

PRECOLUMBIAN LAND USE  
AND SETTLEMENT PATTERNS  
THE SANTARÉM REGION  
LOWER AMAZON

---

---

---

PRECOLUMBIAN LAND USE  
AND SETTLEMENT PATTERN IN  
THE SANTARÉM REGION,  
LOWER AMAZON

P E R S T E N B O R G

UNIVERSITY OF GÖTEBORG, SWEDEN

D E N I S E P A H L S C H A A N

UNIVERSIDADE FEDERAL DO PARÁ, BRASIL

M A R C I O A M A R A L - L I M A

LABORATÓRIO DE ARQUEOLOGIA CURT NIMUENDAJÚ, BRASIL

## **PRECOLUMBIAN LAND USE AND SETTLEMENT PATTERN IN THE SANTARÉM REGION, LOWER AMAZON**

### **Abstract**

One of the most promising areas for the study of pre-Columbian complex societies in the Amazon River basin is the area of the lower Tapajós, Trombetas and Nhamundá rivers. There are written accounts on the Konduri and Tapajó Indians, presenting information on their regional social organization, trade patterns, abundance of foods, and material world. Hence, archaeological evidences – immense sites, full of anthropic remains, and beautiful artefacts – may be contrasted with written information. These rich cultural deposits are vanishing at an alarming rate, as urban centres grow, and agriculture expands in the region. Despite this situation, little archaeological research has been conducted in the area, especially when it comes to investigations of ancient settlement systems and trade patterns. In the last couple of years, we have performed surveys in the Lower Tapajós River basin. The archaeological record indicates that pottery showing strong stylistic resemblance to that found at the large central site is spread at least as far as 90km to the south of present Santarém city. This article presents the results of a regional survey in the vicinities of Santarém, in the Belterra plateau, and Alter do Chão, offering a preliminary settlement system analysis in the region.

Keywords: Tapajó ceramics, settlement patterns, lower Amazon.

## **USO DA TERRA E PADRÃO DE ASSENTAMENTO PRÉ-COLOMBIANO NA REGIÃO DE SANTARÉM, BAIXO AMAZONAS**

### **Resumo**

Uma das áreas mais promissoras para o estudo das sociedades pré-colombianas complexas na bacia do rio Amazonas é a área do baixo curso dos rios Tapajós, Trombetas e Nhamundá. Há relatos escritos sobre os Konduri e os Tapajó, apresentando informações sobre a sua organização social regional, padrões de comércio, a abundância de alimentos, e o mundo material. Assim, evidências arqueológicas – sítios imensos, solos antrópicos, e belos artefatos – podem ser contrastadas com a informação escrita. Estes ricos depósitos culturais estão desaparecendo a um ritmo alarmante, à medida em que os centros urbanos crescem e se expande a agricultura na região. Apesar desta situação, pouca pesquisa arqueológica tem sido realizada na área, especialmente quando se trata de investigar os antigos padrões de assentamento e redes de trocas. Nos últimos anos, temos realizado pesquisas na bacia do baixo rio Tapajós. O registro arqueológico indica que a cerâmica mostrando forte semelhança estilística com a encontrada no grande sítio central está espalhada por pelo menos 90 quilômetros ao sul da presente cidade de Santarém. Este artigo apresenta os resultados de uma pesquisa regional realizada nas proximidades de Santarém, no planalto de Belterra

e Alter do Chão, oferecendo uma análise preliminar do sistema de assentamentos na região.

Palavras-Chave: Cerâmica tapajônica, padrões de assentamento, baixo Amazonas.

## **USO DE LA TIERRA E PATRONES DE ASENTAMIENTO PRE-COLOMBINOS EN LA REGIÓN DE SANTARÉM, BAJO AMAZONAS**

### **Resumen**

Una de las áreas más prometedoras para el estudio de las sociedades complejas precolombinas en la cuenca del río Amazonas es el área del curso inferior de los ríos Tapajós, Trombetas y Nhamundá. Hay relatos escritos sobre los Konduri y los Tapajó, presentando información sobre sus patrones de organización social, de comercio regional, la abundancia de alimentos, y el mundo material. Por lo tanto, la evidencia arqueológica – muchos sitios, los suelos antropogénicos y ricos artefactos – se puede contrastar con la información escrita. Estos depósitos culturales están desapareciendo a un ritmo alarmante, en la medida en que los centros urbanos están creciendo y la agricultura se expande en la región. A pesar de esto, poca investigación arqueológica se ha realizado en la zona, sobre todo cuando se trata de investigar los patrones de asentamiento antiguos y los intercambios regionales. En los últimos años hemos llevado a cabo investigaciones en la cuenca del bajo río Tapajós. El registro arqueológico indica que cerámicas con fuerte similitud estilística con la que se encuentra en el grande sitio central se extiende por al menos 90 kilómetros al sur de la ciudad de Santarém. Este artículo presenta los resultados de una investigación regional realizada en las inmediaciones de Santarém, la meseta de Belterra y en Alter do Chão, ofreciendo un análisis preliminar del sistema de asentamientos en la región.

Palabras-clave: Cerámica tapajônica, patrones de asentamiento, bajo Amazonas.

## INTRODUCTION

The earliest ethnohistorical sources (particularly Carvajal 1934) described densely populated provinces of considerable sizes situated along the Amazon River floodplain and bluffs, which would have a regional political organization, riverine-hinterland trade systems, and productive subsistence systems. Mid-20<sup>th</sup> century archaeology, however, downplayed the accounts of Carvajal and others (Schávelzon and Zarankin 1992). This standpoint particularly attached importance to the ecological assessments of the Amazon basin resources, which, it was reasoned, would imply limitations for the development of dense, complex polities, given the assumed poor soils and limited protein sources (Beckerman 1979, Meggers 1954, Steward 1948). This carrying capacity way of looking at the interactions between human beings and environment was early on criticized by scholars from different fields (Carneiro 1960, Denevan 1966, Lathrap 1970, Myers 1973), whom argued both that the Amazon environment were being taken as uniform, without consideration for the varied and different niche which existed, and that human societies could overcome environmental constraints, with creative responses in order to maximize food production, even increasing soil fertility through mulching, frequent burning, and the building of raised/ridged fields. Indeed, Amazonian studies, beginning in the 1980s, started to yield compelling evidence that human societies had in fact transformed their surroundings in different ways, and that Amazonian forests were not pristine environments to which

humans were obliged to adapt. Quite to the contrary, according to this view, human agency was considered a prime mover in producing part of the current biodiversity (Balée 1989, Posey and Balée 1989, Smith 1980).

Evidence for the existence of complex, regional societies in the region on the eve of European contact were soon presented also by archaeologists, beginning with the pioneer work of Anna Roosevelt in Venezuela (Roosevelt 1980), where she identified a growth in demography and social complexity associated with the adoption of maize cultivation. Although Roosevelt's work was tied to a strong deterministic view towards the environment, she emphasized, in opposition to Meggers, the bountiful resources of the basin, and the fertility of the floodplain (Roosevelt 1989, 1991). Following an increase in quantity and quality of information, the debate has since expanded from discussions about the existence of chiefdoms in the Amazon basin, to include topics such as the likelihood that a variety of social formations emerged during the last two millennia, changing landscapes of floodplains and hinterland in diverse ways – a history that was cut short by the European invasion (Erickson 1980, 2006, Gomes 2007, Heckenberger and Neves 2009, Heckenberger 2005, Heckenberger et al. 2003, Neves 1999, Schaan 2001, 2008, 2012). This also points to the importance of improving our understanding of the changes which the European involvement brought about.

