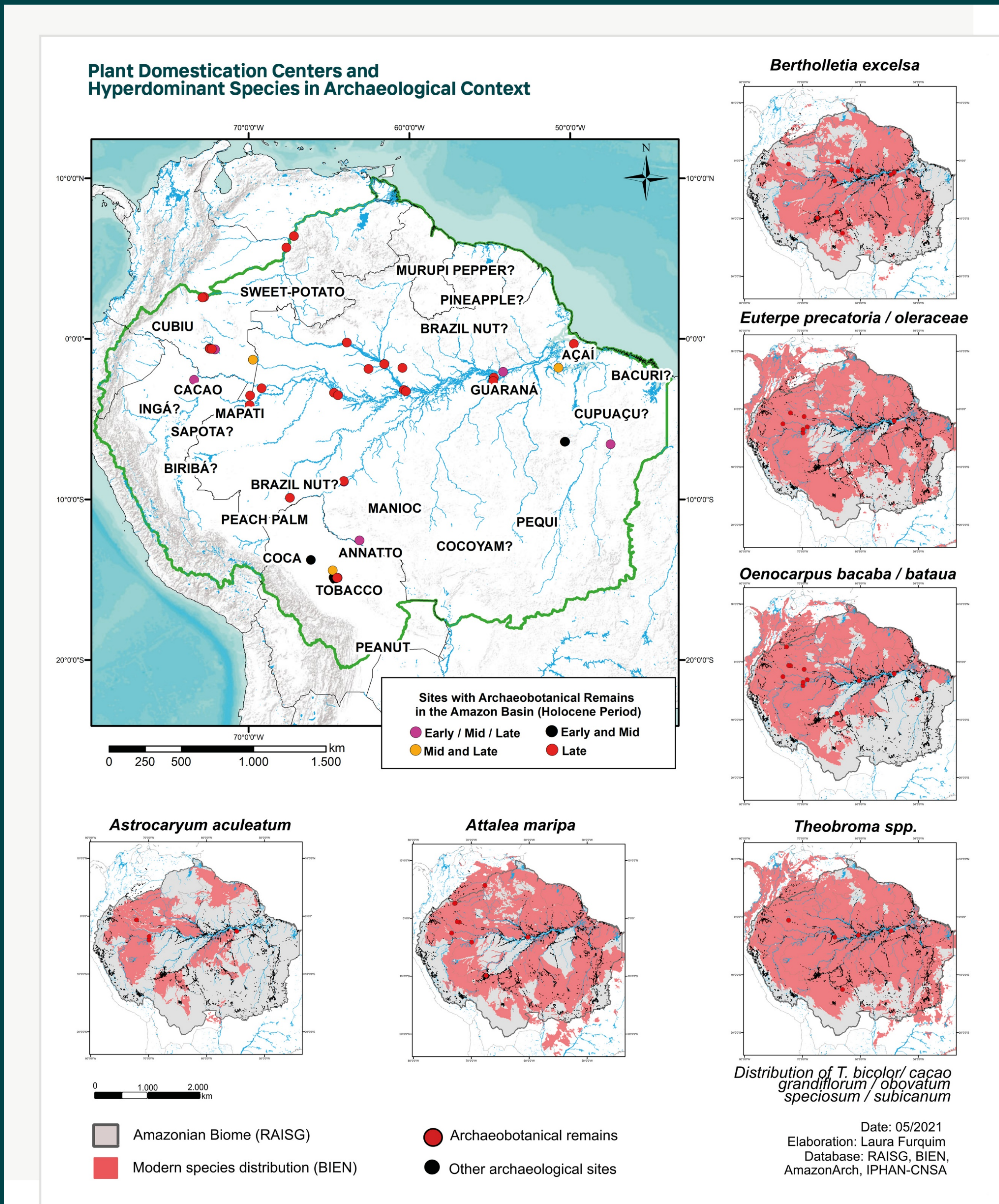

Figure 8.B2 Plant domestication centers and hyperdominant species in archaeological context (drawn by Laura Furquim)

Table 8.1 Food plants recovered from archaeological sites in Amazonia during the Early, Middle, and Late Holocene.

	Late Pleistocene/Early Holocene (12,000-8,200 BP)	***Middle Holocene (8,200-4,200 BP)***	***Late Holocene (4,200-500 BP)***
	7 sites *(Isla Manechi, Caverna da Pedra Pintada, Cerro Azul, Peña Roja, Bacabal 1, Capela, Teotonio)*	***7 sites*** *(La Chacra, Isla del Tesoro, Teotonio, Monte Castelo, San Pablo, Abeja)*	***50 sites*** *(Abeja, Abrigo del Valle de las Piramides, Abrigo Arco, Abrigo Bernardo, Abrigo Selva, Calicata, Campo España, Campo Esperança, Caverna da Pedra Pintada, Cedro, Cerro Azul, Chacra Teleria, Claudio Cutião, Conjunto Vilas, Curare, El Cerro, El Circulo, Fazenda Iquiri, Finca Buenavista, Finca Limoncillos, Floresta, Hatahara, JK geoglyph, La Sardina, Lago das Pombas, Lago do Limão, Las Palmeras, Loma Bella Vista, Loma Mendoza, Loma Salvatierra, Maicura, Mangos del Parguaza, Meseta Araracuara, Monte Castelo, Ome, Parmana, Penã Roja, Porto, Pozo Azul Norte-1, Santa Paula, São João, Serra do Maguari, Sol de Maio, Takana, Teotônio, Tequinho, Tucumã, Tumichucua, Vila Nova I, Vila Nova II)*
Fruits and nuts	*Families: 10; Genera: 11*	*Families: 6; Genera: 6*	*Families: 19; Genera: 27*
	Families: Annonaceae, Cannabaceae, Caryocaraceae, Humiriaceae, Lamiaceae, Lecythidaceae, Malpighiaceae, Memecylaceae, Myrtaceae, Sapindaceae	*Families: Annonaceae, Cannabaceae, Caryocaraceae, Humiriaceae, Lecythidaceae, Malphighiaceae*	*Families: Anacardiaceae, Annonaceae, Cannabaceae, Caryocaraceae, Chrysobalanaceae, Dilleniaceae, Humiriaceae, Lamiaceae, Lauraceae, Lecythidaceae, Malpighiaceae, Malvaceae, Memecylaceae, Moraceae, Myrtaceae, Passifloraceae, Polygalaceae, Sapindaceae, Solanaceae*
	Popular plants: Brazil nut, pequiá, murici, guava, pitomba	*Popular plants: Brazil nut, pequiá, murici*	*Popular plants: Brazil nut, pequiá, murici, cashew, cacao, chili pepper, passion fruit, hog plum, pitomba, uxi*
	Proxy: carbonized seeds	*Proxy: carbonized seeds; phytoliths*	*Proxy: carbonized seeds, phytoliths, starch grains*
Legumes (Fabaceae)	*Genera: 3*	*Genera: 1*	*Genera: 6, Species: 8*
	Genera: Hymenaea, Parkia, Phaseolus/Vigna	*Species: Phaseolus sp. (Common bean)*	*Genera: Arachis, Canavalia, Hymenaea, Inga, Parkia, Phaseolus/Vigna*
	Proxy: carbonized seeds	*Proxy: starch grains*	*Proxy: carbonized seeds, pollen*
Palms (Arecaceae)	*Genera: 8, Species: 15*	*Genera: 6, Species: 6*	*Genera: 14, Species: 29*
	Genera: Acrocomia, Astrocaryum, Attalea, Bactris, Euterpe, Mauritia, Oenocarpus, Syagrus	*Genera: Astrocaryum, Attalea, Euterpe, Lepidocaryum, Mauritia, Oenocarpus*	*Genera: Acrocomia, Astrocaryum, Attalea, Bactris, Chamaedorea, Euterpe, Geonoma, Iriartea, Lepidocaryum, Manicaria, Mauritia, Mauritiella, Oenocarpus, Syagrus*
	Popular plants: babassu, açaí, tucumã, bacaba, bataua, buriti, inajá	*Popular plants: bacaba*	*Popular plants: tucumã, inajá, peach palm, açaí, buriti*
	Proxies: carbonized endocarps or seeds, phytoliths	*Proxies: carbonized endocarps or seeds, phytoliths, pollen*	*Proxies: carbonized endocarps or seeds, phytoliths*

