

THE LONG-TERM TUPIGUARANI OCCUPATION IN SOUTHEASTERN BRAZIL

K D Macario¹ • A Buarque² • R Scheel-Ybert³ • R M Anjos^{1,4} • P R S Gomes¹ • M Beauclair³ • C Hatté⁵

ABSTRACT. We discuss some aspects of the chronology of the Tupiguarani occupation in the southeastern Brazilian coast based on the analyses of 3 charcoal samples from the Morro Grande archaeological site (Rio de Janeiro state). ¹⁴C beta spectroscopy and accelerator mass spectrometry (AMS) techniques were used to determine ages of 2920 ± 70 BP, 2600 ± 160 BP, and 510 ± 160 BP. The occurrence of these ancient dates in southeastern Brazil has important implications for understanding the origin and dispersion of Tupian populations from Amazonia, supporting recent hypotheses that their expansion must have begun well before 2000 BP. On the other hand, the most recent date is a strong indication of a possible reoccupation of the site by the same cultural group around the time. These results show that the Tupiguarani occupation began at least about 3000 yr ago and lasted until its collapse with the European invasion in the 16th century.

INTRODUCTION

Material culture is the main archaeological source for the reconstruction of ancient knowledge, the artifacts and their disposition constituting a relevant part of the archaeological record. In tropical regions, where organic remains are poorly preserved, pottery has been one of the most accessible products and often is the best diagnostic element to identify a specific culture.

We discuss some aspects of the chronology of Tupiguarani occupation in southeastern Brazil based on the analyses of 3 charcoal samples from the Morro Grande archaeological site (Rio de Janeiro state). Brazilian pre-colonial sites bearing a characteristic paint ceramic are classified by archaeologists as the Tupiguarani tradition. These sites' material cultures show a great similarity to the reports and iconographical documentation left by European chroniclers about the native populations that occupied the Brazilian coast at the beginning of 16th century, when the Europeans arrived in Brazil. Most of these groups were related to the Tupi linguistic stock. Habits and beliefs from Tupinambá (northeastern and southeastern coast) and Guaraní (southern Brazil) populations, detailed in the written records, play a significant role in the reconstruction of pre-colonial cultures. Descriptions of their material culture, including ceramic morphology and decoration, as well as the related locations of some pre-colonial sites and important characteristics of their daily activities, especially funerary rituals, imply that some of these archaeological sites belonged to the ancestors of those tribes. Nevertheless, such links are not straightforward and have to be carefully analyzed, since the presence of such elements can also result from trade or interaction within different cultures (Pärssinen 2005).

Systematic archaeological studies have been performed in the Região dos Lagos, a large lagoonal area in southeastern Rio de Janeiro state, where the Araruama Lagoonal complex is included, so that a correlation between early archaeological remains and the different cultural groups can be safely sustained.

Well before the colonial period, 3 different cultural groups inhabited this region: fisher-gatherers and 2 different ceramist-agriculturist populations. The fisher-gatherer populations, the first to

¹Instituto de Física, Universidade Federal Fluminense. Av. Gal. Milton Tavares de Souza, s/n. Niterói, 24210-346, Rio de Janeiro, Brazil.

²Departamento de Antropologia, Museu Nacional, UFRJ, Quinta da Boa Vista, São Cristóvão, 20940-040, Rio de Janeiro, Brazil.

³Departamento de Geologia e Paleontologia, Museu Nacional, UFRJ, Quinta da Boa Vista, São Cristóvão, 20940-040, Rio de Janeiro, Brazil.

⁴Corresponding author. Email: meigikos@if.uff.br.

⁵Laboratoire des Sciences du Climat et l'Environnement, Domaine du CNRS, Bat 12, F-91198 Gif-sur-Yvette, France.

occupy the Brazilian coast, at about 8000 BP, were shellmound builders. These shellmounds are locally named *sambaquis* after the Tupi words *tamba*, meaning shellfish, and *ki*, to pile up. In south-eastern Rio de Janeiro state, these groups have been dated from around 6000 to 1000 cal BP (Lima et al. 2002, 2003, 2004; Gaspar 1998; Scheel-Ybert 2000; Barbosa et al. 2004; Gaspar et al. 2004; Barbosa-Guimarães 2007). Afterwards, groups of Tupi and Macro-Jê language speakers arrived, coming from the Amazon region after a great demographic expansion. Their agriculture-based culture, along with the ceramic technology and warrior characteristics, allowed the development of new ways of subsistence and sociopolitical organization that eventually determined the extinction of shellmound builders (Gaspar et al. 2004, 2007; Barbosa-Guimarães 2007). Analyses of the material culture recovered from each of the different archaeological sites reveal specific characteristics with distinct elements, resulting from solid and well-defined choices concerning not only the settlement area but also the ways through which each group has dealt with its resources. These aspects set unmistakable boundaries and define the 3 sociocultural groups that once occupied this region.

