Dated evidence of the interaction between humans and megafauna in the late Pleistocene of Sergipe state, northeastern Brazil

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Abstract

We present a radiocarbon date (12,742 ± 12,562 cal BP) for an Eremotherium laurillardi tooth found in Sergipe state, northeastern Brazil, which shows anthropogenic marks. Our result provides additional information and reinforces the hypothesis that humans was present in South America earlier than accepted currently, and interacted with megafauna during the late Pleistocene in this region.

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1. Introduction

Recently, Dantas et al. (2012) described a modified tooth of an Eremotherium laurillardi (Lund, 1842) (giant ground sloth) as reflecting human action found in Sergipe state, northeastern Brazil. This material represents new evidence of the interaction between humans and megafauna in South America.

Based on this evidence, Dantas et al. (2012) proposed two hypothesis trying to explain when this interaction between megafauna and human occurred in the northeastern region of Brazil: (1) during the Pleistocene, based on the dated time range for Eremotherium fossils without anthropogenic marks (e.g. Rossetti et al., 2004; Dantas et al., 2013); or (2) during the Holocene, based on the most ancient dated evidences of paleoindians recovered in Sergipe, but without evidence of interaction with megafauna species (Carvalho, 2003). This communication presents a radiocarbon date for the modified tooth mentioned above, which indicates the best hypothesis about when this interaction may have occurred, providing complementary discussion about this finding.

2. Material and methods

A sample of Eremotherium laurillardi tooth LPUFS 4992 (Fig. 1) found in the São José farm, Poço Redondo, Sergipe (Dantas et al., 2012) was analyzed at the Center for Applied Isotope Studies of the University of Georgia, USA. The bioapatite fraction of the tooth dentine was purified as described by Cherkinsky (2009), and carbon isotope ratios were measured using conventional mass spectrometer Finningan 252. The 14C age was defined using 0.5 MV NEC 1.5 SDH-1 Pelletron Accelerator Mass Spectrometer. The results were calibrated to calendar years using CALIB 6.0 on line radiocarbon calibration program with 2 sigma of standard deviation (Reimer et al., 2009).

3. Results and discussion

The dating of the E. laurillardi modified tooth (LPUFS 4992) showed an age between 12,742–12,562 cal BP (10,740 ± 30 14C BP, UGAMS 14017). In the same locality are five teeth of the same species dated between 27,690 and 11,084 cal BP (Table 1). Other dates for this species are available from nearby states (Table 1). In Rio Grande do Norte an age of 18,850–18,580 cal BP was found through U-series dating. Further dates from other regions of Brazil were reported from São Paulo.
Legends (b) Bone; (d) Dentine; were made, because the marks found in the lateral borders of the tooth (LPUFS 4992) is attributed to the time in which these marks show the same coloration of the rest of the tooth (Fig. 1D). As discussed by Purdy et al. (2011), these characteristics suggest manipulation on fresh material.

One of the hypotheses for the arrival of humans in South America (between 14 and 13 ka, e.g. Neves and Piló, 2008) is in agreement with our results. Nevertheless, this is not the only direct dated record of the interaction between human and megafauna. Another older date was indicated by Farina et al. (2014), which shows marks made in bones of the giant ground sloth Lestodon in Uruguay, with an age between 32,298 and 31,219 cal BP, far beyond the age accepted today for the incoming of paleoindians to South America territories.

Other evidence older than 30 ka were also published elsewhere (e.g. prehistoric paintings, lithic instruments; Guidon and Delibras, 1986; Lahaye et al., 2013), and reinforce the interpretation that pioneer people may have lived in South America with low density and high mobility, which would explain the scarcity of sites with incontestable evidence (Prous and Fogaça, 1999). Evidence of human—megafauna interaction from 10 to 9 ka may represent the time when the establishment of permanent settlements of South American paleoindians occurred (e.g. Prous and Fogaça, 1999; Dillehay et al., 2008).

4. Final remarks

In the same locality in which this tooth was found, several lithic instruments were noted at the surface of the outcrop, which Dantas et al. (2012) suggested that were used in the manufacture of this piece. However, these instruments could not be directly associated with this tooth, as noted by Hubbe et al. (2012), because the sediment layers were mixed and those materials were not collected in its original stratigraphic context. Therefore, the instrument that may have been used to drastically alter the tooth shape could not be determined, which limits more complete interpretation and correlation between the findings of this locality. However, we do not consider this to be a hindrance to our proposition of interaction between humans and megafauna during the late Pleistocene in this region, as the modified tooth has now been dated. Finally, our result supports the acceptance of the first hypothesis proposed by Dantas et al. (2012), that this tooth represents a human—megafauna interaction in late Pleistocene.