Squashes/gourds	*Genera: 2*	*Genera: 1*	*Genera: 2*
(Cucurbitaceae)	*Cucurbita, Lagenaria*	*Cucurbita*	*Cucurbita, Lagenaria*
	Proxy: phytoliths	*Proxy: phytoliths*	*Proxy: carbonized fruit, phytoliths, starch*
Roots/tubers	*Families: 3, Genera: 3*	*Families: 3, Genera: 3*	*Families: 6, Genera: 8*
	Families: Araceae, Euphorbiaceae, Marantaceae	*Families: Euphorbiaceae, Marantaceae*	*Families: Araceae, Convolvulaceae, Dioscoreaceae, Euphorbiaceae, Icacinaceae, Marantaceae*
	Popular plants: manioc, leren, cocoyam	*Popular plants: manioc, leren, cocoyam*	*Popular plants: sweet potato, yam, manioc, leren, arrowroot, mairá potato, cocoyam*
	Proxy: phytoliths, starch	*Proxy: phytoliths*	*Proxy: carbonized seeds, phytoliths, starch*
Grains (Poaceae)	*Genera: 0*	*Genera: 2*	*Genera: 2*
		Zea mays, Oryza sp. (maize, rice)	*Zea mays (maize), Oryza sp. (rice)*
		Proxy: phytoliths	*Proxy: carbonized seeds, phytoliths, starch*
Other/multiple uses	*Families: Heliconiaceae, Marantaceae, Moraceae, Solanaceae, Strelitziaceae, Zingiberaceae*	*Families: Heliconiaceae, Marantaceae*	*Families: Annonaceae; Asteraceae, Boraginaceae, Burseraceae, Euphorbiaceae, Heliconiaceae, Humiriaceae, Marantaceae, Marcgraviaceae, Melastomataceae, Moraceae, Phytolaccaceae, Solanaceae, Strelitziaceae, Urticaceae, Zingiberaceae*
	Proxy: carbonized seeds, phytoliths	*Proxy: phytoliths*	*Proxies: carbonized seeds, phytoliths*

Source: Data compiled from: Andrade 1986; Arroyo-Kalin et al., 2019; Bozarth et al. 2009; Cascon & Caromano 2012; Cassino 2018; Castaño-Uribe and Van der Hammen 2005; Dickau et al. 2012; Félix 2019; Furquim 2018; Herrera et al. 1980-1; Hilbert 2017; Hilbert et al. 2017; Lombardo et al. 2020, Kosztura-Nuñez 2020; Maezumi et al. 2018; Magalhães et al. 2019; Mora 2003; Mora et al. 2001; Morcote-Rios 2008; Morcote-Rios & Sicard 2009; Morcote-Rios et al. 2013, 2014, 2017, 2020; Pärssinen et al., 2020; Perry 2004, 2005; Roosevelt 1998, 2000; Roosevelt et al. 1996; Piperno 2011; Piperno & Pearsall 1998; Shock in preparation; Shock and Moraes 2019; Alves 2017; Watling et al. 2015, 2018, 2020b.

et al. 1991). Mammals were differentially exploited across the basin, with some species gaining importance in certain areas at particular times (e.g., brocket deer at Loma Salvatierra, Bolivia; Driesch and Hutterer 2012).

By changing the morphology, demography, and distribution of both plant and animal species through their management practices, Indigenous peoples increasingly transformed local ecosystems during the Holocene, domesticating different environments such as forests, savannas, and wetlands and using and managing thousands of plant species (Rostain 2013; Mayle and Iriarte 2014; Clement et al. 2015; Erickson and Balée 2006). The recent progress made by archaeologists and ecologists in documenting human influences on vegetation, both past and present, points to a scenario whereby, after at least 13,000 years of co-evolution between humans, plants, animals, climate, and landscapes, Pleistocene vegetation communities disappeared, and pristine environments became increasingly rare (Erickson 2006; Roosevelt 2014; Balée 2013). Studies show that at least 155 plant species native to the Amazon, Mesoamerica, northern South America, and northeastern Brazil; mostly trees and other perennial species; were domesticated to some degree by pre-Columbian people (Clement 1999; Levis et al. 2017; Box 8.2). These species occur with greater frequency closer to archaeological sites (Junqueira et al. 2010; Levis et al. 2017; Franco- Moraes et al. 2019), and twenty of them are considered hyperdominant (i.e., overrepresented in Amazonian tree communities) (ter Steege et al. 2013), raising questions as to the influence of cultural processes in their distribution (Figure 8.3). Around 200 additional tree species are also deliberately cultivated, and even more are managed, in forest landscapes (Balée 1989; Peters 2000; Levis et al. 2012, 2018), while more than 2,200 species are used today for different purposes by IPLCs (Coelho 2018).

8.5. The Amazon as the center of the first ceramics in the Americas

Ceramic analyses occupy a special place of research in Amazonian archaeology because they tell us about the technological traditions, social relations, and symbolic universes of the people who made and used them. Ceramics not only play an important role in the processing and consumption of beverages and food, but also act as a means of transmitting ideas through their decorative patterns (Lima et al. 2016).

Ceramic production is a technology that developed independently in several places across the world from the Terminal Pleistocene to the Middle Holocene. In the Americas, the earliest centers of ceramic production are located mainly away from the supposed centers of emergence of hierarchical, socially stratified societies, such as the Central Andes and Mesoamerica. Some of these centers are located in the Amazon, where there were at least four independent inventions of ceramic technology: the lower Amazon, the Atlantic coast, the Upper Madeira Basin and the Zamora-Chinchipe Basin in Ecuador. In the first three areas, early ceramics are associated with the construction of artificial shell and earthen mounds (Figure 8.3).

In the lower Amazon, near the current city of Santarém, excavations at the Taperinha fluvial shell mound yielded the earliest ceramics in the Americas, dating back to c. 7,000 BP (Roosevelt 1995; Roosevelt et al. 1991). On the Atlantic coast, east of the mouth of the Amazon in the extensive area of mangroves covering the shores of Pará and Maranhão states, there are dozens of coastal shell mounds and other sites containing ceramics of the so-called Mina phase, dated to 5,500 years ago (Simões 1981; Roosevelt 1995; Silveira and Schaan 2010; Bandeira 2009; Lopes et al. 2018). In the Middle Guaporé Basin, on the border of Bolivia and Brazil, excavations at the Monte Castelo shell mound produced ceramic vessels dating to ca. 5,200 years ago (Pugliese et al. 2017). Finally, in the Zamora-Chinchipe area of the *ceja de selva* of Ecuador, ceramics dated to about 4,500 years ago have remarkable similarities to the later styles of Chorrera and Cupinisque of the Pacific Coast (Valdez 2013), the latter being associated with the emergence of early stratified societies in the Andes.

Away from the Amazon, the other centers of independent early ceramic production in South America are all found in lowland tropical environments, such as Santa Elena province in Coastal Ecuador, the lower Magdalena Basin near Barranquilla, and the Guiana coast (Roosevelt 1995; Oyuela-Caycedo 1995; Raymond and Oyuela-Caycedo 1994; but see Meggers [1997] for a different perspective). Such evidence should be strong enough to refute the hypothesis – more political than scientific – that the tropics are of marginal importance in the early cultural history of South America.

8.6. The formation of anthropic soils (*terras pretas*) and evidence of widespread human niche construction in the middle/late Holocene

Anthropogenic Dark Earther (ADEs) are black to brown, organic-rich anthrosols covering areas up to 90 ha that are found in many archaeological sites in the Amazon dating from ca. 2,500 years BP onwards (Heckenberger et al. 1999; Kern et al. 2004; Neves et al. 2004; McMichael et al. 2014; Clement et al. 2015) (Figure 8.4). These are stable, fertile soils with higher pH and nutrient content (P, N, Ca, Mg) than adjacent soils, conditions that are maintained even under the intense lixiviation of the Amazon (Lehmann et al. 2003, Teixeira et al. 2009). These properties render ADEs valuable for cultivation by modern communities (Clement et al. 2003; Junqueira et al. 2010).

Despite being known to scientists since the nineteenth century, it was only much later that the Indigenous origin of these soils was established (Sombroek 1966; Smith 1980). Today, it is accepted that ADEs are among the most visible and widespread testimonies of past Indigenous settle ments in the Amazon, despite recent claims of their natural origin (Silva et al. 2021) (Figure 8.5). The establishment of the Indigenous origin of ADEs marked a major turning point in Amazonian archaeology, as they attest to past landscape transformations at scales that were previously thought impossible (Petersen et al. 2001; Woods et al. 2009; Glaser and Birk 2012).