A common center of origin is accepted for the Tupiguarani occupation in the Amazon region, but archaeologists disagree about their exact origin or the expansion routes, or even the chronology. Studies are mostly based on linguistic and ethnographic (historical distribution of Tupian speakers) data since systematical archaeological studies are rare in some regions.

In such a context, this paper focuses on the use of ^{14}C beta spectroscopy and AMS as important tools for understanding the origin and dispersion of Tupiguarani groups, suggesting the need for new models to describe the spatial occupation as a function of the time for the Tupiguarani population, and considering the possibility of reoccupation of some sites.

SITE DESCRIPTION

The studied area is located in the Araruama area, on the southeastern coast of Rio de Janeiro state (22°47'07"S, 42°21'49"W; see Figure 1). The Morro Grande archaeological site is located in the homonym district, covering an area of about $90 \times 10^3 \text{ m}^2$. Preservation of organic remains is a great problem in most tropical areas; therefore, ceramics are the main source of information for the Tupiguarani tradition, since ceramics are present in all settlements thus far investigated. From their variety of shapes and decoration, multiple functions can be inferred. They can be simple or very sophisticated, presenting geometric motives in red or black over a white slip. The urns of different sizes and shapes could be used either for burial or for the production of *cauim*, a fermented beverage used in the rituals of life or death.

Two areas of marked characteristics can be distinguished in this settlement: a central and a surrounding zone. The central zone, including many funerary structures and hearths, is related to the housing area. In the surroundings, there are no structures and the evidence points to areas of waste material (Buarque and Cordeiro 2003). Some fireplaces could be related to the funerary ceremony, since the bowls show burn marks on the outside and food marks in the inside, corresponding to chroniclers' reports that in historic Tupinambá funerary rituals they used to leave food beside the dead body in order to prevent it from being eaten by the *Anhanga* spirit, which they used to fear in a very special way (Léry 1994).

The considerations above stress the importance of ceramic dating for such studies of archaeological sites and for the understanding of this culture, its social features, and its interaction with other groups.

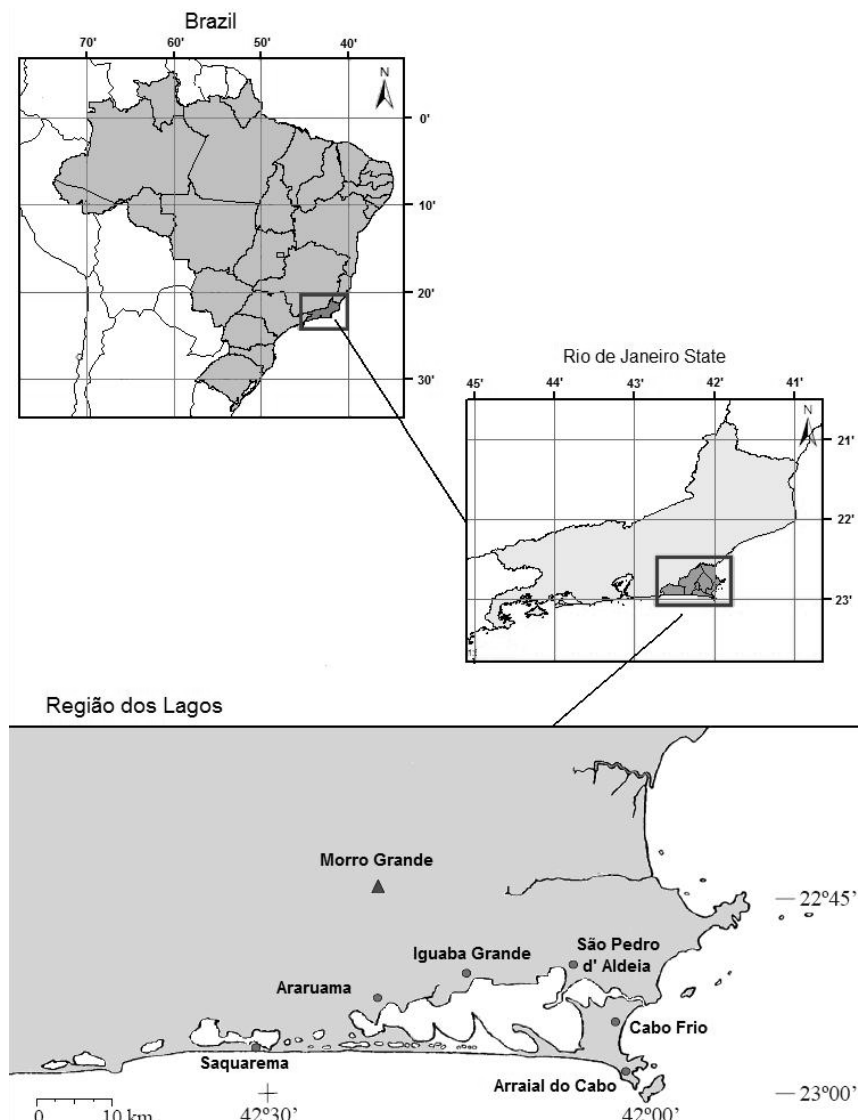


Figure 1 Geographical location of the study area. The black triangle represents the Morro Grande archaeological site.