One of the types of evidence for the existence of large, populated settle-

ments during the late pre-Columbian times which has attracted considerable attention lately (notably including that of the medias), is that of the Amazonian Dark Earths – ADE (or *terra preta* soils), commonly found associated with archaeological artifacts (Kern and Kampf 1989, Lehmann 2003, Smith 1980, Sombroek 1966, Woods et al. 2009, Woods and McCann 1999). These are anthropogenic soils, formed through the deposition of organic material at least to some extent an unintentional side-effect of diverse human activities, including food preparation, decayed wood and palm houses, craftwork, burial remains, and so forth (Kern 1988, Kern and Kampf 1989). The possibility that *terra preta* was produced intentionally as a strategy of soil improvement has been stressed by several researchers (e.g. Hecht 2003, Steiner et al. 2008, Woods and McCann 1999). Suggested procedures for soil enhancement include particular methods of clearing, usually referred to as “slash-and-char”, in which pyrolysis (a burning method with limited supply of oxygen) is the dominating type of burning and addition of various kinds of organic waste (Steiner, Teixeira, and Zech 2004). The degree of intentionality behind the human-driven formation of the ADE and related environmental modifications has yet to be evaluated.

*Terra preta* was formed on top of latosols, often accompanied by cultural layers that in some places can reach more than 2m of deposits and a plentitude of cultural material and artifacts.

The *terra preta* formation processes still have to be systematically defined and isolated from the more ordinary accumulation of cultural material and formation of cultural layers associated with human activity. *Terra preta* researchers have stressed the large distribution of these soils throughout the basin, and the fact that they are testimonies of large societies occupying the Amazon river bluffs and also the hinterlands (*terra firme*) (Kern et al. 2004). Such soils have high pH, high organic content, high concentrations of P, Ca, Mg, Mn, besides being incredibly resistant to leaching. Given their persistence through time, they are supposed to provide clues for settlement chronology and demographic density (Glaser and Woods 2004, Lehmann et al. 2003, Schaan, Kern, and Frazão 2009, Woods et al. 2009). Stability is therefore a distinguishing mark of the *terras pretas*. Hence, although the settlements that once somehow produced them in most cases vanished in the 16<sup>th</sup> and 17<sup>th</sup> centuries, the soils have not become leached or decomposed. In fact their fertility implies that they are the most coveted soils for agricultural purposes in the Amazon today, and as a consequence, their use by farming populations has increased and the archaeological record is being destroyed at an alarming rate. Interest in *terra preta* has recently increased (Glaser and Woods 2004, Lehmann et al. 2003, Teixeira et al. 2009, Woods et al. 2009) owing to their role in the debate on complex polities in Amazonia (Heckenberger, Petersen, and Neves 1999, Meggers 1992, Petersen, Neves,

and Heckenberger 2001), agricultural productivity (Madari, Sonbroek, and Woods 2004) and in demonstrating that the Amazonian landscape is to a considerable extent anthropogenic (Denevan 2001, Lehmann et al. 2003, Oliver 2001, Woods et al. 2009).

As previously noted, recent research indicate that the Amazon basin housed a variety of social formations in pre-Columbian times. However, there is a great need to improve our understanding of how these societies were related to one another. Concerning the chronological conditions our knowledge is still fragmentary and in great need of reinforcement. Regarding contemporaneously existing societies their socio-political interrelationship need close examination. Having these aims in prospect, an important step is to build up in-depth information of settlement history through time. In order to analyse the origins of socio-economic variation, it must be put in relation to a variety of factors, amongst other those involved in the formation of group-identities, subsistence patterns, mobility, as well as positions in pre-Columbian systems of exchange and trade.

In this article, we focus on the study of settlement systems related to the societies that developed by the mouth of the Tapajós River from the latter half of the first millennium A.D. onwards (Figure 1). The Tapajó were met by Europeans in the 17<sup>th</sup> century, but their culture and social organization probably vanished rapidly after their defeat against the Portuguese in 1639. Nimuendajú (Nimuendajú 2004:188)

assumed that the population declined rapidly during the 16<sup>th</sup> and 17<sup>th</sup> centuries as a result of slavery, warfare and oppression from the colonial power. The survivors were in most cases relocated to the historical villages and missions in the areas of today's Santarém, Alter do Chão, and Vila Franca do Lago Grande, together with native populations of other background (Cabalar 2003). Although some information on their social organization, subsistence patterns, and symbolic world is available from the historical sources, we depend on archaeological research in order to reconstruct their ancient way of life, their geographical dispersion, their relation to other polities, and the history of their emergence and development through time. While archaeological research has been conducted at the central site in Santarém, a site lying underneath the present city of Santarém, the available results are still preliminary (Quinn 2004, Roosevelt 1999, Schaan 2010), and no archaeological attempts have been made to explore and analyse the organization of these pre-Columbian societies at a regional level.

Given the lack of information on Tapajó regional organization and geographical importance, our initial work has focused on studying sites located in the Belterra Plateau, many of them earlier located by the German-Brazilian researcher Nimuendajú in the first half of the 20<sup>th</sup> century, during his work for the Gothenburg Museum (now the Museum of World Culture) in Gothenburg, Sweden (Nimuendajú

1949, 2004). In this paper we present the results from our fieldwork accomplished so far, proposing a preliminary settlement pattern analysis which sets the foundation for the ongoing research in the area, aiming at contributing to a general debate on the development and history of complex societies in the Amazon basin.

### THE SANTARÉM REGION

The later prehistory of the Santarém region in the lower Amazon (considering the Tapajós and the Trombetas/Nhamundá river basins) is characterized by the emergence of two related but distinct ceramic complexes: Santarém (mainly distributed south of the Amazon River) and Kondurí (found to the north of the Amazon River). There are a few C14 and TL dates associated with Santarém and Kondurí pottery (Gomes 2001, 2005, Guapindaia 2008, Hilbert and Hilbert 1979, Pouguet 2002, Quinn 2004), but both complexes have been preliminarily dated to the

period AD 1000-1700.

A key issue for the future is to analyze the formation and distribution of *terra preta* in the Santarém region in relation to sustenance and settlement systems and socio-economic organization. As noted above, in reconstructing the factors involved in the formation of *terra preta*, it is of critical importance to establish the relation between this process and the formation, or accumulation, of organic and inorganic material in cultural layers. Hence, any occurrences of *terra preta* unaccompanied by the typical content of cultural layers, such as pottery and osteological remains, as well as the contrary case of accumulated cultural material in non-*terra preta* strata, are of significant interest. Previous research on *terra preta* particularly concerned with the Santarém region includes the work of Woods and McCann (1999, Woods 1995).

Trade routes and networks for communication may directly and indirectly have linked enormous areas together. These routes of communication along

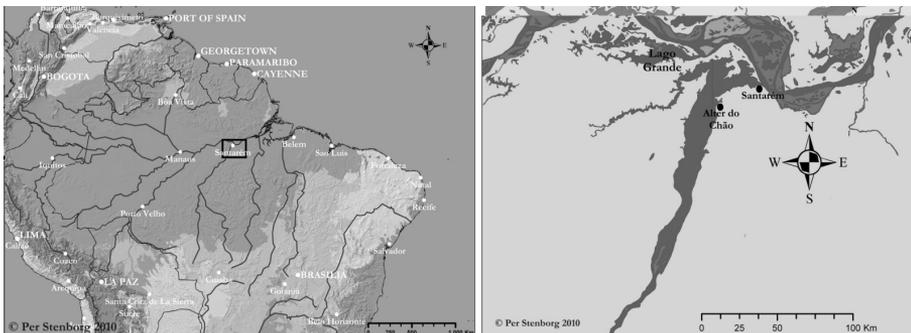


Figura 1 – Tapajós River is part of the Lower Amazon Region, which covers the eastern part of the Amazon Basin; to the north it borders on the highlands of the Guyanas, to the south on the Brazilian highlands, to the east on the Atlantic, while to the west many of its characteristics are met with also in the Upper Amazon Region. By Per Stenborg 2010.

waterways would have involved key points, particularly in the junctions between north-south and east-west connections. A tentative theory is that interruptions of the reasonably homogenous pattern of material culture found along the Amazon, exemplified by the dominance for Santarém and Kondurí ceramics in the investigation area may reveal the positions of particularly important routes of communication along the tributaries. In this scheme, the Santarém Region would form a key area for investigation.