Although widespread after 2,500 years BP, ADEs began to form around 5,500 years ago in areas such as the Upper Madeira river in Brazil (Watling et al. 2018) and the Middle Caquetá area in Colombia (Morcote-Ríos et al. 2017), mirroring the pattern of the periphery of the Amazon as centers of plant domestication.

It is possible to distinguish two broad types of ADEs (Sombroek 1966); (i) deeper, blacker soils, often full of artefacts and settlement debris, and very enriched in nutrients, and (ii) shallower, brown, less enriched (but still modified) soils, devoid of artefacts. Studies show that these represent two ends of a continuum of soil modification (which accompanies a continuum of agrobiodiversity Junqueira et al. 2016a, 2016b; Lins et al. 2015), with blacker soils likely having formed as a product of waste management and domestic activities in the core of settlement areas, and browner soils likely the result of cultivation (slash and burn, organic mulching) associated with garden areas on the periphery (Arroyo-Kalin et al. 2012; Schmidt et al. 2014; Alves 2017).

The extent to which ADEs were intentionally created in pre-Columbian times is still debated (Arroyo-Kalin 2016). There is still no agreement on whether they were produced to improve unfertile Amazonian upland soils or if they resulted from the passive accumulation of organic matter from sedentary settlements. The presence of ADEs on the floodplains of the Amazon River near Manaus (Macedo et al. 2017) tends to negate the first hypothesis, since ADEs here developed on alluvial soils that have naturally elevated contents of P, Ca, Zn, Cu that are above agronomic critical levels (Havlin et al. 2005). However, it is also likely that, once formed in upland areas, these soils created new niches that allowed for the cultivation of nutrient-demanding plants such as maize (Rebellato et al. 2009; Arroyo-Kalin 2010).

A study in Santarém combining on-site archaeobotany and off-site paleoecology shows the appearance of ADEs ca. 2,000 BP was accompanied by sys-

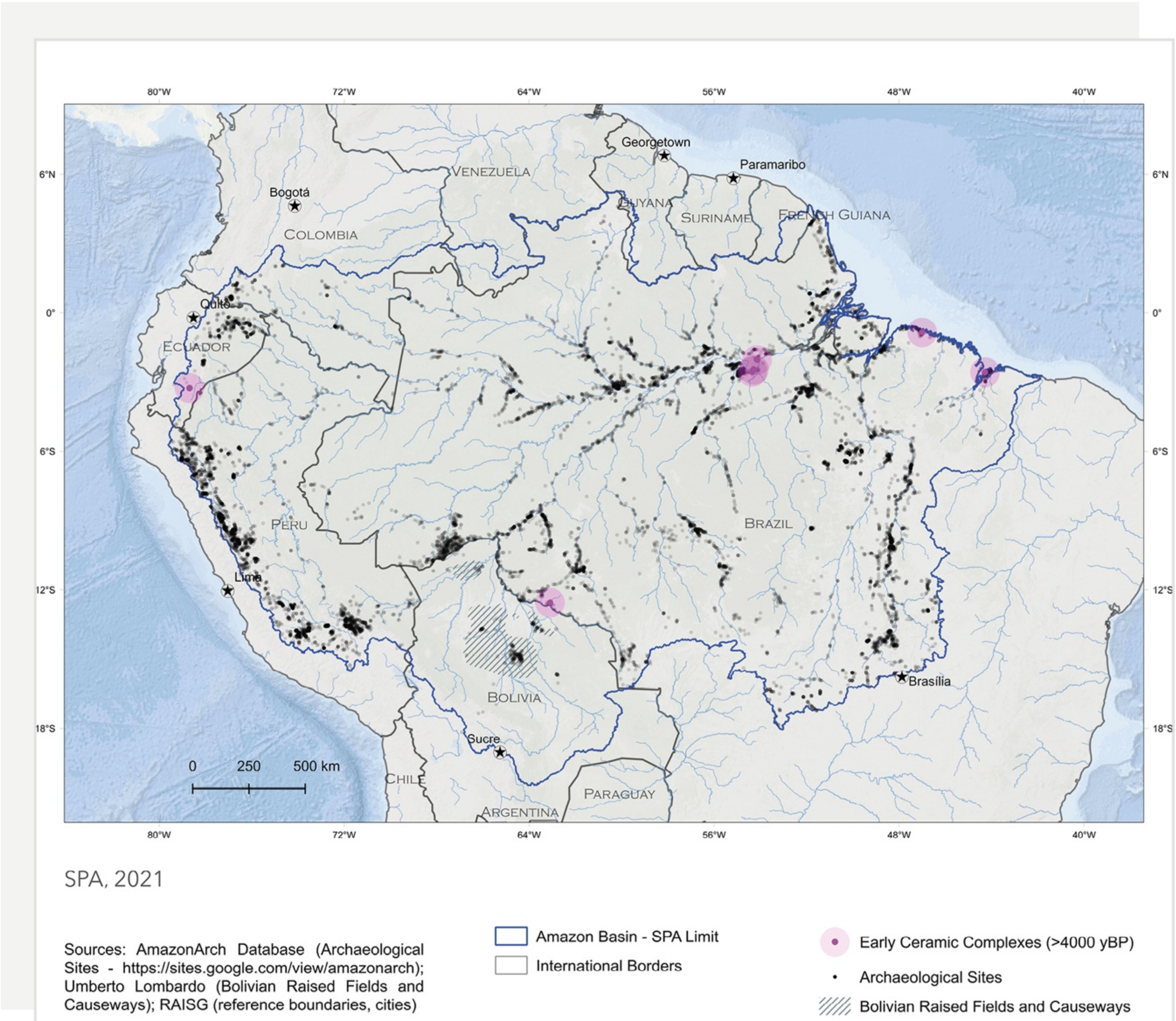

Figure 8.3 Archaeological sites with early ceramics in the Amazon (source AmazonArch)

temic changes in regional plant communities that included increases in edible species (Maezumi et al. 2018). Phytoliths from Bactris/Astrocaryum palms are particularly prevalent in ADE soils located along the Amazon and Madeira Rivers, including at Teotônio, where successive occupations of different ceramic-producing cultures have begun to yield evidence of diachronic variation in plant consumption and cultivation practices through time (Watling et al. 2020b).

8.7. Monumentality and cultural diversity in the pre-Columbian Amazon

In the Amazon, variability of material culture and settlement patterns may be said to match that of Indigenous languages (Neves 2011), although this is not a universal correlation. Since the beginning of systematic research in the region, ceramics have played a key role in mapping the distribution of archaeological cultures or units, largely as a conse-