METHODS

Archaeological excavations, made during several stages of fieldwork since 1993, identified 5 stratigraphic layers in different loci. The occupation level measures up to 0.60 m in thickness, within a sandy substratum. Artifacts are visible from the surface, although they are partially destroyed by anthropogenic activity. The majority of artifacts (ceremonial and daily-use bowls, upper portion of urns and lids) occurs between 0.20 and 0.50 m depth, in a light gray layer with black lenses of charcoal (originating from archaeological hearths). The artifacts below this depth (down to 1.20 m), within clay and quartz beds, are restricted to funerary urns, generally buried and well preserved. Usually, the lids are broken and the fragments are mixed with sediments inside the urns. Some painted bowls occur around them.

The site was carefully excavated according to traditional archaeological methods (Demoule et al. 2002). The adopted methodology for the approach was defined on the basis of the kind of site and the nature of the remains that were visible on the surface, since the fieldwork aims to gather both the vestiges and the information on the material culture.

The study site presented funerary structures alternating with habitation areas; therefore, we have chosen to emphasize the horizontal dimension by opening up some areas to reveal the spatial relationships between features and artifacts, through the observation of natural levels, keeping the findings *in loco*, removing them just after being drawn and photographed. Such an approach enabled us to control the space configuration with identification of the remains that characterized the different areas.

The analysis of soil layers was performed by stratigraphy, with the aid of transverse sections that allowed observing variations in color, texture, and sediment type resulting, for example, from the presence of a house floor, a fireplace, a post-hole, or a funerary structure.

Charcoal samples from hearths were systematically collected and kept for anthracological analysis or radiocarbon dating. During the 1995 fieldwork, a large charcoal sampling of dispersed (in the sediments) and concentrated (in hearths and other features) material was performed for anthracological studies. Thus, all the sediments removed from the excavation area were dry- or water-sieved and charcoal pieces were collected with supple tongs.

Three charcoal samples were dated, 2 by ^{14}C AMS at the PRIME Lab of Purdue University (USA) and the other sample by conventional beta spectroscopy at Gif-sur-Yvette (France). Sample preparation and measurement are described below.

All samples went through the usual acid-alkali-acid chemical pretreatment for organic samples. For samples Plid-0686B and Plid-0688B, the entire chemical processing was performed at 95 °C, while Gif-11045 sample was processed at room temperature. The AMS samples were then dried and combusted at 900 °C in an evacuated quartz tube with copper oxide and a silver foil. Carbon dioxide was purified under vacuum and graphitized in quartz tubes with zinc in its internal walls and with a small tube containing iron inside. Tubes were heated for 2 periods of 10 hr at 700 °C.

The terminal voltage of the 7.5MV FN Tandem accelerator of the PRIME Lab was 4MV, and $^{13,14}\text{C}$ beams (charge state of 3⁺) were selected by the high-energy magnetic analyzer and detected. Ages were calculated as in Donahue et al. (1990) and the oxalic acid standard used was NBS SRM 4990 C. The beta counting sample was flame-combusted under an O₂ stream. The released CO₂ was purified and counted for 5 nights in beta-counters. Counters were calibrated with a ^{14}C -free commercial CO₂ and oxalic acid I.

Calibration was performed using OxCal v 3.10 calibration software (Bronk Ramsey 1995, 2001), based on the Southern Hemisphere calibration data set (McCormac et al. 2004), in the 2- σ range. For this site, 1 ^{14}C date was already available, so we calibrated it for comparison.

RESULTS AND DISCUSSION

The Morro Grande occupation was previously dated to 1740 $\pm$ 90 BP (Beta-84333 in Buarque 1999), resulting in a calibrated age of 1820–1390 cal BP (2 σ). This date was already considered very early, but it was in accordance with other Tupiguarani occupations in Rio de Janeiro, like the date of 1650 $\pm$ 160 BP for the ceramic layer of Zé Espinho shellmound, in Guaratiba state (Crancio 1987), in São Paulo state the date of 1870 $\pm$ 100 (SP BA7, Brochado 1973), and in Ary Carneiro, the

date 2200 ± 200 BP (Maranca 2000, *apud* Moraes 2007). This sample corresponds to disperse charcoal from domestic hearths, found inside an urn due to its broken lid. Another previous dating for this site, a thermoluminescence (TL) age of 315 ± 50 BP (Latini 1998), was initially questioned by archaeologists as being too recent, since historical data reported the end of these populations in the late 16th century (Monteiro 1949), after a Portuguese battle victory culminated in the massacre or expulsion of Tupian populations in the Araruama region (Salvador 1982). Moreover, there was no evidence of contact with the Europeans in this site until recently.