### **CURT NIMUENDAJÚ**

The German-Brazilian researcher Curt Unkel Nimuendajú is mostly known for his ethnographic fieldwork carried out among lowland Amerindian populations in the first half of the 20<sup>th</sup> century. His work has formed an important source of information for later research (Clastres 1975, Lévi-Strauss 1955, Lévi-Strauss 1985, Viveiros de Castro 1986). Until quite recently only limited information about Nimuendajú's archaeological research in the Brazilian Amazon had been published (Linné 1928, Linné and Montell 1925, Meggers and Evans 1957, Nimuendajú 1949, Nordenskiöld 1930, Palmatary 1939, 1960, Wassén 1934). More recently, however, the posthumous publication of his detailed field reports (Nimuendajú 2004), as well as correspondence (Nimuendajú 2000) has helped showing the importance also of his archaeological and historical studies (see also Stenborg 2009). Much of his archaeological fieldwork

was carried out on behalf of the Gothenburg Museum in Sweden, which was by the time becoming a centre for Amerindian Studies under the direction of Erland Nordenskiöld.

Nimuendajú's archaeological fieldwork covered a vast region, from the upper Rio Negro, Rio Uaupés and Rio Içana in the north-western Amazon all the way to the regions of Belém, Marajó, Mexiana and Caviana as well as Amapá by the Atlantic shore (Figure 2). His investigations thus dealt with many key areas concerning Amazonian pre-Columbian history and yielded a unique material from numerous archaeological sites (Figure 3). The Santarém region was, however, the object of study for his most ambitious investigation – a fact also reflected by the large number of items from this region included in the collections that he sent to the museum in Gothenburg.

### **NIMUENDAJÚ'S RESEARCH IN THE AREAS OF SANTARÉM, LOWER TAPAJÓS AND LAGO GRANDE DE VILA FRANCA**

Six of Nimuendajú's expeditions concerned the Santarém region and adjacent areas (e.g. the lower Rio Tapajós, Lago Grande de Vila Franca, and Rio Trombetas). In 1923 his first two voyages in this region revealed 48 archaeological sites to the south of the city of Santarém, around Alter do Chão, on the right bank of Rio Tapajós, and along the southern shore of Lago Grande de Vila Franca. The bulk of these sites were the remains of settlements situated on *terra preta* soils.

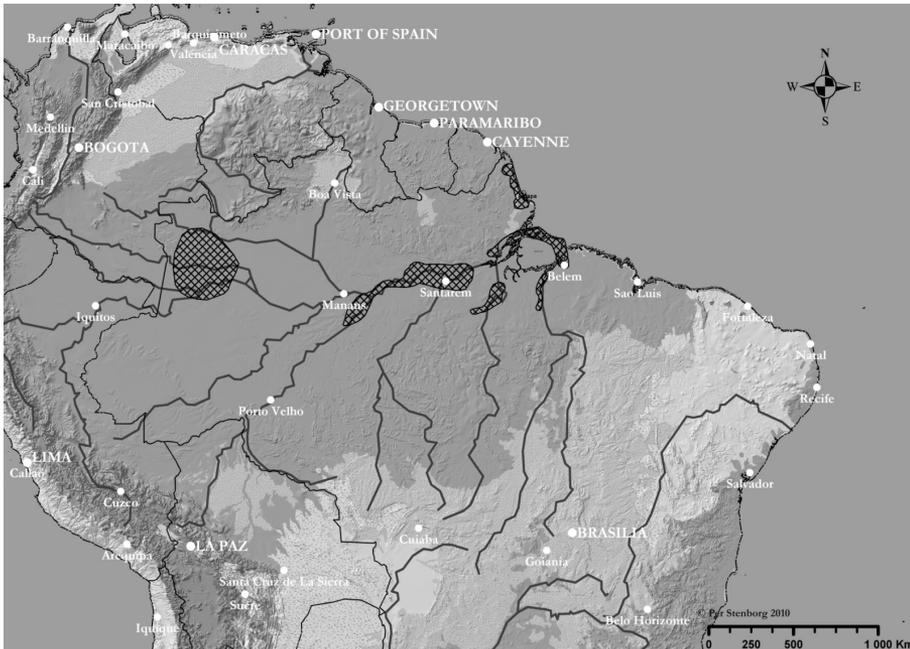


Figura 2 – The hatched areas give a rough estimation of the areas where Curt Nimuendajú carried out archaeological investigations for the Gothenburg Museum between 1922 and 1927.

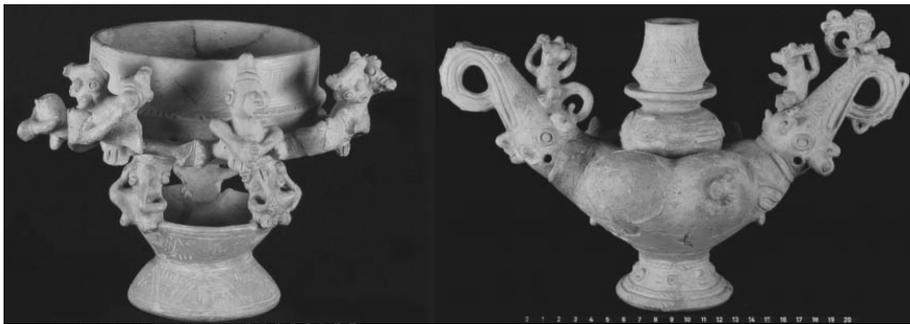


Figura 3 – Pottery from the Santarém area. From Nimuendajú (2004). Photo by Ferenc Schwetz.

The material sent to the Gothenburg Museum mainly consists of decorated pottery and fragments in the shape of zoomorphic appendages and figurines. Although these are common features of the Santarém pottery, Nimuendajú undoubtedly selected this kind of material, putting away fragments of plain ceramics as well as material that he

regarded to date from the time of European contact (Nimuendajú 2004:151). Lithic materials included hoes, stone spindle whorls, Muiraquitãs (frog shaped green stone pendants) and stone-idols.

During the next few years he undertook further investigations in the Santarém, Tapajós and Lago Grande areas, also exploring sites in neighbouring re-

gions. He described the Santarém material as a characteristic ceramic complex easily distinguished from materials found in adjacent areas. Another distinct ceramic complex was that of the Kondurí pottery, replacing the Santarém pottery north of the Amazon River; in the region of Rio Nhamundá and Rio Trombetas. South of the Amazon River he found the limit between the Santarém material and that of the Kondurí some 140 km west of Santarém city, at Serra Bananal. To the southwest the Santarém material bordered on that of the Maué, while he ascribed divergent materials to the west to the Tupinambarana and the Aroagui. To the East he found Santarém-like material as far as Água Boa by Rio Curuá, while a markedly different material was found further east, by the Igarapé Cuçary and Lago da Boa Vista, as well as by Monte Alegre, on the northern side of the Amazon River. He was not able to certify how far the Santarém material extended to the south, but found it as far as Aramanaí, situated some 90 km south of Santarém, on the right bank of Rio Tapajós. He estimated that a material, which he held to be that of the Sapupé, replaced the Santarém complex somewhere between lat. 3° and 4°S.

#### **SOCIO-ECONOMIC DEVELOPMENT AND POLITICAL ORGANIZATION**

It is reasonable to assume that Nimuendajú collected materials originated from several different time-periods. It is therefore unlikely that all the “areas” identified by Nimuendajú represent the remains

of material culture from contemporaneously existing societies. As stated in the foregoing, available dates for the Santarém and Kondurí pottery associate both complexes with the late first and early second millennium A.D. This is why we may suggest that these materials were produced by societies that existed – at least partly – contemporaneously (see below). Both complexes further belong to the Incised-and-Punctate tradition (Meggers and Evans 1961). The co-occurrence of a number of traits within a spatially delimited area indicates (at the least) that people interacted differently within this region, than between this and neighbouring regions. To the extent that a homogenization of material culture also implied the spreading of properties such as modes of production, land use, socio-political organization and the like it also renders a development towards political unity quite likely.