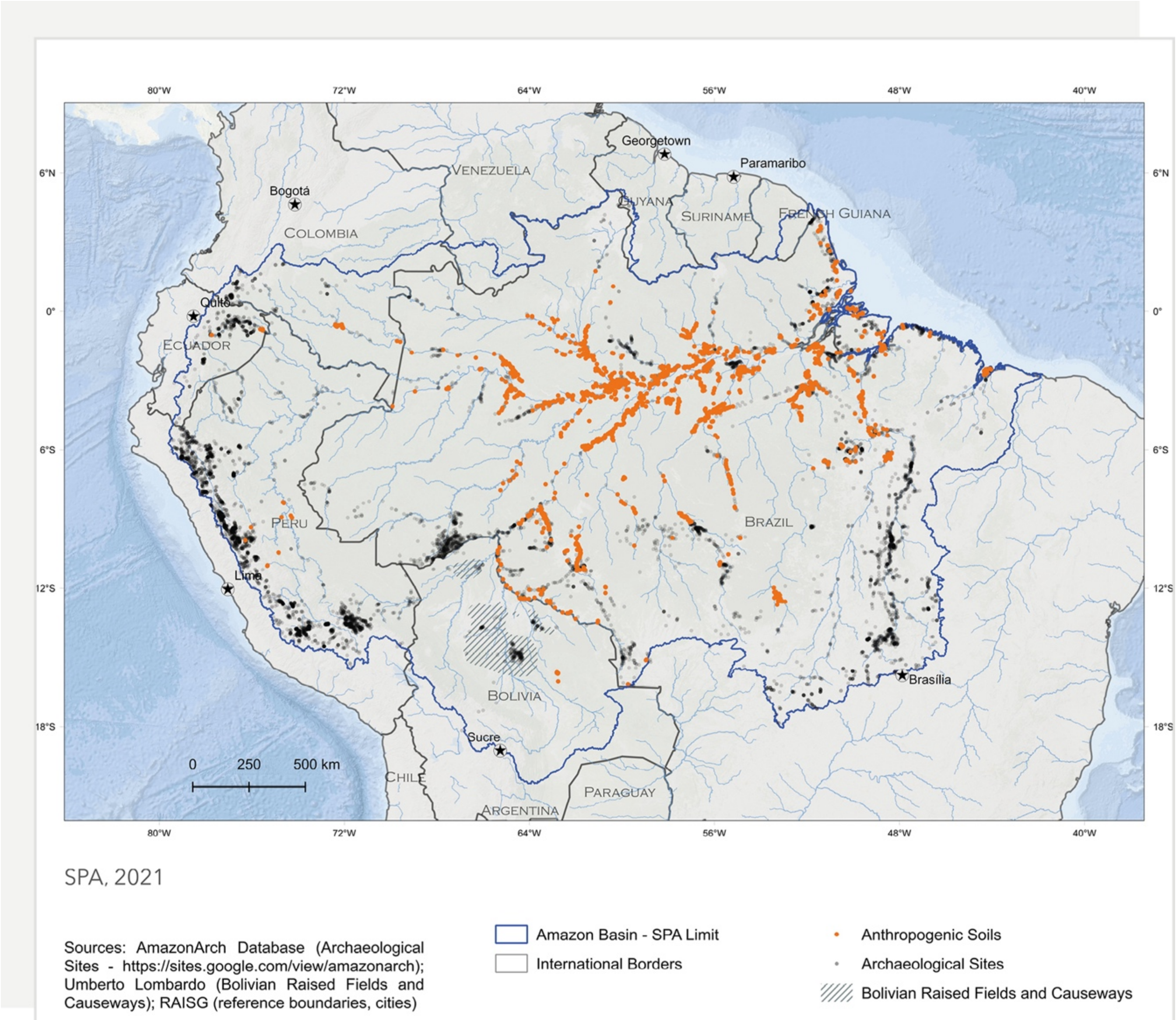

Figure 8.4 Archaeological Sites with ADEs in the Amazon (source AmazonArch).

quence of the great quantities in which they are found compared to other cultural remains. Beautifully decorated ceramics from the lower Amazon region quickly caught the attention of 19th century naturalists, gaining ample space in the museum exhibits of different European countries at the time (Neves 1999/ 2000).

The ubiquity of pottery contrasts with a diminished presence of stone artifacts, including lithic tools and rock art (Neves 2006), as well as a near absence of structures built from stone. This pattern probably reflects the irregular availability of stone throughout the Amazon, as well as the universal use of perishable materials such as wood and palm for house building (Novaes 1983), which decompose and disappear with the passage of time, obscuring the dimensions of Indigenous settlements (but see Stampanoni 2016 for the excavation of an ancient longhouse near the Urubu River, in the Central Amazon). The tropical climate and accompanying acidic soils may also frequently erase human and faunal bone remains from the archaeological record (Rapp Py-Daniel 2010), although such remains preserve much better in ADEs due to the almost neutral pH of these soils. The megalithic structures of Amapá present an exception to this. There, large stone slabs were erected on top of underground chambers filled with Aristé burial urns, presenting an example of the convergence of monumentality and mortuary practices (Saldanha and Cabral 2017). The practice of producing mortuary effigies is maintained by some Indigenous groups today, such as the wooden representations found in Kuarup rituals in the Upper Xingu (Guerreiro 2011).

Aside from shellmounds, the earliest evidence of monumentality in the Amazon comes from sites such as Santa Ana La Florida and Montegrande, located on the current border of Ecuador and Peru, along the Upper Marañon Basin (Olivera Nuñez 2016; Valdez 2013). There one finds spiral stone structures, the earliest known evidence for cacao domestication (Zarrillo et al. 2018), exotic goods such as Strombus shells from the Pacific coast across the Andes (Valdez 2013), the earliest evidence of stirrup spout vessels (Valdez 2013), and polychrome murals (Olivera Nuñez 2016). These elements become common in later history but seem to have some of their earlier manifestations in these contexts (Figure 8.6).

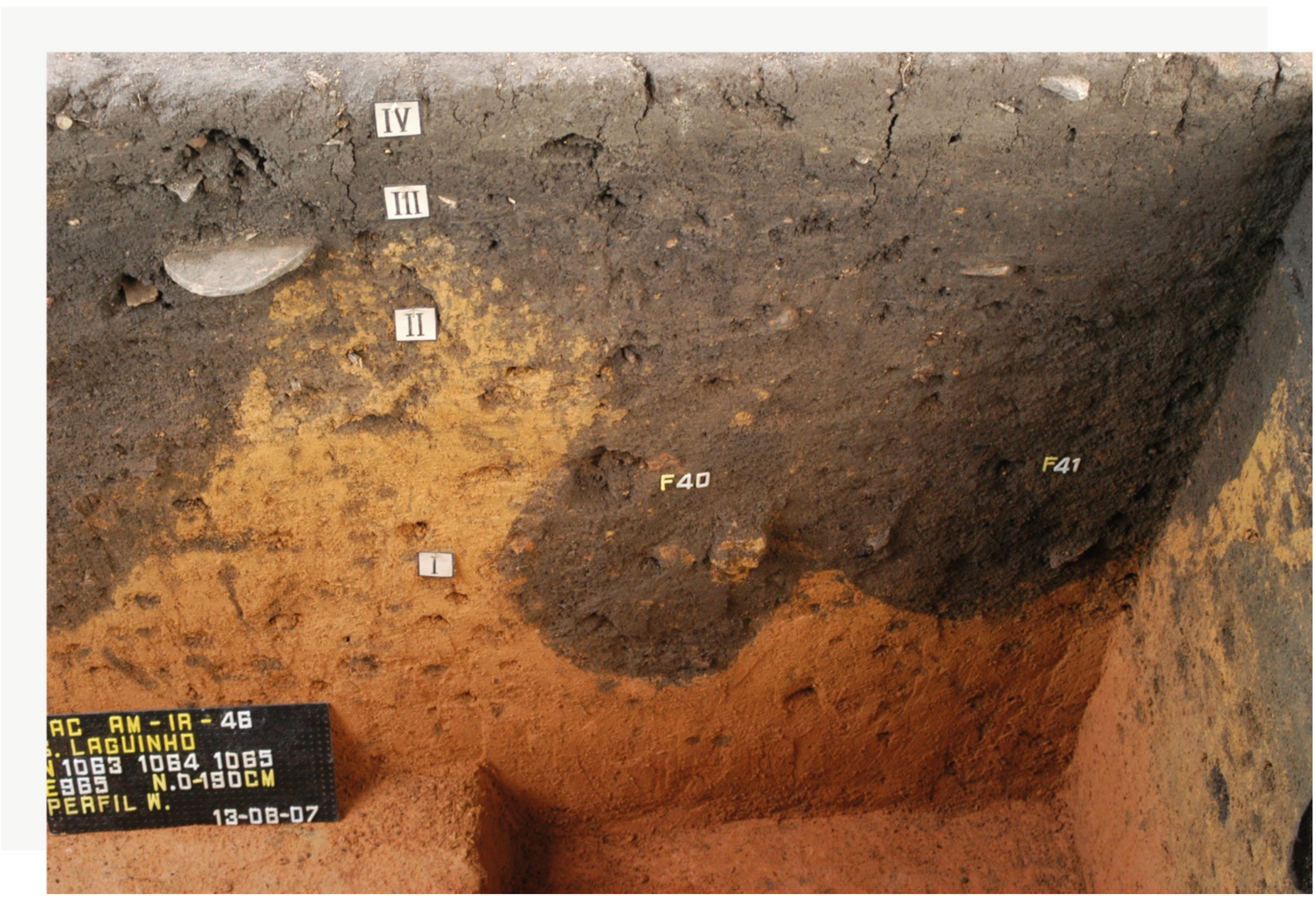

Figure 8.5 Profile cut of ADE soil formed by pits cut into natural yellowish oxisols, Paredão phase (1,300 – 900 BP), Laguinho site, Central Amazon (Photo: Eduardo Neves).