In this work, we report new excavations and dates of 3 charcoal samples, leading to important results. A charcoal sample (PLid-0686B) from the same funerary structure previously dated by TL was dated to 510 ± 160 BP, or 750–0 cal BP (2σ). Sample Gif-11045 (2920 ± 70 BP or 3220–2840 cal BP, 2σ) belonged to a specialized hearth, probably used for cooking ceramics. From the same period, sample PLid-0688B (2600 ± 160 BP or 3000–2150 cal BP, 2σ) was part of a funerary hearth at the same archaeological locus.

Figure 2 shows the calibrated ages for the ^{14}C dates of Morro Grande archaeological site, the 3 samples discussed in this work plus the already reported dating (Buarque 1999). The 3 oldest date probabilities cover a wide range of time pointing to a long-term occupational period in this region. Research in other regions about subsistence practices indicate that the Tupi were highly sedentary (Noelli 1998) probably due to their agricultural practices.

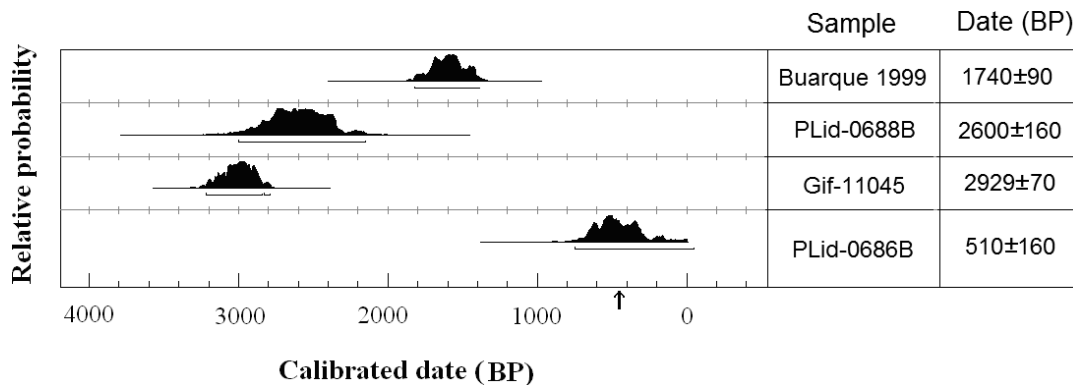


Figure 2 OxCal calibration software (Bronk Ramsey 1995, 2001) plot showing the probability distributions for each sample from the Morro Grande archaeological site. The arrow indicates the beginning of the Colonial period (AD 1500).

It is important to point out that even though the region might have been occupied continuously, the occupation of each site might be intermittent, with abandonment and continuous occupation of lands immediately adjacent, a settlement system characteristic of agriculturalist groups. The large number of Tupiguarani sites in this region reinforces this hypothesis. On the other hand, the stratigraphy of the occupational layers of Morro Grande corroborates the short occupational periods.

The occurrence of such ancient dates in southeastern Brazil has important implications for hypotheses concerning the origin and dispersion of Tupian populations from the Amazon region, supporting the claim of recent authors who consider that the Tupian expansion began well before 2000 BP (Noelli 1998). These results also represent an overlap between the periods when fisher-gatherers and ceramists inhabited the southeastern coast, providing strong evidence that the extinction of the shell-mound builders could be related to the presence of the Tupian population (Gaspar et al. 2007).

Figure 3 presents the oldest and the most recent ^{14}C dates available for each Brazilian state (Noelli 1999/2000; Corrêa and Samia 2006; Moraes 2007). The earliest ages are found in southern and southeastern Brazil. However, the available ^{14}C dates for Tupiguarani archaeological sites are not in accordance with the traditionally most accepted models for the origin and dispersion of these groups. These models are mostly based on linguistic and ethnographic data, considering the historical distribution of Tupian speakers and the development of such languages. Although there are no expansion models based on archaeological evidence due to the limited studies and the lack of dating, the comparison between linguistic models and archaeological records can bring important information on the expansion dynamics.