#### **THE HISTORICAL RECORD AND MATERIAL DATA**

Historical sources give information pointing to the existence of chiefdom-like political organization, at least in some parts of the Amazon Region by the time of European contact (Carvalho 1934, Porro 1994). It is difficult to assert precisely what kind of material imprint such an organization may have left in the archaeological record. It may be speculated that native settlements were withdrawn from the immediate surroundings of the river in response to the increasing European presence in the region during the decades that followed upon Orellana’s voyage in

1541-42. Such a development may account for some of the dissimilarities found as we compare Orellana's chronicler, Gaspar de Carvajal's account, with later sources (Bettendorf 1990, Porro 1994). During the course of the establishment of trade relations with the Europeans, the riverbeds may once again have been occupied by native villages. The constitution of such post-contact societies settled in the vicinity of the Amazon River may of course have been quite different from their predecessors.

Needless to mention, the historic information constitutes an invaluable source of information concerning historic and late prehistoric times. However, as argued elsewhere (e.g. Schaan 2004, Stenborg 1998), it is essential for archaeology to establish an independent empirical fundament for its generation of hypotheses. Initially, therefore, the aim will be to improve our knowledge about the material record in this region.

#### **AVAILABLE DATA CONCERNING TEMPORAL ASSOCIATIONS OF THE ARCHAEOLOGICAL MATERIAL**

The existing dates from the Santarém and Trombetas–Nhamundá areas indicate that the Santarém and Kondurí complexes belong to a late phase of Amazonian pre-Columbian history. The results of luminescence dates for samples from the Santarém material at Museu de Arqueologia e Etnologia at the University of São Paulo undertaken by Gomes (2001) centred on

the period A.D. 900 to 1200. Quinn (2004:147) published a series of 16 radiocarbon dates of material from the Santarém Porto-site. The calibrated results of 14 of these have ranges spanning from the 13<sup>th</sup> to the early 17<sup>th</sup> centuries (95.4% probability), with the main emphasis on the last three centuries before the European contact. The remaining two dates, however, gave much earlier results, indicating activity in the area also during the last millennium B.C. A single radiocarbon dating of a Kondurí-context, published by Hilbert and Hilbert (1979: 448), gave  $490 \pm 130$ , calibrated to A.D. 1260–1630 (Pouquet 2002). Recent research carried out by Guapindaia in the middle Trombetas River yielded four dates between 1020 and 1450 AD (calibrated) for Kondurí contexts (Guapindaia 2008: 171). A significant feature may be the limited impact of the so-called Amazonian Polychrome on the Santarém and Kondurí material (cf. Nimuendajú 2004: 130, Petersen, Heckenberger, and Neves 2001). Although the connections between the various pottery types referred to as the Amazon Polychrome tradition is problematic, late pre-Columbian polychrome pottery is more common west, e.g. Guarita and Paredão in the Central Amazon–Rio Negro areas (Heckenberger, Petersen, and Neves 1999, Hilbert 1968, Lathrap 1970, Neves 1998, Petersen, Heckenberger, and Neves 2001) as well as east, e.g. Marajoara (Meggers and Evans 1957, Roosevelt 1991, Schaan 2001) of the Santarém and Trombetas–Nhamundá areas. Taken together, the areas dominated by Santarém and Kondurí

materials may constitute a gap or interruption in the distribution of the Amazonian Polychrome ceramics during late pre-Columbian times. These interruptions coarsely coincide with the areas of confluence between the Amazon and the Trombetas and Nhamundá rivers to the north and the Tapajós River to the south, why the impact that communication and mobility along these tributaries may have had on the development should be considered.

Although scholars such as Roosevelt (1992) point to an abrupt change from the Polychrome Horizon to the Incised-and-Punctate, evidence from Andirobal and Port sites indicate that the appearance of Incised-and-Punctate ceramics in the area did not replace the polychrome pottery. Conversely, potters related to the Incised-and-Punctate Horizon copied from the painted pottery some geometric designs, and both horizons co-existed simultaneously in the ceramics produced with distinct functions.

#### **THE FIELDWORK CARRIED OUT IN 2008**

A field campaign undertaken in 2008 consisted in surveying and mapping a large number of archaeological sites over an area covering the regions from the city of Santarém at 54°43' W and 2°26'S and approximately 100km to the east on the southern side of the branch of the Amazon River to longitude 54°05'W and southward about 40km to latitude 2°40'S south of the city of Alter do Chão (cp. Nimuendajú 2004:131, 153f) at the right bank of

the Tapajós River. This fieldwork was facilitated by grants from the Rausing Foundation, the University of Gothenburg and the University of Pará, and was carried out as a form of rescue work, in the view of a rapid increase in the destruction of the archaeological record of this key region for the understanding of the lowland South American history. The record is being destroyed for a number of reasons, such as mining activities, road and pipe-line construction, and (as mentioned above) in particular for agricultural purposes.

A total of 43 archaeological sites were mapped using a Trimble GeoXH GPS (for a list of sites, see the appendix) (Figure 4). Real-time differential correction was not available on site, but could be applied during post processing of the GPS data in Sweden using data from the SOPAC, Kourou, base-provider situated some 895km from the area of investigation. The quality of the collected data could thereby be improved from an average precision of about 20m to about 1m.

As had been anticipated, the majority of the sites of the survey area are at present in a state of rapid destruction, mainly owing to large-, and small-scale expansion of modern agricultural activity (Figures 5 and 6). Of the 43 sites about 20 could with certainty be identified as the same sites that had been visited and initially investigated by Curt Nimuendajú in the 1920's, during his fieldwork for the Ethnographic Museum in Gothenburg. Today this material forms part of the collections at the Museum of World Culture in Gothenburg.

In addition to the fieldwork in November 2008, the Brazilian researchers have surveyed further areas in the projected region of investigation. In 2006, Denise Schaan and Marcio Amaral surveyed areas to the south of Santarém not covered by the 2008 survey (Schaan 2006). More recently, they have continued the non intrusive field surveys, expanding the area of investigation further east by including the Monte Alegre area (cp. Nimuendajú 2004:140–143, 147–150) on the northern side of the Amazon River, as well as further to the west by covering vast region surrounding the Lago Grande de Vila Franca (Ibid. :134f, 155).

### PRELIMINARY RESULTS

The total number of archaeological sites recorded and mapped during these surveys amount to approximately 80. It is estimated that the collections at the Museum of World Culture in Gothenburg include material from about 50% of these sites. The total number of items collected by Nimuendajú for the museum in Gothenburg is 8,234 and approximately half of these have come from sites situated within the projected geographical area of investigation.

The great majority of the surveyed sites are remains of settlements situated at typical *terra preta* soils, particularly fertile anthrosols, rich in organic matter and contrasting sharply with



Figure 4 – The area surveyed in November 2008. Mapped sites are indicated. By Per Stenborg 2010.



Figure 5 – *Terra preta* sites: Cajutuba 1 and Terra Preta do Jacú. Photos by Imelda Bakunic and Denise Schaan.



Figure 6 – Santarém pottery collected by local inhabitants at Serra Grande (Guaraná road). Photo by Per Stenborg 2008.

the otherwise poor soils found in the Amazon region (Figure 7). The sizes range from 0.1ha (Guari) up to 16ha (Santarém-Aldeia) and the depth of the *terra preta* strata varies from 0.2m (Pindobal 1) to 2m (Vila Americana and Santarém-Aldeia) (Figure 8). To date the time of initial formation of the *terra preta* layers, and to associate this environmental change with transformations in human action and possibly with the emergence of new socioeconomic structures, institutions and modes of production, may be considered primary tasks.