While ceramic vessels date to 7,000 BP, they become more common around 3,000 BP onwards, when archaeological complexes, such as the Pocó and Amazonian Barrancoid traditions, can be linked to the expansion of populations speaking Arawakan languages (Lathrap 1970; Heckenberger 2002; Neves et al. 2014). Around this time, a second wave of earthworks – following the shell mounds – began to flourish. In the Brazilian state of Acre, and neighboring departments of Pando, in Bolivia, and Madre de Dios, in Peru, over 500 archaeological sites consisting of ditched geometric earthworks, including circular and square ditches (up to 7 m deep), have been documented, dating to between 3,000 BP and 800 BP (Ranzi et al. 2007; Schaan 2012; Saunaluoma 2012) (Figure 8.7). Their positions on the tops and edges of natural plateaus (Schann 2012) suggests they were built in locales that commanded good control of their surroundings, while the relative low frequency of artifacts inside them (and the presence of carefully deposited ceramics close to the entrances of the earth-

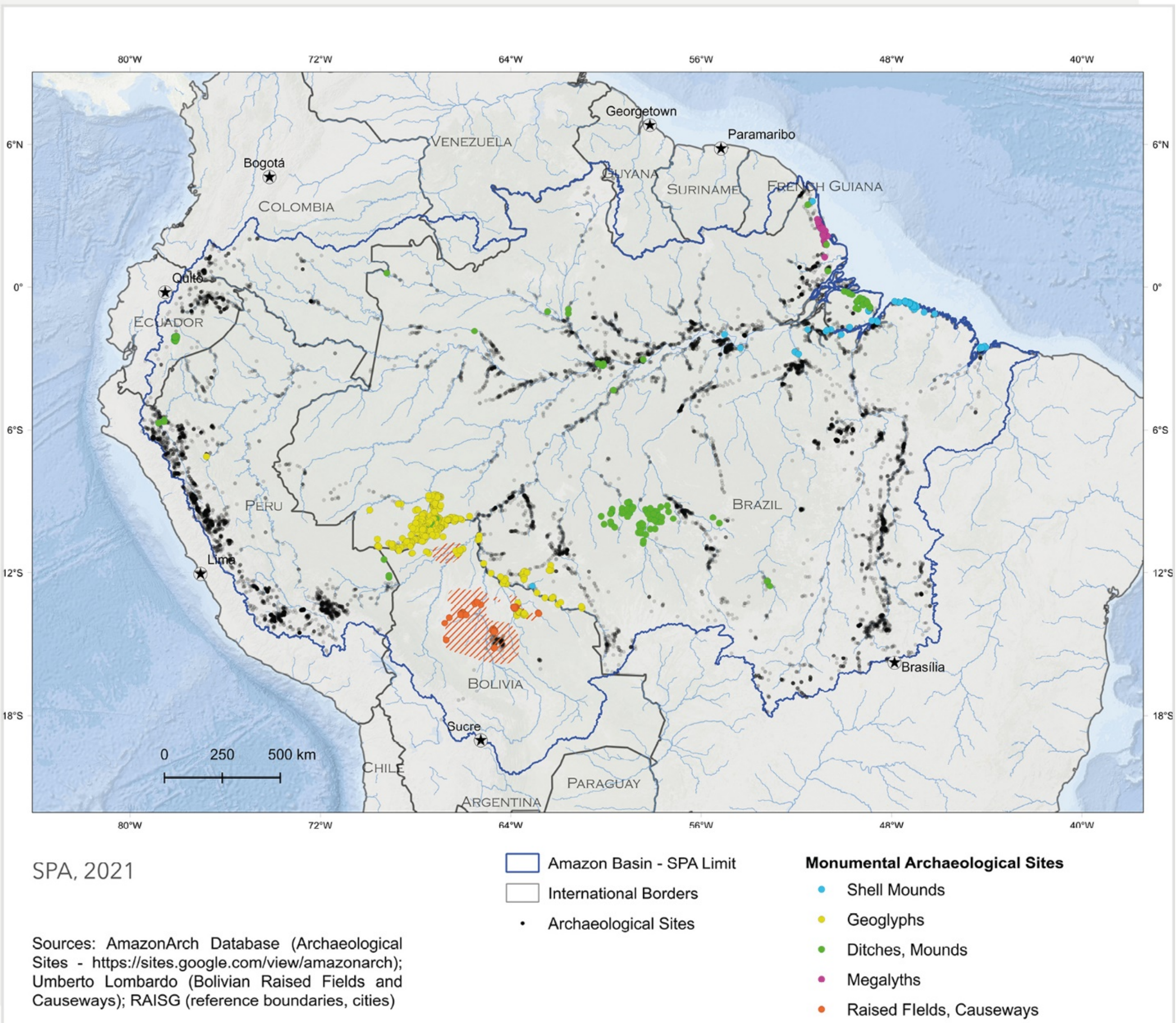

Figure 8.6 Areas in the Amazon known to have monumental archaeological sites (source AmazonArch)

works) has been argued to indicate they were regional ceremonial centers, rather than settlement sites (Saunaluoma et al. 2018: 363-364).

The same general area was later occupied from ca. 1,000 to 400 BP by people who settled in villages composed of mounds displaced around central plazas and connected to each other by road networks (Iriarte et al. 2020; Saunaluoma et al. 2021). Around the same time, further east in the Brazilian Amazon, a similar pattern of roads connecting much larger settlements was also identified (Heckenberger et al. 2008).

Moving northwest, towards the Ecuadorian Amazon, the concentration of hundreds of platforms, arranged in the form of panels and connected by road systems, is the best example of pre-Hispanic urbanism in the Amazon. According to current data they were built between 2,700 and 1,500 BP (Rostain 1999, 2012; Rostain and Pazmiño 2013; Salazar 2008). LiDAR surveys identified and urban center called Kunguints, composed of hundreds of mounds covering an area of approximately 4.5 km^2, and two wide roads running from the city from west to east (Prümers 2017).

During the first centuries AD, the Amazon experienced a blossoming of cultural styles and an increased flow and mixture of technological traits and exotic materials, suggesting highly connected societies (Heckenberger 2008). Trade materials were manifold, such as the exotic stone ornaments known as *muiraquitãs* (Amaral 2018), ceramics (Van den Bel 2010), and plants. Such specialized trading systems can still be found in regional Indigenous social systems found in the Upper Rio Negro (Neves 2006; Ribeiro 1995) and the Upper Xingu (Franchetto and Heckenberger 2001).

As well as the diversity of ceramic styles, the quantity and variety of earthworks also increased throughout the beginning of the common era. For example, the Iténez region of Bolivia contains a range of features attesting to complex networks of social interaction, including causeway-canal systems (Erickson 2009), fish-traps (McKey et al. 2016), and circular ditched enclosures (Prümers and Jaimes Betancourt 2014). According to LiDAR survey (Prümers 2014), all 24 ditch systems are located on slight elevations, where intermittent streams occur. The largest site was about 200 ha in size and most of the ditches were probably built between 800 to 600 BP.

Intensive surveys in the neighboring Beni Department, Bolivia, also revealed the existence of hundreds of settlement mounds up to 20 m tall and ca. 40 ha in area, generally situated on fluvial deposits of inactive rivers and occupied between 1,500 to 1,600 BP (Lombardo and Prümers 2010). Some of the sites have polygonal embankments that perhaps served a protective function. Canals and causeways connect the sites, and ponds were built, probably to ensure the water supply during the dry season, but also possibly for fish capture (Prestes-Carneiro et al. 2020).

The west-central area of the Llanos de Mojos, west of the Mamoré River, contains the largest, densest, and most diverse concentration of agricultural landscapes in the Amazon (Erickson 2006, 2008; Erickson and Walker 2009). Along the Iruyáñez River there are platforms between 5 and 20 meters wide, 300 meters long, and 0.5 to 1.0 meters high (Denevan 1966, 2001; Erickson 2006; Lombardo 2010; Walker 2004, 2011) (Figure 8.8). Raised-field construction in this area began around 2,500 years BP (Walker 2018). It is possible that the raised fields constituted a complement to other forms of agriculture, since most of them are located on infertile soils and, in the cases where relevant data are available, these point to the fact that they were in use for a short period, followed by a longer fallow time (Rodrigues 2016).

It was also during this period (1,600 to 700 BP) that the Marajoara culture flourished in the savannas of the eastern part of Marajó island (Schaan 2012: 31, Figure 8.9A). These groups constructed mounds on the banks of rivers and lakes, sometimes in groups of up to forty, that they packed with exuberant funerary urns. Some scholars believe that the Marajoara culture was formed by several connected chiefdom societies, who exerted political influence through the construction and control of hydraulic structures such as weirs and artificial fish ponds (Schaan 2010). Marajoara culture is known for pots, figurines, and mortuary paraphernalia with formidable iconography (Barreto 2016). East of Marajó, at the very edge of the Amazonian biome, large villages composed of stilt houses built on seasonal lakes around 1,100 AD and containing materials evidencing long-term trade networks with the mouth of the Amazon are currently being studied (Navarro 2018).

