The earliest shellmounds of the central-south Brazilian coast

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Abstract

This paper presents a new date for one of the oldest shellmounds of the central-south Brazilian coast. This date seems to confirm three previous results obtained from two other shellmounds in the same region and formerly seen as unreliable by the archaeological community. A charcoal sample from a coastal shellmound located in the state of Rio de Janeiro, Sambaqui do Algodão, was dated by 14C-AMS to 7860 ± 80 years BP. Besides confirming the previous ones, this new date is pulling back by some two thousand years the consensually accepted antiquity for the initial settlement of the central-south Brazilian coast – around 6000 years BP. The geographical and chronological proximity of those archaeological sites suggest that the initial settlement of the coast would have begun in this region rather than in the nuclear area with denser concentrations of shellmounds further to the South. It also strengthens the evidence of the possible route used by inland hunter-gatherers to reach this part of the coast.

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1. The central-south Brazilian coast and the shellmound builders

The dominant physiographic features of Brazil’s central-south coastal landscape are an abrupt, steep forest-covered escarpment running parallel to the coast, reaching heights greater than two thousand meters within a few kilometers of the shoreline; and a narrow, quite irregular strip of coast, displaying a nearly continuous sequence of bays and lagoons edged with vast mangroves, as well as countless islands that are extensions of the continental relief. Typical of estuarine systems where two neighboring ecosystems meet – land and sea – these ecotones comprise subsystems linked by the ebb and flow of tide and river waters providing high nutrient influx, and displaying one of the highest productivity rates among marine ecosystems. These waters are veritable vivaria and
one of the most fertile natural environments in the world.

Especially rich in mollusks, crustaceans and fish, these ecosystems favored the settlement of prehistoric hunter-gatherers coming from the highlands, who arrived at the coast and became fishers and shellfish gatherers, building huge shellmounds sometimes as tall as 30 m. They are found from the northern coast of Rio Grande do Sul (51°W, 30°S) to Bahia (38°W, 15°S), and are more conspicuous and more densely concentrated in the state of Santa Catarina (47°W, 28°S). Fig. 1 shows the location and relative density of the shellmounds in Brazil.

2. Chronology of Brazilian shellmounds

The radiocarbon dating of shellmounds is crucial for understanding the rise, maintenance, and collapse of these socio-cultural systems that flourished in the course of five thousand years, until the beginning of the Christian era, when their remains disappear. By this time, the well-succeeded inland horticulturalists had arrived at the coast. These newcomers were more powerful economically – since they were able to produce their own food –, socially organized in more complex structures, more advanced technologically and more expressive numerically, and ended up determining the absorption or extinction of the fisher-gatherers.

There are currently some 300 radiocarbon dates available for Brazilian shellmounds, which attest to the initial occupation of the coast at around 6500 years BP [1,2]. The distribution of the frequency of such dates shows that these cultures seem to have reached their peak between 5000 and 3000 years BP (see Fig. 2).

Nevertheless, three very early radiocarbon dates had been obtained decades ago from two different shellmounds. In 1956, Emperaire and Laming [3] obtained two dates of 7803 ± 1300 years BP and 7327 ± 1300 years BP in Gif-sur-Yvette, France, for the Sambaqui de Maratuá, located in the region of Santos, São Paulo. Charcoal samples were measured by conventional beta counting, producing very imprecise results that would in turn result in the calibrated dates of (10500–4000) cal years BC (2σ) and (9500–3000) cal years BC (2σ), respectively. Notwithstanding, those dates did not challenge the chronology consensually accepted for the shellmounds at that point. In 1981, Kneip [5] obtained another early date: 7958 ± 224 years BP (SPC 207), at the Sambaqui de Camboinhas, in Rio de Janeiro (22°58'S, 43°3'W). Conventional beta counting of a shell sample was again performed. For this sample, the calibrated date would be (7000–6000) cal years BC. It was also contested

![Fig. 1. The location and density of shellmounds in Brazil.](image)

![Fig. 2. Histogram of average radiocarbon dates for the coastal shellmounds.](image)
by the belief that the sand banks over which the shellmound stood were more recent and would have been formed after the presumed date of the site [4]. This assumption turned out to be mistaken, because new dates [6] on peats from the bottom of the lagoon formed by the sand banks corresponded to ages around 30,000 years BP. Therefore, these results show that the sand banks over which the shellmound stood were formed during the Pleistocene period, and so there was no reason to distrust that early date obtained at the Sambaqui de Camboinhas.