However, in order to investigate the origin and significance of *terra preta*, it is also important to examine anomalies concerning the co-occurrence between *terra preta* and cultural material such as pottery and bone. In case *terra preta*

was produced deliberately in order to improve potentials for food production, it may be postulated that areas used exclusively or primarily for agricultural activities would show comparably low concentrations of such cultural material. Furthermore, it may be suggested that this would mean that settlement areas used for non-agricultural purposes (e.g. as dwellings) would demonstrate a weaker association with environmental modifications, such as deliberate soil improvement, as compared to agricultural areas, while the deposition of refuse such as fragments of pottery and bone would be of substantial influence. If, on the other hand, *terra preta* originated as an unintentional consequence of pre-Columbian human activities, it might be suggested that, through time, the pattern of land-use followed an over-



all chronology where domestic space subsequently was re-utilized and transformed into agricultural areas. In this latter case, while quite possibly linked to the emergence of certain patterns of human action, the formation of *terra preta* would have been unrelated to the subsequent use of *terra preta* for agricultural ends.

Another fundamental question concerns the lapse of time between commencing actions leading up to the transformation of non-*terra preta* soils into *terra preta*, and the appearance of soil improvement at a scale of significance for agricultural production. The shorter the time needed in order to obtain significant improvement in fertility, the greater the probability that these actions were intentionally undertaken in order to increase agricultural productivity.

In the regional approach adopted in this study the spatial distribution of various resources is an additional key issue. The preconditions for obtaining and producing comestibles vary between different parts of the Santarém region. In addition to exploitation of *terra preta* areas, flood recession agriculture may have been practiced in seasonally inundated floodplains (Winklerprins 2002). The amount of sediment carried by the rivers is an important aspect concerning the potentials for flood recession agriculture. Whitewater rivers, rich in suspended material, such as the Amazon River, offer superior conditions for this kind of agriculture, in comparison with clear-and black-water rivers such as

the Tapajós. Assuming that seasonally flooded areas along the Amazon were used for agriculture, the need for soil improvement would have been lesser than along the Tapajós and in the inland. Survey will therefore include different ecozones and analyze the distribution of *terra preta* with respect to differences concerning environmental preconditions. Future work therefore will include documentation of the size, thickness and cultural content of *terra preta* patches in different sectors of the region to allow reconstruction of prehistoric management of terrestrial resources and socio-economic development. This work will make use of GIS-technology for spatial modeling, analysis, geovisualization and spatio-temporal analysis (e.g. Longley et al. 2005, Mehrer and Wescott 2006).

Preliminary results of these initial investigations reveal the existence of various types of sites in the area of investigation (Figures 8 and 9). Tentatively three types of settlements have been distinguished:

- 1) A first category consists of large sites situated at low altitudes featuring high concentrations of archaeological materials, deep *terra preta* deposits and proximity to the main watercourses of the region. These sites, exemplified by Santarém-Aldeia, Sítio Porto (one of very few sites in the region where recent archaeological investigations have been carried out by Roosevelt, Schaan and colleagues) (Roosevelt 2000, Schaan 2010), Lavras I, São Domingos II, São Domingos III and Vila Americana, can tentatively be interpreted as

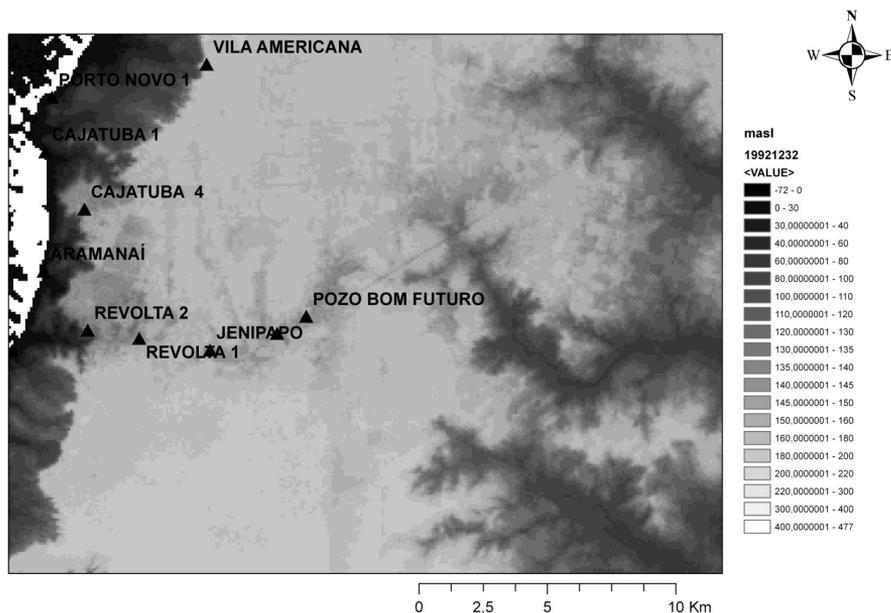


Figure 9 – The south-western section of the survey area: The location of surveyed sites are displayed on top of a DEM (digital elevation model). The DEM is based on the SRTM 3 arc seconds data set, displaying the elevation pattern of the region. The great majority of the inland sites are found in valleys and depressions where the conditions of water supply were superior in comparison with the surrounding upland areas. By Per Stenborg.

large population centers.

2) A second type of sites are of similar size, but contain much lower concentrations of cultural material, thinner *terra preta* strata (in many cases of lighter color, referred to as Terra Mulata, after Sombroek 1966) and, although situated near water resources, their distribution is not limited to the proximities of the main waterways. These sites include Juá, Jacú, Pindobal, Lavras II, Lavras III, Carapanari I, Carapanari IV and Carapanari V. A working hypothesis is that these sites were primarily tied to agriculture. An alternative interpretation is that their period of occupation was considerably shorter than that

of the first category of settlements. In some cases, such as that of Alter do Chão, historical sources give evidence of the existence of settlements in post-contact times (in that case the “Aldeia Borary”, cf. Nimuendajú 2004:131).

3) The third category are made up of smaller sites, displaying *terra preta* deposits of varying depths, with limited access to surface water. The concentration of archaeological material is relatively high. Genipapo I, Genipapo II, Bom Futuro and Posto Novo belong to this category. In all probability this category covers sites of different ages, having had a variety of functions during their occupation. Tentatively,

this “morphological” category may be presumed to include:

3a. Installations associated with specialized resource management. At Genipapo the existence of an artificial well reported by Nimuendajú (2004: Plate 203) was verified. The outer perimeter of this well, measuring some 15 to 20m in diameter, was mapped. The construction of these wells must have required considerable investment of labor and a significant degree of organization. Presence of excavated wells could therefore be an indication of incorporation into a socio-political organization at a level of structuring beyond that of individual villages and installations.

3b. Settlements predating the emergence of large population centers and the development of socio-political organization beyond that of the individual village or village groups. At earlier stages population numbers may have been comparably low, with considerably less integration into regional political and economic systems, reducing the importance of juxtaposition to the main waterways.

3c. Site postdating the initial moments of European contact (i.e. the mid 16<sup>th</sup> century onward). In post-contact settings, processes of change, involving dramatic reduction of population numbers, as well as strategic and preventive relocations



Figure 10 – Serra do Capiranga in the background, an example of a terra preta site located on a hill top.

of settlements to remote and sheltered positions, sometimes on hill tops (Figure 10), have been demonstrated for other Latin American regions (Stenborg 2002).

The results of the surveys so far accomplished indicate that neither *terra preta*, nor archaeological sites in general, are more abundant in the vicinity of the Amazon River, than along the lower Tapajós and in the inland areas. Rather, there appear to be concentrations of sites in the southwestern part of the surveyed area, near the village of Belterra (Tapajós), as well as in some inland areas, such as that of Lavras 1-3 and Jacú.

At present rate of destruction a large number of these site will have vanished within a few years (the logging and destruction of forest land in the Santarém region is easily discernible on satellite images, for example at *Google Earth*), a circumstance increasing the need of further documenting and investigating these archaeological remains as soon as possible.

Future work will attempt to date the period of initial *terra preta* formation in this region. Based on that knowledge it will be possible to investigate the rate of association between sites from the “*terra preta*”- period and the *terra preta* themselves. Were these sites, as a rule, associated *terra preta* soil forming, or were there contemporary sites where activities neither depended on *terra preta* soils, nor did result in *terra preta* formation?

In this manner we will be able to identify

different settlement types as well as settlement systems. A number of type-sites will be investigated with respect to *terra preta* formation, association between particular cultural remains and initial period of *terra preta* formation.