From 1,200 to 400 BP in the Central and Western Amazon, from the Manaus area all the way to the Ucayali, Napo, Içá-Putumayo, and Japurá-Caquetá Rivers, as well as upstream of the Madeira River, one sees sites covered by ceramics belonging to the so-called Amazonian Polychrome Tradition (TPA) (Figure 8.9B). These ceramics, as the name implies, are characterized by painted decoration in distinct tones of red, yellow, orange, or black on a white base. Despite the general similarities, there is considerable variability between ceramics and archaeological sites associated with TPA. The chronology and geographical distribution of these sites show a clear pattern: older in the Central Amazon, younger in the Upper Amazon.

From around 1,000 years BP onwards, in the area around the city of Santarém, Brazil, another ceramic tradition emerged known as Incised-Punctuated, of which the best-known are probably the Tapajonic or Santarém ceramics. These vessels have modeled decoration with anthropomorphic and zoomorphic motifs, such as birds, bats, rep-

Figure 8.7 Geometric square geoglyphs connected by road in area previously covered by forest and currently covered by pasture in Eastern Acre state, Brazilian Amazon, 2,500-500 BP (Photo: Maurício de Paiva).

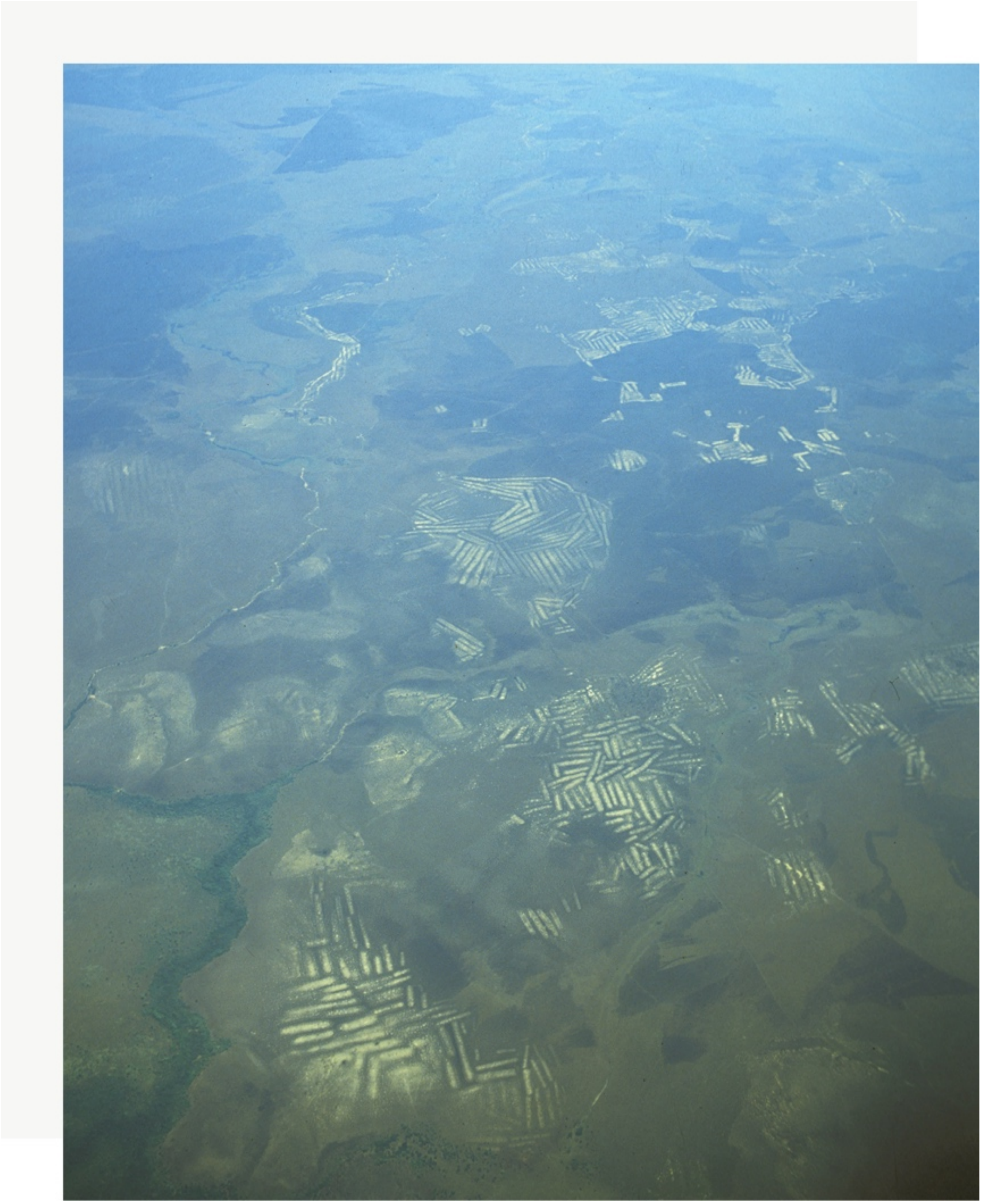

Figure 8.8 Agricultural raised fields in the flooded savannas of the Iruyañez River, Beni River drainage, Llanos de Mojos, Beni Department, Bolívia (Photo: Heiko Prümmers).