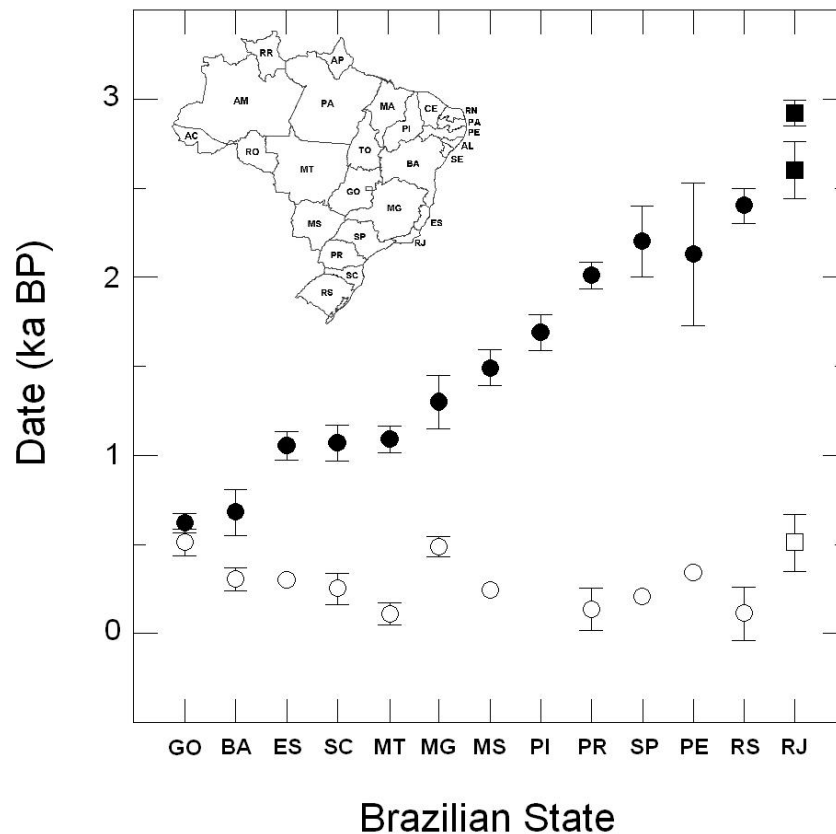


Figure 3 Earliest and most recent available dating for Tupiguarani settlements over the Brazilian territory. For Rio de Janeiro state, the 3 records correspond to this work.

One of the most important models concerning the origin of Tupian stock languages was proposed by Lathrap (1970) and refined by Brochado (1984). Figure 4 shows a scheme describing such a model, which claims that the expansion would have begun in the central Amazon, with Guaraní groups going down to the south inland and Tupian groups moving east to the coast and then to the south. This hypothesis is based either on the association of Tupian speakers and the Amazon Polychromic Ceramic Tradition with the assertion that these ceramics should be older in the Amazon region than anywhere else. However, this assertion has been contested in the last few years by systematic archaeological studies revealing quite recent dates for such a ceramic tradition, from 1050 BP to younger dates (Heckenberger et al. 1998). In recent studies (Mageste 2008), the earliest ages for the

polychromic ceramics outside the Amazon basin are found in southeastern Brazil, mostly in the Rio de Janeiro and Minas Gerais states, suggesting that the occupation of the coast by groups related to the Tupiguarani ceramists tradition was in the south-north direction, contrary to what had been proposed by Brochado (1984).

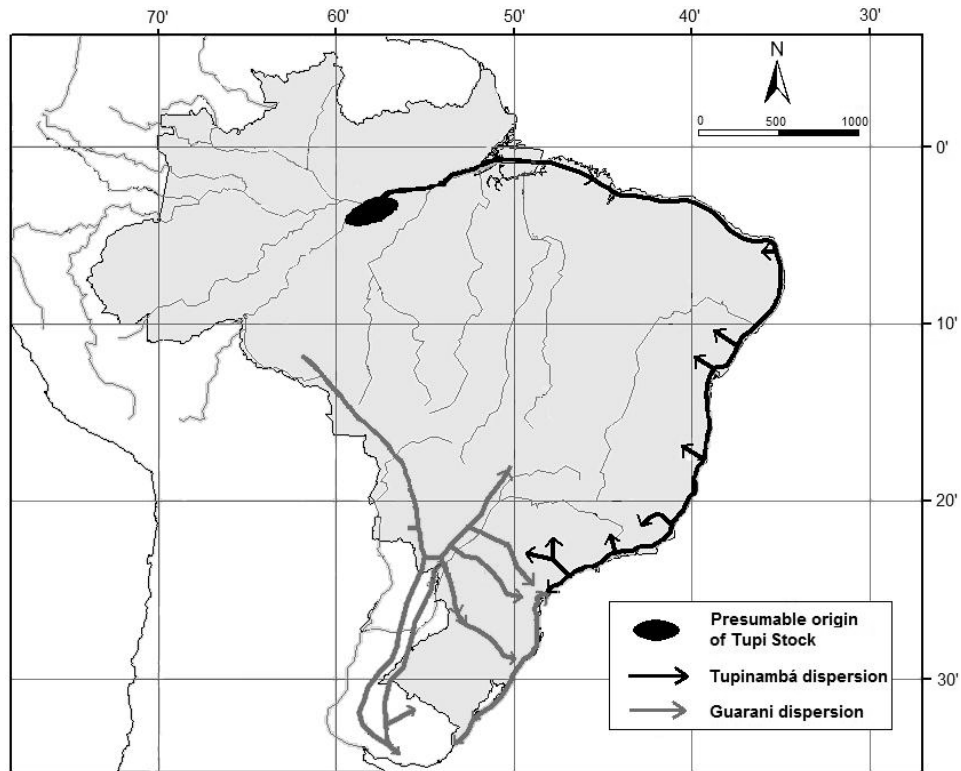


Figure 4 Brochado (1984) model for the dispersion of Tupian populations along Brazil

Rodrigues' hypothesis (1964, 2000), based on linguistic studies, is presently considered very consistent for the origin of Tupian stock. He suggests that the expansion center of these groups would have been located in the southwestern Amazon, in Rondônia state. They would probably have moved inland to the south and to the east, then dispersed in a northern direction along the South American continent, as illustrated Figure 5. Our present results do support such a model, but further investigations are essential to strengthen this hypothesis on an archaeological basis.