Of fundamental interest is the prehistoric management of terrestrial resources, in particular the *terra preta* anthrosols, through combined archaeological and soil science analyses. The formation and use of the *terra preta* soils can only be understood by tracking a variety of interacting processes at several scales, including soil processes, environmental control, modes of production, subsistence strategies at various levels and socio-political organization. This demands a broad multidisciplinary research effort (cf. Madari et al. 2004). By tracing particular activities we also aim at identifying functionally specialized installations other than those tied to agriculture. We hereby aim at producing a model concerning systems of production and modes of interaction at different scales in the region of study.

## REFERENCES

- Balée, W. 1989. The culture of Amazonian forests, in *Resource management in Amazonia: indigenous and folk strategies. Advances in Economic Botany* vol. 7. Edited by D. A. Posey and W. Balée, pp. 1-21. New York: New York Botanical Garden.
- Beckerman, S. 1979. The abundance of protein in Amazonia: A reply to Gross. *American Anthropologist* 81:533-60.
- Bettendorf, P. J. F. 1990. *Crônica dos Padres*

- da Companhia de Jesus no Estado do Maranhão. *Lendo o Pará* 5. Belém: Fundação Cultural do Pará Tancredo Neves, Secretaria de Estado da Cultura.
- Cabalzar, A. 2003. *Kumurô. Banco Tukano*. São Paulo: Instituto Socioambiental.
- Carneiro, R. L. 1960. Slash-and-Burn agriculture: A closer look at its implications for settlement patterns, in *Men and Cultures*. Edited by A. F. C. Wallace, pp. 229-34. Philadelphia: University of Pennsylvania Press.
- Carvajal, G. d. 1934. Discovery of the Orellana River, in *The discovery of the Amazon according to the account of friar Gaspar de Carvajal and other documents*. Edited by J. T. Medina, pp. 167-235. New York: American Geographical Society.
- Clastres, H. 1975. *La terre sans mal: Le prophétisme Tupí-Guarani*. Paris: Éditions du Seuil.
- Denevan, W. M. 1966. *The aboriginal cultural geography of the Llanos de Mojos*. Berkeley: University of California Publications.
- \_\_\_\_\_. 2001. *Cultivated landscapes of Native Amazonia and the Andes: triumph over the soil*. *Oxford Geographical and Environmental Studies*. Oxford, UK New York: Oxford University Press.
- Erickson, C. L. 1980. *Sistemas agrícolas prehispanicos en los Llanos de Mojos*. *América Indígena* 40:731-755.
- \_\_\_\_\_. 2006. "The domesticated landscapes of the Bolivian Amazon, in *Time and Complexity in Historical Ecology*. Edited by W. Balée and C. Erickson. New York: Columbia.
- Glaser, B., and W. I. Woods. 2004. *Amazonian dark earths: explorations in space and time*. Berlin/ New York: Springer.
- Gomes, D. M. 2001. Santarém: symbolism and power in the tropical forest, in *Unknown amazon: Culture in nature in ancient Brazil*. Edited by C. McEwan, C. Barreto, and E. Neves, pp. 134-55. London: British Museum Press.
- \_\_\_\_\_. 2005. *Análise dos padrões de organização comunitária no baixo Tapajós: o desenvolvimento do formativo na área de Santarém, PA*. Doctoral Dissertation, University of São Paulo, São Paulo, Brazil.
- \_\_\_\_\_. 2007. The diversity of social forms in pre-colonial Amazonia. *Revista de Arqueologia Americana* 25:189-226.
- Guapindaia, V. L. C. 2009. *Além da margem do rio - a ocupação Konduri e Pocó na região de Porto Trombetas, PA*. Doctoral Dissertation, University of São Paulo, São Paulo, Brazil.
- Hecht, S. B. 2003. Indigenous soil management and the creation of Amazonian Dark Earths: Implications of Kayapó practices, in *Amazonian Dark Earths. Origin, properties, management*. Edited by J. Lehmann, D. C. Kern, B. Glaser, and W. I. Woods, pp. 355-372. Dordrecht, Boston, London: Kluwer Academic.
- Heckenberger, M., and E. G. Neves. 2009. Amazonian archaeology. *Annual Review of Anthropology* 38:251-266.
- Heckenberger, M. J. 2005. *The ecology of power: Culture, place, and personhood in the Southern Amazon, A.D. 1000-2000*. Nova York & Londres: Routledge.
- Heckenberger, M. J., A. Kuikuro, U. T. Kuikuro, J. C. Russel, M. Schmidt, C. Fausto, and B. Franchetto. 2003. Amazonia 1492: Pristine Forest or Cultural Parkland? *Science* 301:1710-1713.
- Heckenberger, M. J., J. B. Petersen, and E. G. Neves. 1999. Village size and permanence in Amazonia: Two archaeological examples from Brazil. *Latin American Antiquity* 10:353-376.
- Hilbert, P. P. 1968. *Archäologische Untersuchungen am Mitteren Amazonas. Beiträge zur Vorgeschichte des Südamerikanischen Tieflandes. Marburger Studien zur Völkerkunde*. Berlin: Dietrich Reimer Verlag in Berlin.
- Hilbert, P. P., and K. Hilbert. 1979. Archäologische Untersuchungen am Rio Nhamundá,

- Unterer Amazonas. *Beiträge zur Allgemeinen und Vergleichenden Archäologie Band 1*:439-450.
- Kern, D., G. d'Aquino, T. E. Rodrigues, F. J. Frazão, W. Sombroek, T. Myers, and E. Neves. 2004. Distribution of Amazonian Dark Earths in the Brazilian Amazon, in *Amazonian dark earths: explorations in space and time*. Edited by B. Glaser and W. Woods, pp. 51-75. Berlin: Springer-Verlag.
- Kern, D. C. 1988. *Caracterização pedológica de solos com Terra Preta Arqueológica na Região de Oriximiná, Pará*. Master's Thesis, Universidade Federal do Rio Grande do Sul, Brazil.
- Kern, D. C., and N. Kampf. 1989. Antigos assentamentos indígenas na formação de solos com Terra Preta Arqueológica na Região de Oriximiná, Pará. *Revista Brasileira de Ciência do Solo* 13:219-25.
- Lathrap, D. W. 1970. *The Upper Amazon*. New York: Praeger.
- Lehmann, J. 2003. *Amazonian dark earths: origin properties management*. Dordrecht, Boston: Kluwer Academic Publishers.
- Lehmann, J., D. Kern, B. Glaser, and W. Woods. 2003. *Amazonian dark earths: origins, properties, management*. Netherlands: Kluwer Academic Publishers.
- Lévi-Strauss, C. 1955. *Tristes Tropiques*. Paris: Librairie Plon.
- \_\_\_\_\_. 1985. *La potière jalouse*. Paris: Librairie Plon.
- Linné, S. 1928. Les recherches archéologiques de Nimuendajú au Brésil. *Journal de la Société des Américanistes de Paris* (nouvelle série) XX:71-91.
- Linné, S., and G. Montell. 1925. *Från Brasiliens Indianer i Förntid och Nutid. C. Nimuendajús arkeologiska och etnografiska forskning*. Göteborg: Göteborgs Museum, Etnografiska Avdelningen.
- Longley, P. A., M. Goodchild, D. J. Maguire, and D. W. Rhind. 2005. *Geographic Information Systems and Science*. Chichester: John Wiley & Sons.
- Madari, B. E., W. G. Sombroek, and W. I. Woods. 2004. Research on anthropogenic Dark Earth Soils. Could it be a solution for a sustainable agricultural development in the Amazon?, in *Amazonian Dark Earths: Explorations in space and time*. Edited by B. B. Glaser and W. I. Woods, pp. 169-181. Berlin: Springer.
- Meggers, B. J. 1954. Environmental limitation on the development of culture. *American Anthropologist* 56:801-24.
- \_\_\_\_\_. 1992. Tropical forest environments and archaeology: a view from Amazonia, in *Environment and archaeology*. Edited by A. G. Pantel, K. A. Schneider, and G. Loyola-Black. San Juan, Puerto Rico.
- Meggers, B. J., and C. Evans. 1957. *Archeological investigations at the mouth of the Amazon*. Vol. Bulletin 167. Washington, D.C., Smithsonian Institution Bureau of American Ethnology U.S. Govt. Print. Off.
- \_\_\_\_\_. 1961. An experimental formulation of Horizon styles in the tropical forest area of South America, in *Essays in Pre-Columbian art and archaeology*. Edited by S. K. Lothrop, pp. 372-288. Cambridge: Harvard University Press.
- Mehrer, M. W., and K. L. Wescott. 2006. *GIS and archaeological site location modelling*. London: CRC.
- Myers, T. P. 1973. Toward a reconstruction of prehistoric community patterns in the Amazon basin, in *Variation in anthropology: Essays in honor of John C. McGregor*. Edited by D. Lathrap and J. Douglas, pp. 233-252. Urbana: Illinois Archaeological Survey.
- Neves, E. G. 1998. *Paths in dark waters: archaeology as indigenous history in the upper rio Negro basin, northwest Amazon*. Ph.D. Dissertation, Indiana University.
- \_\_\_\_\_. 1999. Changing perspectives in Amazonian archaeology, in *Archaeology in Latin America*. Edited by G. G. Politis and B. Alberti, pp. 216-43. London: Routledge.
- Nimuendajú, C. 1949. Os Tapajó. *Boletim do*