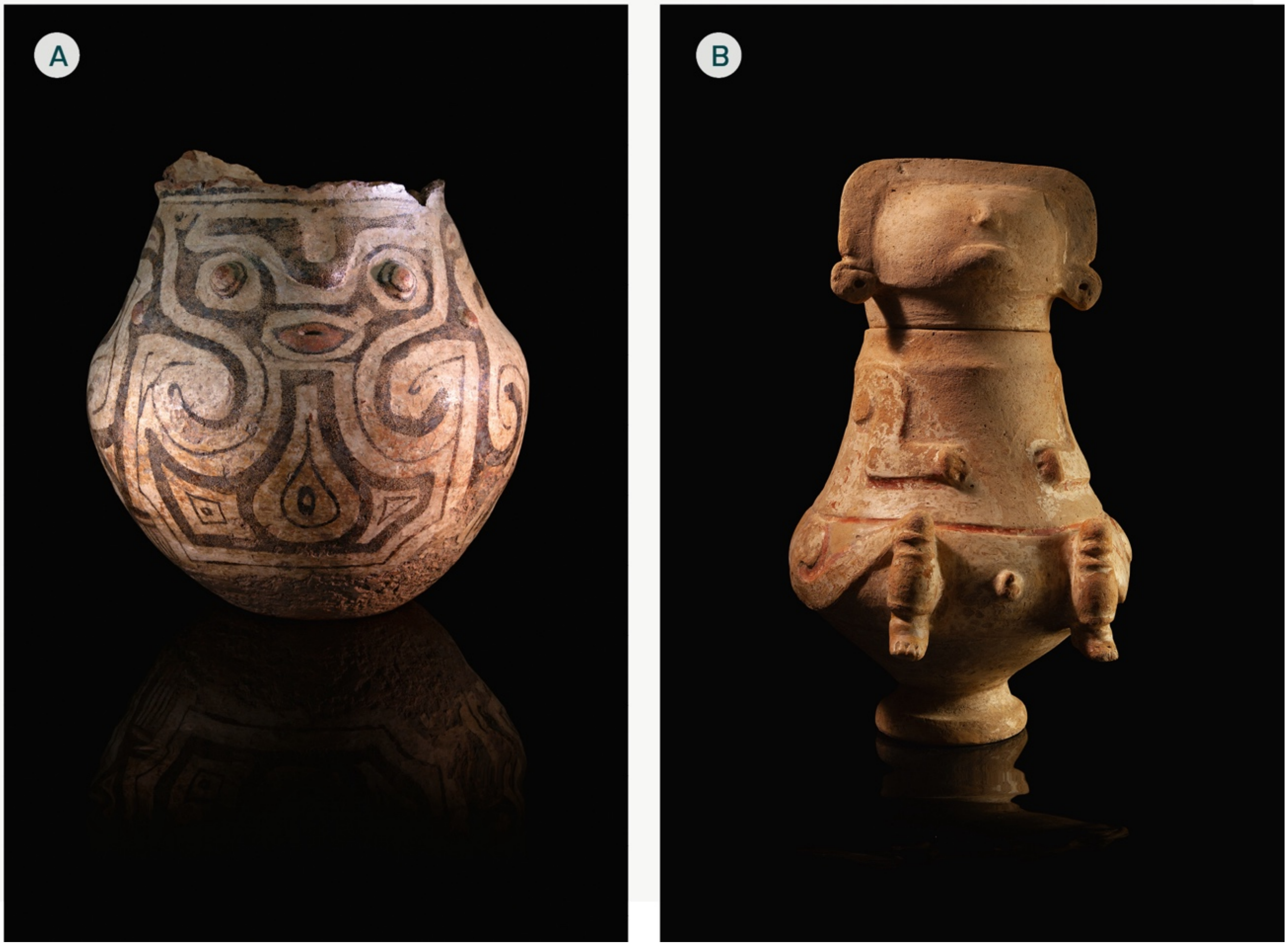

Figure 8.9 A) Polychrome funerary urn, Marajoara phase, Marajó island, mouth of the Amazon, Brazil, 1,600-700 BP, Museum of Archaeology and Ethnology, University of São Paulo (Photo: Maurício de Paiva); B) Anthropomorph funerary urn, Guarita phase, Central Amazon, Brazil, 1,100-500 BP, Museum of Archaeology and Ethnology, University of São Paulo (Photo: Maurício de Paiva).

tiles, and mammals. In Tapajonic ceramics, the presence of naturalistic anthropomorphic statuettes is also common, where details such as body paint, jewelry, and different hairstyles can be perceived (Gomes 2011; Figure 8.10). Tapajonic ceramics are found in a large area whose center is the current city of Santarém, in a large archaeological site mostly destroyed due to urban growth. The few available dates indicate that the Tapajonic occupation began at least at the begin-ning of the second millennium AD, making Santarém probably the longest continuously occupied place in the Brazilian Amazon.

Besides riverine connections, there also existed in precolonial times networks of roads and pathways that connected vast areas of the interfluves (Schmidt 2012; Figueiredo 2018; Saunaluoma et al. 2020, Iriarte et al. 2020; Erickson 2010; Heckenberger et al. 2008), that would later be documented by the first European chroniclers (Porro 1994; Pessoa et al. 2020). The nodes bonding these systems were settlements occupying strategic positions, such as rapids and river junctions. In places like these, large archaeological sites are found and it is common that they are covered by contemporary Amazonian cities such

Figure 8.10 Anthropomorph statuette of male figure adorned with earring and tiara sitting on stool, Santarém, lower Amazon, 800-500 BP, Museum of Archaeology and Ethnology, University of São Paulo (Photo: Maurício de Paiva).

Figure 8.11 Archaeologist Márjorie Lima excavating a cemetery of funerary urns at Tauary village, Tefé Lake, Central Amazon, Brazil (Photo: Instituto de Desenvolvimento Sustentável Mamirauá).

as Manaus and Santarém (Almeida 2017). Likewise, archaeological objects commonly make their way into the life of present-day communities, urban and rural, who keep and re-signify them (Bezerra 2013).

In spite of the demographic collapse that took place across the region following the onset of European conquest and colonization, we can state that, over the past 12,000 years, the Amazon has never been an empty space, devoid of people, but has been shaped by an archive of human action. Today, Indigenous peoples and local communities are distributed across areas that were likely more densely occupied and intensively transformed in the past, close to rivers and terrestrial and aquatic resources, leading them to interact closely with the legacies of previous occupation (Figure 8.11). Patches of ADEs are currently inhabited and/or managed by traditional peoples, who have developed detailed knowledge and practices related to their cultivation and management (e.g., Fraser et al. 2012; Junqueira et al. 2010, 2016a, b; Lins et al. 2015). As a result, current forests and food production systems based on ADEs and other archaeological sites are diverse and show singular plant diversity patterns (Lins et al. 2015; Odonne et al. 2019; Levis et al. 2020; Junqueira et al. 2016a, b; Watling et al. 2020a), stemming not only from past modifications of soils and associated plants, but also from their constant transformation through current management practices (Levis et al. 2020; Junqueira et al. 2016b).

The distribution of plant species in the Amazon has been influenced by long-term human actions, particularly species that were once managed, cultivated, or domesticated by Indigenous peoples (Balée 1989, 2013; Clement et al. 2015; Levis et al. 2017). IPLCs recognize the actions of their ancestors in the landscape and often enter into cyclical relationships with local ecosystems by transforming old-growth forests that were once cultivated into swiddens or settlements (Politis 2007; Franco-Moraes et al. 2019). Traditional peoples also play an important role in maintaining past ecosystem legacies through their traditional resource mana-gement practices (Junqueira et al. 2016a; Levis et al. 2020). Domesticated landscapes and plants form an essential element of current livelihoods (Figure 8.12).

For example, at Amanã Lake, a tributary of the lower Japurá/Caquetá River, human settlement c. 3,000 BP generated orchards, gardens, and ADE patches through to the early colonial period (Neves et al 2014). Following demand in the post-war period, rubber-tapper communities moved to the lake and began managing these anthropic forests while creating new gardens. Favored by past societies, species such as bacaba, açaí, cacao, and Brazil nut have persisted, but different landraces of cacao, manioc, legumes, and chili pepper began germinating when 20th century communities began using fire as part of slash and burn agriculture. ADEs had acted as "seed banks" preserving these species, which were then able to regrow after burning (Tamanaha et al. 2019).

Landscapes continuously occupied by IPLCs encompass multiple temporalities and time scales. The multiple connections between pre-Columbian and contemporary traditional management practices evidence how plants and landscapes provide us with a thread of continuity that stretches back millennia, irrespective of biological discontinuities between human populations. This leads us to state that in the Amazon, archaeology is alive and pertains to the present as much as to the past.

8.9. The role of archaeological data and perspectives in evaluating and planning for protected areas

Archaeological research can provide useful perspectives in evaluating current land use and supply valuable subsidies in planning for more efficient and just strategies that recognize the fundamental role and rights of IPLCs. Here, we approach what we consider to be some of the most problematic issues related to the creation and management of current protected areas, including Indigenous lands, traditional peoples' territories, and conservation units.

All categories of protected areas overlay IPLCs' territories. These territories are socially and historically constituted, and encompass different landscapes in which many land uses, including habitation, resource extraction, gathering, cultivating, fishing, hunting, fallows, and sacred or meaningful places, are present (e.g., Posey 1985). The recognition of the multiple uses of territory is too often ignored by policy makers and governments, who consequently exclude areas important to IPLCs, disenfranchising them from their territories. The boundaries of traditionally occupied territories can also be thought of as meeting places rather than barriers (Gallois 2005), at times overlapping with those of other social groups; such interactions can be observed in ancient material culture as well as through linguistic borrowing (e.g., Rocha 2020b; Rodrigues 1985). The overlap of territories from different communities is not usually considered in the definition of protected areas, generating conflicts among neighbors.

Conservation units (CUs) tend to be defined by criteria related to "nature," often ignoring social dimensions. CUs fall within two basic categories, strict-protection Nature Reserves in which human occupation is prohibited, and Sustainable Use Conservation Units where people live so long as they abide by regulations. In the Brazilian Amazon, there is a systematic pattern of imposing strict-protection Nature Reserves on territory traditionally occupied by IPLCs (Almeida 2004; Almeida et al. 2018; Balée et al. 2020; Coelho et al. 2017; O'Dwyer 2002; Torres and Figueiredo 2005; IBDF 1984). This has been justified through the supposed existence of 'empty' lands and 'pristine' forests; however, as we have demonstrated, the co-occurrence of well-preserved areas and traditional Amazonian peoples is no coincidence. Imposed restrictions have had the effect of outlawing traditional practices inextricably linked to traditional peoples' dietary habits and ways of life. These, as we have seen, can in fact be congruent with the aims of conservation and contribute to the promotion of biodiversity, ecosystem services, and food security (e.g., Balée et al. 2020; Levis et al. 2018; Scoles and Gribel 2015; Torres 2011). Gradual and direct expropriation of communities as a result of these policies has exposed these areas to predatory invasion. CUs that allow for the presence of traditional peoples have been shown to be more coherent with the already recognized millennial human use of biodiversity – so long as they are not conceded to private enterprise in top-down initiatives, in contravention to ILO C169 (Nepomuceno et al. 2019).