Until now, the available data ranges shown in Figure 3 reflect the fact that most of the archaeological studies in Brazil are performed in the southern and southeastern regions, with just a few in the northern and northeastern regions. On the other hand, throughout the entire country the last records of the Tupiguarani culture are contemporary with the 16th century European invasion, even in regions where studies are rare. The most recent dating from Morro Grande archaeological site attests to the presence of such groups up until this period.

Some recent studies in this settlement present evidence that support the hypothesis of European influence in the Tupiguarani culture (Buarque et al. 2003). Some loci excavated since 2005 disclose modifications in ceramics morphology and decorative characteristics. The variations in the material

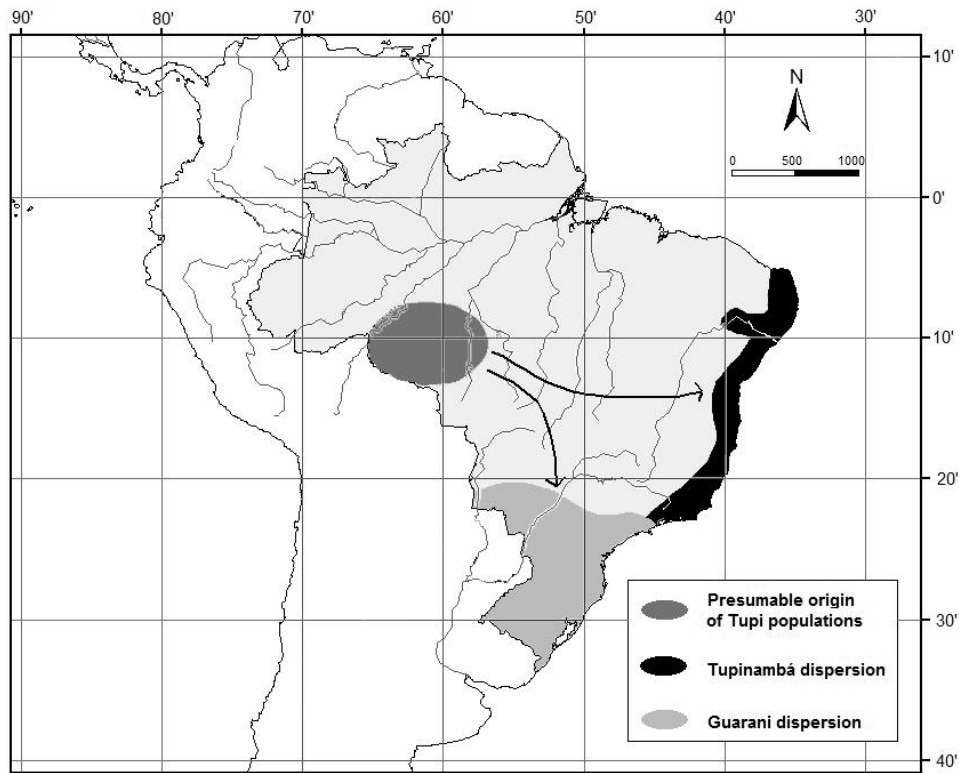


Figure 5 Rodrigues (1964, 2000) model for the dispersion of Tupian populations along Brazil

culture indicate European influence, as well as point to the possibility of reoccupation of the same area after a long period by groups of the same culture. The sectors where the most recent dates were obtained are far from the site's more densely occupied areas, which represent the beginning of its occupation.

Archaeological investigations in other Brazilian regions also suggest that the same sites may have been reoccupied after centuries of abandonment (Prous 1992). In southern Brazil, there is evidence of reoccupation of the same regions along more than 1500 yr, suggesting a large temporal persistence for the settlement territory (Noelli 1999/2000).

Concerning the previous TL result, it could be corroborated by the ^{14}C dating of the corresponding charcoal (Plid-0686B) since it is contained by the calibration interval. In this case, the occupation could be associated to some group of survivors after the Portuguese invasion since most of the Tupiguarani population was destroyed after the AD 1575 battle.

On the other hand, the analyses of Figure 2 show that, despite the large error bar of the most recent age, the probability distribution of the calibrated result suggests that the sample was very likely to have belonged to the pre-colonial period or either be contemporary with the first Europeans' arrival in Brazil, in the early 16th century. This result is in accordance with chronicles that the massacre by the Portuguese led to the complete banishment of these groups in this region, emphasizing that the survivors were gathered by the priests of the so-called Companhia de Jesus in some villages in Rio de Janeiro (Salvador 1982).