- Museu Paraense Emílio Goeldi. Série Antropologia* 10:93-108.
- \_\_\_\_\_. 2000. *Cartas do Sertão de Curt Nimwendajú para Carlos Estevão de Oliveira*. Lisboa: Museu Nacional de Etnologia, Assíro and Alvim.
- \_\_\_\_\_. 2004. In *Pursuit of a Past Amazon. Archaeological researches in the Brazilian Guyana and in the Amazon region*. Gotenborg: Elanders Infologistik.
- Nordenskiöld, E. 1930. *L'Archéologie du Bassin de L'Amazonie*. Paris: G. van Oest.
- Oliver, J. R. 2001. The archaeology of forest foraging and agricultural production in Amazonia, in *Unknown Amazon: Culture in nature in ancient Brazil*. Edited by C. McEwan, C. Barreto, and E. Neves, pp. 50-85. London: The British Museum Press.
- Palmatary, H. C. 1939. *Tapajó Pottery*. Vol. 8. *Etnologiska Studier*. Göteborg: Göteborgs Etnografiska Museum.
- . 1960. The archaeology of the lower Tapajós Valley, Brazil. *Transactions of the American Philosophical Society* 50.
- Petersen, J. B., M. J. Heckenberger, and E. G. Neves. 2001. Prehistoric ceramic sequence in the central Amazon and its relationship to the Caribbean. *XIX International Congress for Caribbean Archaeology*, Aruba, 2001, pp. 250 - 259.
- Petersen, J. B., E. G. Neves, and M. J. Heckenberger. 2001. Gift from the past: Terra Preta and prehistoric Amerindian occupation in Amazonia, in *The unknown Amazon. Culture in nature in ancient Brazil*. Edited by C. McEwan, C. Barreto, and E. G. Neves, pp. 86-105. London: British Museum Press.
- Porro, A. 1994. Social organization and political power in the Amazon floodplain: the ethnohistorical sources, in *Amazonian Indians from prehistory to the present: Anthropological perspectives*. Edited by A. C. Roosevelt, pp. 79-94. Tucson: University of Arizona Press.
- Posey, D. A., and W. Balée. Editors. 1989. Resource management in Amazonia: Indigenous and folk strategies. *Advances in Economic Botany* vol.7. New York: New York Botanical Garden.
- Pouquet, M. 2002. Chronologie de la Période Céramique de l'Achéologie Amazonienne: Réflexions Théoriques et Méthodologiques, Pontificia Universidade Católica do Rio Grande do Sul.
- Quinn, E. R. 2004. Excavating "Tapajó" ceramics at Santarém: Their age and archaeological context. M.A. Thesis, Department of Anthropology, University of Illinois at Chicago, USA.
- Roosevelt, A. C. 1980. *Parmana: Prehistoric maize and manioc subsistence along the Amazon and Orinoco*. New York: Academic Press.
- \_\_\_\_\_. 1989. Resource management in Amazonia before the conquest: Beyond ethnographic projection, in *Resource Management in Amazonia: indigenous and folk strategies*, vol. 7, *Advances in Economic Botany*. Edited by D. A. Posey and W. Balée, pp. 30-62. New York: The New York Botanical Garden.
- \_\_\_\_\_. 1991. *Moundbuilders of the Amazon: geophysical archaeology on Marajo Island, Brazil*. San Diego: Academic Press.
- \_\_\_\_\_. 1992. Arqueologia Amazônica, in *História dos Índios no Brasil*. Edited by M. C. da Cunha, pp. 53-86. São Paulo: Fapesp, Cia das Letras, SMC.
- \_\_\_\_\_. 1999. The development of prehistoric complex societies: Amazonia: a tropical forest, in *Complex polities in the ancient tropical world*. Edited by E. A. Bacus and L. J. Lecero, pp. 13-33.
- \_\_\_\_\_. 2000. The lower Amazon: a dynamic human habitat, in *Imperfect balance: landscape transformations in the precolumbian Americas*. Edited by D. L. Lentz. New York: Columbia University Press.

- Schaan, D. P. 2001. Into the labyrinths of Marajoara pottery: status and cultural identity in an Amazonian complex society, in *The Unknown Amazon. Nature in culture in ancient Brazil*. Edited by C. McEwan, C. Barreto, and E. G. Neves, pp. 108-133. London: British Museum Press.
- \_\_\_\_\_. 2004. *The Camutins chiefdom: Rise and development of complex societies on Marajó Island, Brazilian Amazon*. Ph.D. Dissertation, Department of Anthropology, University of Pittsburgh, USA.
- \_\_\_\_\_. 2006. *Diagnóstico do patrimônio arqueológico na área de influência da rodovia BR-163 - Trecho Santarém-Rurópolis*. Belém, UFPA, 39 pp.
- \_\_\_\_\_. 2008. The nonagricultural chiefdoms of Marajó Island, in *Handbook of South American Archaeology*. Edited by H. Silverman and W. Isbell, pp. 339-357. New York: Springer.
- \_\_\_\_\_. 2010. *Savamento do Sítio PA-ST-42: Porto de Santarém*. Final Report. Belém: UFPA. Unpublished.
- \_\_\_\_\_. 2012. *Sacred geographies of ancient Amazonia: Historical ecology of social complexity. New frontiers in historical ecology vol 3*. Walnut Creek, CA: Left Coast Press, Inc.
- Schaan, D. P., D. C. Kern, and F. Frazão. 2009. An assessment of the cultural practices behind the formation (or not) of anthropogenic black earth in Marajo Island archaeological sites, in *Amazonian Dark Earths: Wim Sombroek's vision*. Edited by W. Woods, W. teixeira, J. Lehmann, C. Steiner, A. WinklerPrins, and L. Rebellato, pp. 127-141. Berlin: Springer.
- Schávelzon, D., and A. Zarankin. 1992. *Arqueología de San Telmo: excavaciones en la iglesia y residencia jesuítica de Nuestra Señora de Belén (actual San Telmo)*. Buenos Aires: Universidad de Buenos Aires, Facultad de Arquitectura, Diseño y Urbanismo, Instituto de Arte Americano e Investigaciones Estéticas Mario J. Buschiazzo.
- Smith, N. 1980. Anthrosols and human carrying capacity in Amazonia. *Annals of the American Association of Geographers* 70:553-566.
- Sombroek, W. G. 1966. Amazon soils. *A reconnaissance of the soils of the Brazilian Amazon Region*. Wageningen: Centre for Agricultural Publication and Documentation.
- Steiner, C., W. G. Teixeira, and W. Zech. 2004. Slash and Char: An Alternative to Slash and Burn Practiced in the Amazon Basin, in *Amazonian Dark Earths: Explorations in space and time*. Edited by B. B. Glaser and W. I. Woods, pp. 183-194. Berlin: Springer.
- Steiner, C., W.G. Teixeira, W. I. Woods, and W. Zech. 2008. Indigenous knowledge about terra preta formation, in *Amazonian Dark Earths: Wim Sombroek's Vision*. Edited by W. I. Woods, W. G. Teixeira, J. Lehmann, C. Steiner, A. WinklerPrins, and L. Rebellato, pp. 193-204. Netherlands: Springer Dordrecht.
- Stenborg, P. 1998. The troublesome xenogamy between archaeology and ethnohistory: Examples from research on north-western Argentinian prehistory and early history, in *Past and present in Andean prehistory and early history*, vol. 42, *Etnologiska Studies*. Edited by S. Ahlgren, A. Muñoz, S. Sjödin, and P. Stenborg, pp. 75-90. Göteborg, Gothenburg: Etnografiska Museeti.
- \_\_\_\_\_. 2002. *Holding back history: Issues of resistance and transformation in a post-contact setting, tucumán, Argentina c. A.D. 1536-1660*. Vol. 21. GOTARC, series B, *Archaeological Theses*. Göteborg: Göteborg University.
- \_\_\_\_\_. 2009. Points of Convergence - Routes of Divergence: Some considerations based on Curt Nimuendajú's archaeological work in the Santarém-Trombetas area and at Amapá, in *Anthropologies of Guayana: Cultural Spaces in Northeastern Amazonia*. Edited by N. L. Whitehead and S. W. Alemán, pp. 55-73. Tucson: The University of Arizona Press.
- Steward, J. H. 1948. The tropical forest tribes,