At present, only a fraction of traditionally occupied territories have been officially recognized. With regard to *quilombola* communities in the Brazilian Amazon, this only amounts to ~899,000 hectares, representing 0.26% of all *quilombola* territories (Levis et al. 2020). Other peoples' traditionally occupied territories, often invisible to the eyes of the State, are in a similar situation. Land insecurity exposes IPLCs to the advance of predatory activities, imposed through violence and intimidation, which often become the only viable alternatives for them to sustain themselves. Archaeology further helps us understand that IPLCs transmitted knowledge orally across generations about their histories and territories. These memories are often anchored in specific landscape markers, highlighting how in the Amazon ecocide and epistemicide are two sides of the same coin.

8.10. Indigenous peoples and local communities' archaeologies

From its inception as a discipline, archaeology was employed as a powerful element in the construction of ethnic, national, and imperial identities. Until recently, this endeavor was carried out by elite groups, or to suit reigning political interests. Over the past few decades, pressure from other groups, who actively began claiming the past for themselves (Politis and Curtoni 2011:

496) by including archaeological sites (and specific remains) as part of their political discourse (Bezerra 2012, 78), has contributed to changing this scenario, leading the discipline to reconsider its role and responsibilities towards claimants, in particular marginalized IPLCs.
In the Amazon, archaeological research undertaken in close collaboration with Indigenous peoples was inaugurated at the turn of the millennium (e.g., Heckenberger 1996; Silva 2002). The creation of undergraduate archaeology courses at public universities in Brazil such as the Federal University of Western Pará, Federal University of Rondônia, and Amazonas State University, has enabled members of IPLCs to enter the discipline. These scholars have begun appropriating archaeological tools while offering critiques and novel contributions to archaeological concepts, as well as opening up new avenues for research (e.g., Munduruku 2019; Parintintin 2019; Silva 2018; Wai Wai 2019; Wai Wai 2017). Among these concepts, of utmost importance is that of sacred place. Sacred places can be present within potent features in the landscape; they may include archaeological remains such as rock art or concentrations of medicinal plants, or be "invisible" in archaeological terms. Access can be regulated according to specific norms and may be restricted except to the initiated. They are often salient topographical features and may house supernatural entities, such as spirit mothers of fish or game animals, or they may be where significant mythical-historical events occurred (Rocha 2020a). The violation of sacred places is thought to result in grave misfortunes, accidents, and diseases (Baniwa 2018).

Encounters between IPLCs and archaeology have also occurred within wider contexts of conflict and human rights violations spearheaded by the expansion of capitalist frontiers (development of infrastructure such as dam and road building) within environmental licensing frameworks (Bezerra 2015; Rocha et al. 2013) (Figure 8.13). The construction of dams on the Teles Pires River, a tributary of the Tapajós in the southern Brazilian Amazon, led to the destruction of important sacred places for the Munduruku, Apiaká, and Kayabi peoples. Here the “salvaging” of funerary urns by archaeologists was considered by the Munduruku as a violation of ancient cemeteries (Pugliese and Valle 2015, 2016). This has resulted in perhaps the first instance of an archaeological heritage-related direct action in Brazil, as on Christmas day 2019 the Munduruku occupied the Alta Floresta Natural History Museum, performed rituals, and reburied the funerary urns. This suggests that archaeologists must follow consultation protocols in line with the International Labour Organization’s Indigenous and Tribal People’s Convention (ILO C169), which guarantees the right to free, prior, and informed consent in relation to actions and projects that will impact their territories and heritage.

8.11. In the Amazon, natural heritage is cultural heritage: Recommendations for policy makers

The study of technological developments, material culture, language dispersals, monumental constructions, and networks linking peoples in disparate locations should put to rest the idea of the Amazon as a “pristine” peripheral region with nothing else to offer other than hydropower energy, mineral resources, and timber; as an exit corridor for commodities; or a repository of state-owned lands to eventually be turned into pasture or soybean plantations. This model has clearly failed and is putting Amazonian peoples and ecosystems – as well as the rest of humanity – at risk. Amazonian archaeology shows that we have much to learn from Amazonian peoples past and present and provides a means to help do historic justice to the region as a center of history, knowledge, and culture in its own right.

By unearthing the role played by ancient Amazonians in configuring forest and urban landscapes, and by studying relationships between agrobiodiversity, landscape legacies, and the region’s current plural societies, archaeology can provide a long-term perspective and concrete examples of pathways leading to the preservation and restoration of the region.

8.12. Conclusions

The archaeological heritage of the Amazon, which, as we have seen, includes its natural components, is now being destroyed at a faster pace than ever before. From the perspective of archaeology, any solution conceived for the Amazon must necessarily have at its center Indigenous peoples and local communities, whose very identities are closely linked to their traditionally occupied territories (Almeida 2004), of which they are guardians. They know best how to make good use of them. Guaranteeing collective land rights for IPLCs is the most effective way of conserving biodiversity in the Amazon and worldwide (Walker et al. 2020; Garnett et al. 2018).

8.13. Recommendations

- IPLCs' territorial rights must urgently be recognized and guaranteed. Not doing so exposes them and their territories to violence, invasion, degradation, and disease, and can accelerate forest degradation and biodiversity loss. Furthermore, their rights to self-determination must be upheld.
- Strict-protection nature reserves whose interiors have been traditionally occupied should be reconfigured to allow traditional peoples to remain and continue their ways of life, preserving their natural-cultural heritage.
- The fact that different traditional and/or Indigenous peoples may have areas of common use within their different territories needs to be contemplated by legislation, since not doing so has generated conflicts between neighboring communities.
- Prior to territorial demarcation, in-depth research about, and inclusion of, the peoples affected and their natural-cultural heritage is a *sine qua non* condition so that the relationships between the affected communities, the land, and their neighbors is adequately taken into account and future conflicts are avoided.
- In configuring protected areas (which include Indigenous lands, conservation units, and traditional peoples' territories), land use beyond habitation zones must be taken into account (e.g., hunting and resource extraction areas and sacred places) and anthropogenic forests must be understood as natural-cultural heritage.
- The inclusion of social scientists as well as IPLCs (in a way that respects their forms of social organization) in the creation and management plans for protected areas is needed to properly contemplate community specificities and territorial use.
- Further initiatives from state agencies and the third sector are needed to support IPLCs to generate incomes from the agrobiodiversity they have created and managed for millennia and to enable them to continue to provide vital ecosystem services.
- The use of controlled, localized, low temperature fires by IPLCs is a historical management strategy, important to their cultivation and forest management practices, that prevents wildfires in dryer periods. We encourage the incorporation of traditional people and their knowledge on fire use in environmental management strategies led by state agencies within protected areas.
- IPLCs' territories concentrate "islands of forests" surrounded by agro-pastoral fields. Because of climate change and deforestation (particularly from invasions) around their territories, abrupt and more flammable forest borders are created. We recommend the creation of protection and buffer zones around these territories, particularly the creation of corridors of protected lands that allow preservation of environments and ensure proper communication between their human and non-human inhabitants.
- Education paradigms within and without the region must shift to incorporate archaeological knowledge of the Amazon, in order to furnish society at large with a more accurate historical conception of the region that takes in the

fundamental contributions of Amazonian peoples to both national and global development.
- Intercultural education and museum projects constructed with IPLCs must be installed in order for local histories and knowledge to serve as a central reference to empower IPLCs, rather than sole focus on historical developments of national societies that are far-removed from local realities.
- Funding for local archaeological and other interdisciplinary research, which includes and is designed by IPLCs and geared towards their needs, must be encouraged, allowing for the co-production of knowledge.
- Pre-Columbian Indigenous societies developed technologies with long-lasting impacts that were highly adapted to Amazonian conditions – such as ADEs, raised-fields, and agroforests, which optimized development and the expansion of food production systems. These technologies can inspire new forms of urbanism, waste management, and land-use systems highly integrated with the Amazon's natural conditions, with the potential to boost sustainable solutions for the Amazon.
- Decisions on infrastructure and other development projects should be taken with consideration to ILO C169. This involves collaborative assessments of impacts to IPLCs' heritage. Environmental licensing should therefore enable such decisions on technical, rather than political, grounds (Fearnside 2015), rather than serving as a "bureaucratic ritual of territorial occupation" (Folhes 2016).
- The countries of the Amazon Basin will have to seek the means to adopt variables of these measures in a community way, thus favoring not only the protection of many Indigenous peoples but also the conservation of Amazonian biodiversity.

These recommendations support the overall aim of consolidating IPLCs' autonomy, so that they are able to decide on their collective futures, which necessarily involve the Amazon's stability and integrity.

8.14. References

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