SUMMARY AND CONCLUSIONS

This work reports new excavations of the Morro Grande archaeological site and the ^{14}C dating of 3 charcoal samples. Two other samples from this site had been previously dated, 1 by thermoluminescence (TL) and another one by ^{14}C . The latter was also calibrated for comparison.

From the results, at least 3 periods of occupation of the site can be identified: (1) a first period represented by the use of an utilitarian hearth, probably for ceramics cooking, dating to 2920 ± 70 BP (3220–2840 cal BP) and by a mortuary ritual dating to 2600 ± 160 BP (3000–2150 cal BP) from a funerary hearth; (2) a second period represented by the dispersed charcoal from domestic hearths of a later occupation (1740 ± 90 BP, or 1820–1390 cal BP); (3) a third term represented by a funerary assemblage, dating to 315 ± 50 and 510 ± 160 BP (750–0 cal BP).

The occurrence of such ancient dates in southeastern Brazil has important implications regarding the hypotheses concerning the origin and dispersion of Tupian populations from the Amazon region, supporting the claim of recent authors who consider that the Tupian expansion began well before 2000 BP.

It is important to note that the lack of more dating for Tupiguarani settlements can lead to false interpretations of short-term occupations of the regions. Intense and detailed excavations such as in Morro Grande are rare and usually just 1 sample from each site is actually dated. The distribution of archaeological remains associated to the analysis of the material culture recovered in this site provides valuable information to sustain the hypothesis of reoccupation.

ACKNOWLEDGMENTS

The authors would like to thank the Brazilian funding agencies CNPq, FAPERJ and CAPES, for their financial support. We thank the staff of the PRIME Lab, especially Dr David Elmore, Ken Mueller, Mary Ann Rounds, Pankaj Sharma, and Linda Paquay, for their hospitality toward K D Macario during the period of sample preparation and AMS dating.

REFERENCES

- Barbosa M, Buarque A, Gaspar MD, Macario KD, Anjos RM, Gomes PRS, Coimbra MM, Elmore D. 2004. Intermittent occupation of the sambaqui builder settlements in Rio de Janeiro State, Brazil. *Nuclear Instruments and Methods in Physics Research B* 223–224: 695–9.
- Barbosa-Guimarães M. 2007. A ocupação pré-colonial da Região dos Lagos, RJ: sistema de assentamento e relações intersociais entre grupos sambaquianos e grupos ceramistas Tupinambá e da Tradição Una [PhD dissertation]. Museu de Arqueologia e Etnologia, Universidade de São Paulo, São Paulo, Brazil.
- Brochado JP. 1973. Migraciones que difundieron la Tradición Alfarera Tupiguarani. Buenos Aires: Relaciones, Sociedad Argentina de Antropología 7. p 7–39.
- Brochado J. 1984. An ecological model of the spread of pottery and agriculture into eastern South America [PhD dissertation]. Urbana-Champaign: University of Illinois. 574 p.
- Bronk Ramsey C. 1995. Radiocarbon calibration and analysis of stratigraphy: the OxCal program. *Radiocarbon* 37(2):425–30.
- Bronk Ramsey C. 2001. Development of the radiocarbon calibration program. *Radiocarbon* 43(2A):355–63.
- Buarque A. 1999. A cultura Tupinambá no Estado do Rio de Janeiro. In: Tenório MC, editor. *Pré-História da Terra Brasilis*. Rio de Janeiro: Editora UFRJ. p 307–20.
- Buarque A, Cordeiro J. 2003. *O Sítio Serrano: Franceses e Tupinambá desconheciam o testamento de Adão* [CD-Rom]. XII Congresso da Sociedade de Arqueologia, Brasileira, SAB 2003.
- Buarque A, Rodrigues-Carvalho C, Silva EC. 2003. Programa funerário dos Tupinambá em Araruama, RJ – Sítio Bananeiras. *Revista do Museu de Arqueologia e Etnologia* 13:39–55.
- Corrêa AA, Samia DG. 2006. Simpósio internacional o povoamento das Américas. In: *Proceedings of Cronologia da Tradição Arqueológica Tupiguarani* 2. p 405–16. Available at <http://www.fundham.org.br/fundamentos7/artigos/19%20Samia%20Correa.pdf>.