3. The dating of the Sambaqui do Algodão

This paper presents the dating of a charcoal sample from the Sambaqui do Algodão. Located in a small island in the Ribeira Bay, in Angra dos Reis, Rio de Janeiro (22°55′48″S, 44°20′48″W), this site integrates a group of seven shellmounds built very closely together in different islets in the small Ariró Cove. It presents two distinct stratigraphic levels: the inferior, where an abundant capture of mollusks took place; and the superior, where there was a clear increase in fishing as a means of compensating the smaller availability of mollusks. The superior level of the site had been previously dated to 3350 ± 80 years BP (WSU 3359) [7]. This result is compatible with the time range of occurrence for the shellmounds. The dating of the inferior level is the one reported in this paper.

The charcoal sample was dated using the AMS technique at the PRIME Lab of Purdue University. It was collected at the inferior level of the shellmound. The usual chemical pre-treatment for organic samples was performed. The sample was reduced to 1–2 mm thickness and treated with hydrochloric acid to remove the inorganic fraction. A base treatment, with sodium hydroxide, was completed in order to remove the fulvic and humic fractions. Finally, another acid treatment removed the inorganic carbon that could have been incorporated to the sample during the base treatment. The sample was then dried and combusted in an evacuated quartz tube with a silver foil and copper oxide, at 900 °C. The CO₂ was graphitized in a quartz tube with zinc and iron.

The 7.5 MV FN Tandem accelerator of the PRIME Lab was used for the measurement. The terminal voltage used was 4 MV, and ¹³C and ¹⁴C beams, with charge state 3+, were selected by the high-energy magnetic analyzer and detected.

The age was calculated as in Donahue et al. [8] and the oxalic acid standard used was the NBS SRM 4990 C. Calibration was performed using OxCal Version 3.5 from Oxford University [9]. Also the previous dates were calibrated for comparison. Both atmospheric corrections for Southern Hemisphere and estimate marine corrections for Brazilian coast were performed for charcoal and shell samples calibration, respectively.

4. Results and discussion

The results of the charcoal AMS measurements led to 7860 ± 80 years BP (PLID T00-0677) or cal BC (7050–6450) years (2σ) (OxCal Version 3.5; Oxford University [9]). This result confirms and reinforces the three other dates previously considered as dubious. This fact reopens the discussions about the antiquity of the settlement of the Brazilian coast.

It is interesting to notice that the three occurrences are remarkably contemporaneous (see Table 1) and that the sites have geographical proximity, in the axis Rio de Janeiro/São Paulo, very distant of the nuclear area of Santa Catarina. This demonstrates that the initial settlements occurred in an area that does not coincide with the one in which those cultures reached their highest degree of social complexity.

The origins and routes through which the hunter-gatherers reached the shore and became the oldest fisher-gatherers of the coast are still questions to be answered, since there is no evidence of hunter-gatherers in the highlands of Rio de Janeiro. From the present result we could surmise that those fisher-gatherers could have originated in the São Paulo plateau, not far from the site Sambaqui do Algodão. We believe that the Ribeira Valley, in São Paulo, is one of the few possible routes of communication between the countryside and the coast.
in the extensive barrier constituted by the Serra do Mar range. This hypothesis is reinforced by the existence of archaeological sites with freshwater mollusks along the Ribeira River course, one of which was dated to 9000 years BP [10].

5. Conclusions

The dating of Sambaqui do Algodão, in the State of Rio de Janeiro, reopens the discussions on the origins of the first hunter-gatherers that settled the central-south Brazilian coast and the routes through which they have reached the seashore.

The assumption that the oldest shellmounds would be among the large sites built by the fisher-gatherers in Santa Catarina, South of Brazil, has to be questioned since the oldest dates are being found in Rio de Janeiro and São Paulo.

Therefore, the present result compels us to consider the three previously questioned dates, pulling back the traditionally accepted chronology for the settling of the coast by at least two thousand years.

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References


Table 1

Oldest radiocarbon dates available to Brazilian shellmound settlements

<table>
<thead>
<tr>
<th>State</th>
<th>Shellmound</th>
<th>Sample material</th>
<th>Dating method</th>
<th>Radiocarbon age (years BP)</th>
<th>Calibrated age (years BC) (2σ)</th>
</tr>
</thead>
<tbody>
<tr>
<td>São Paulo</td>
<td>Maratuá</td>
<td>Charcoal</td>
<td>Conventional β counting</td>
<td>7803 ± 1300</td>
<td>10 500–4000</td>
</tr>
<tr>
<td>São Paulo</td>
<td>Maratuá</td>
<td>Charcoal</td>
<td>Conventional β counting</td>
<td>7327 ± 1300</td>
<td>9500–3000</td>
</tr>
<tr>
<td>Rio de Janeiro</td>
<td>Camboinhas</td>
<td>Shell</td>
<td>Conventional β counting</td>
<td>7958 ± 224</td>
<td>7000–6000</td>
</tr>
<tr>
<td>Rio de Janeiro</td>
<td>Algodão</td>
<td>Charcoal</td>
<td>AMS</td>
<td>7860 ± 80</td>
<td>7050–6450</td>
</tr>
</tbody>
</table>