in *Handbook of South American Indians*, vol. 3. Edited by J. Steward. Washington D.C.: Smithsonian Institution. Bureau of American Ethnology. Bulletin 143.

Teixeira, W. G., D. C. Kern, B. E. Madari, E. N. Lima, and W. Woods. Editors. 2009. *As terras pretas de índio da Amazônia. Sua caracterização e uso desse conhecimento na criação de novas áreas*. Manaus: Embrapa Amazônia Ocidental.

Viveiros de Castro, E. 1986. *Araweté: Os deuses canibais*. Rio: Jorge Zahar.

Wassén, S. H. 1934. The frog-motive among the South American Indians. *Anthropos* 29:319-37.

Winklerprins, A. M. G. A. 2002. Seasonal floodplain-upland migration along the lower Amazon River. *Geographical Review* 92:415.

Woods, W. I., and J. M. McCann. 1999. The Anthropogenic Origin and Persistence of Amazonian Dark Earths. *Yearbook, Conference of Latin Americanist Geographers* 25:7-14.

Woods, W. I., J. Lehmann, L. Rebellato, C. Steiner, W. G. Teixeira, and A. M. G. A. WinklerPrins. 2009. *Amazonian Dark Earths: Wim Sombroek's Vision*. Dordrecht: Springer Netherlands.

Woods, W. I. 1995. Comments on the Black Earths of Amazonia, in *Papers and Proceedings of the Applied Geography Conferences*, vol. 18. Edited by F. A. Schoolmaster, pp. 159-165. Denton, Texas: Applied Geography Conferences.

## **APPENDIX: LIST OF SITES SURVEYED AND MAPPED WITH GPS IN NOVEMBER 2008**

### **A. SITES MAPPED IN THE REGION SOUTH OF SANTARÉM. (7-8/11, 2008)**

1. Mararú: An area of *terra preta*, considerably damaged by modern, small-scale agricultural activities. One modern house has been constructed on the remains of the site. No cultural material visible on the surface.
2. Mararú 2: Site extending over approximately 20ha. Ceramic fragments are found in abundance on the surface of the ground. The area is used for mechanized agriculture and Papaya-cultivation.
3. Cuiarana: Heavily damaged *terra preta* site. Most of the black soil has been cultivated away, and today only small areas of *terra preta* soil remain
4. Lavras 1: Very large *terra preta* area, partly damaged by modern agriculture. Large quantities of pottery, predominately of Santarém type are visible on the surface of the ground.
5. Boa Fé: *terra preta* area.
6. Comunidade *terra preta*: *terra preta* area.
7. Jacú: Area used for modern cultivation. The limit between the *terra preta* and surrounding, poorer soils is easily seen as a distinct change in colour.
8. Lavras 2. *terra preta* site, most of which is presently used as cultivation camps.
9. Lavras 3: *terra preta* site similar to TP2 to which it may in prehistoric times have been an extension.
10. Fim de Lavras: Situated on a high/slope. Distinct border between *terra preta* and *terra mulata* soils,
11. Santa Maria: Polychrome pottery of the Incised-Punctuated tradition found on the surface

### **B. SITES SITUATED IN THE REGION NEAR THE WESTERN SHORE OF THE TAPAJOS RIVER. (8/11-2008)**

12. Vila Americana
13. Cacoalinho
14. Aramaná (Aramanahy)
15. Jacaré

16. Maracanã (Situated close to the city of Santarém)

**C. SITES NEAR ALTER DO CHÃO (9/11-2008)**

17. Pindobal, sandy terra preta soil, by the Tapajós River

18. Sítio Cedro Rei. Distinct pottery (non-Tapajoid)

19. Serra do Mocotó

20. Capiranga

**D. SITES IN THE ENVIRONS OF SANTARÉM CITY. (10/11-2008)**

21. Santarém Aldeia

22. Sítio Porto— Vera Paz (rims of funerary vessels were here visible in the hard-packed surface of the ground)

**E. SITES IN THE REGION EAST OF SANTARÉM. (11/11-2008)**

23. Guaraná1

24. Serra Grande

25. Santana do Ituqui

26. Pacoval

27. Água boa—Paraíso

**F. THE REGION SOUTH OF ALTER-DO-CHÃO. (12/11-2008)**

28 Porto Novo – Small *terra preta* on hilltop by the road

29. Cajatuba 1: Large *terra preta* area, now heavily damaged by modern construction. The central portion of the *terra preta* covering various km. Indications of agriculture, such as a stone hoe

30. Cajatuba 4

31. Revolta 1: Similar to Lavras. Extensive *terra preta* areas, only interrupted by minor spots of poorer soil

32. Revolta 2: Large area of dark *terra preta*, including much cultural material Extending some 800m further to the south

33. São Domingos: Large *terra preta* with very hard packed soils. This is the find-

ing place of the *muyraquita* (frog pendant) depicted below.

34. At the Tapajós forest reserve (FLONA) we had to turn back as the guard did not let us pass through.

35. Jenipapo 1: (Nimuendajú 2004:Plate 081)

36. Jenipapo 2: Small *terra preta* with carbon in the surface, some pottery

37. Bom Futuro The existence of an ancient artificial well had been indicated by Nimuendajú (2004). This information could be supported by the finding of an excavated well in the Bom Futuro zone. The outer perimeter of the reservoir measuring some 15 to 20m in diameter and was mapped.

#### G. SITES IN THE REGION WEST OF SANTARÉM (13/11-2008)

38. Sítio Juá: Large *terra preta* site at the shore, probably extending ca. 1 km along the shore and 200-300 m inland. May have had particular functions tied to agriculture as well as exploitation of aquatic resources.

39. Carapanari 1 (6780-): Elongated *terra preta* at “hilltop”. Great concentrations of archaeological material, including tapajoid pottery.

40. Carapanari 2: Relatively extensive *terra preta* site. Has been damaged by road construction. The *terra preta* Strata is about 1,5m deep. Situated on height.

41. Carapanari 3. Similar to C2, but situated in a less pronounced high position.

42. Jatoba 1.

43. Jatoba 2. *terra preta*, in elevated position, but heavily damaged by road construction debris. Have probably extended far beyond the measured areas, indications of farming, such as hoes and axes.

Recebido em 12/12/2011.

Aprovado em 05/02/2012.