- Crancio F. 1987. Ocorrência de cerâmica na camada superior do sambaqui Zé Espinho. In: Kneip L, editor. *Coletores e Pescadores Pré-históricos de Guaratiba-Rio de Janeiro*. Editora UFRJ e EDUFF. p 156–84.
- Demoule JP, Giligny AL, Schnapp A. 2002. *Guide des Méthodes de l'Archéologie*. Paris: Éditions La Découverte. 293 p.
- Donahue DJ, Linick TW, Jull AJT. 1990. Isotope-ratio and background corrections for accelerator mass spectrometry radiocarbon measurements. *Radiocarbon* 32(2):135–42.
- Gaspar MD. 1998. Considerations on the sambaquis of the Brazilian coast. *Antiquity* 72(277):592–615.
- Gaspar MD, Tenorio MC, Buarque A, Barbosa-Guimarães M, Oliveira JC, Scheel-Ybert R. 2004. Histórico e principais resultados do projeto de investigação: o aproveitamento ambiental das populações pré-históricas do Rio de Janeiro. *Arquivos do Museu Nacional Rio de Janeiro* 62(2):103–29.
- Gaspar MD, Buarque A, Cordeiro J, Escórcio E. 2007. Tratamento dos mortos entre os Sambaquieiros, Tupinambá e Goitacá que ocuparam a Região dos Lagos, Estado do Rio de Janeiro. *Revista do Museu de Arqueologia e Etnologia* 17:169–89.
- Heckenberger M, Neves EG, Petersen JB. 1998. De onde surgem os modelos? As origens e expansões Tupi na Amazônia Central. *Revista de Antropologia* 41:69–96.
- Latini RM. 1998. Caracterização, análise e datação de cerâmicas arqueológicas da Bacia Amazônica através de Técnicas Nucleares [PhD dissertation]. Rio de Janeiro: Universidade Federal Fluminense. 142 p.
- Lathrap DW. 1970. *The Upper Amazon*. Southampton: Thames and Hudson. 256 p.
- Léry J. 1994. *Histoire d'un Voyage fait en la terre du Brésil (1578)*. 2nd edition. Commenté et annoté par Frank Lestringant. Paris: Le Livre de Poche, Librairie Générale Française. 670 p.
- Lima TA, Macario KD, Anjos RM, Gomes PRS, Coimbra MM, Elmore D. 2002. The antiquity of the prehistoric settlement of the central-south Brazilian coast. *Radiocarbon* 44(3):733–8.
- Lima TA, Macario KD, Anjos RM, Gomes PRS, Coimbra MM, Elmore D. 2003. AMS dating of early shellmounds of the southeastern Brazilian coast. *Brazilian Journal of Physics* 33:276–9.
- Lima TA, Macario KD, Anjos RM, Gomes PRS, Coimbra MM, Elmore D. 2004. The earliest shellmounds of the central-south Brazilian coast. *Nuclear Instruments and Methods in Physics Research B* 223–224:691–4.
- Mageste LEC. 2008. Antigüidade Tupi na Zona da Mata mineira: uma abordagem interdisciplinar. In: Loures O, editor. *Arqueologia da Zona da Mata Mineira – Carangola*. Juiz de Fora, MG. p 141–51.
- McCormac FG, Hogg AG, Blackwell PG, Buck CE, Hingham TFG, Reimer PJ. 2004. SHCal04 Southern Hemisphere calibration, 0–11.0 cal kyr BP. *Radiocarbon* 46(3):1087–92.
- Monteiro J. 1949. Relação da Província do Brasil, 1610. *História da Companhia de Jesus no Brasil*. Serafim Leite, S.I., Tomo VIII. Rio de Janeiro: Instituto Nacional do Livro. p 393–425.
- Moraes CA. 2007. Arqueologia Tupi no nordeste de São Paulo: um estudo de variabilidade artefactual [Master's thesis]. São Paulo: Museu de Arqueologia e Etnologia, Universidade de São Paulo. 311 p.
- Noelli F. 1998. The Tupi: explaining origin and expansions in terms of archaeology and of historical linguistics. *Antiquity* 72(277):648–63.
- Noelli F. 1999/2000. A ocupação humana na Região Sul do Brasil: arqueologia, debates e perspectivas, 1872–2000. *Revista USP*, V. 44. *Arqueologia Brasileira II*: 218–69.
- Pärssinen M. 2005. Quando começou, realmente, a expansão guarani em direção às Serras Andinas Orientais? *Revista de Arqueologia da SAB* 18:51–66.
- Prous A. 1992. *Arqueologia Brasileira*. Brasília: Editora UNB. 613 p.
- Rodrigues AD. 1964. Classificação do Tronco lingüístico Tupi. *Revista de Antropologia* 12:99–104.
- Rodrigues AD. 2000. Hipótese sobre as migrações dos três subconjuntos meridionais da família Tupi-Guarani. *Atas do II Simpósio Nacional da ABRALIN* [CD-Rom]. Florianópolis: Universidade Federal de Santa Catarina. 10 p.
- Salvador FV. 1982. *História do Brasil (1500–1627)*. São Paulo: Editora Itatiaia Ltda e Ed. da Universidade de São Paulo. 437 p.
- Scheel-Ybert R. 2000. Vegetation stability in the southeastern Brazilian coast area from 5500 to 1400 ¹⁴C yr BP deduced from charcoal analysis. *Review of Palaeobotany and Palynology* 110(1–2):111–38.