![Fig. 1. Images of the modified tooth of *Eremotherium laurillardi* (LPUFS 4992), in (A) right lateral view, (B) internal view, (C) left lateral view, (D) featured polish marks.](image)

Table 1
Datings for *Eremotherium laurillardi* in Brazil.

<table>
<thead>
<tr>
<th>Sample number</th>
<th>Latitude (°S)</th>
<th>Localities</th>
<th>Ages (years)</th>
<th>Calibrated age (2σ range, cal yr BP)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sample 2(1)</td>
<td>04°16'</td>
<td>Itaituba/PA</td>
<td>11,340 ± 50(8)</td>
<td>13,760–13,700</td>
</tr>
<tr>
<td>UGAMS 09435(2)</td>
<td>06°15'</td>
<td>Currais Novos/RN</td>
<td>15,450 ± 40(9)</td>
<td>18,580–18,850</td>
</tr>
<tr>
<td>UGAMS 14017(3)</td>
<td>09°55'</td>
<td>Poço Redondo/SE</td>
<td>10,740 ± 30(6)</td>
<td>12,562–12,742</td>
</tr>
<tr>
<td>UGAMS 13339(4)</td>
<td>09°55'</td>
<td>Poço Redondo/SE</td>
<td>10,990 ± 30(6)</td>
<td>12,685–13,070</td>
</tr>
<tr>
<td>UGAMS 13540(5)</td>
<td>09°55'</td>
<td>Poço Redondo/SE</td>
<td>11,010 ± 30(6)</td>
<td>12,704–13,080</td>
</tr>
<tr>
<td>UGAMS 13541(6)</td>
<td>09°55'</td>
<td>Poço Redondo/SE</td>
<td>9720 ± 10(6)</td>
<td>11,084–11,233</td>
</tr>
<tr>
<td>UGAMS 13542(7)</td>
<td>09°55'</td>
<td>Poço Redondo/SE</td>
<td>9730 ± 30(6)</td>
<td>11,089–11,237</td>
</tr>
<tr>
<td>UGAMS 13543(8)</td>
<td>09°55'</td>
<td>Poço Redondo/SE</td>
<td>11,580 ± 30(6)</td>
<td>13,292–13,581</td>
</tr>
<tr>
<td>UGAMS 09432(9)</td>
<td>09°55'</td>
<td>Poço Redondo/SE</td>
<td>22,440 ± 50(8)</td>
<td>26,690–27,690</td>
</tr>
<tr>
<td>UGAMS 06136(10)</td>
<td>10°42'</td>
<td>Quijingue/BA</td>
<td>15,770 ± 40(6)</td>
<td>18,730–19,280</td>
</tr>
<tr>
<td>S/μ(11)</td>
<td>10°58'</td>
<td>Caatinga do Moura/BA</td>
<td>15,000 ± 50(6)</td>
<td>25,000–25,500</td>
</tr>
<tr>
<td>S/μ(12)</td>
<td>10°58'</td>
<td>Caatinga do Moura/BA</td>
<td>16,100 ± 30(6)</td>
<td>25,000–25,500</td>
</tr>
<tr>
<td>MZSP-PV610(13)</td>
<td>24°35'</td>
<td>Iporanga/SP</td>
<td>12,530 ± 60(3)</td>
<td>15,130–14,240</td>
</tr>
</tbody>
</table>

Legends (b) Bone; (d) Dentine; (s) Stylolesthum; (14C) dating in collagen; (14C) dating in bioapatite; (U-series) dating; PA: Pará; RN: Rio Grande do Norte; SE: Sergipe; BA: Bahia; SP: São Paulo. Cited articles (1) Rossetti et al. (2004); (2) Dantas et al. (2013); (3) Our data; (4) França et al. (2014); (5) Drefahl (2010); (6) Auler et al. (2006); (7) Hubbe et al. (2013).

The radiocarbon date presented for the *Eremotherium laurillardi* tooth (LPUFS 4992) is attributed to the time in which these marks were made, because the marks found in the lateral borders of the tooth (Fig. 1A and C) have smooth edges, and the floor of the cut marks show the same coloration of the rest of the tooth (Fig. 1D). As

References


