Full Citation Details:
Pate, F.D. McDowell, M.C. Wells, R.T. & Smith, A.M. 2002. Last recorded evidence for megafauna at Wet Cave, Naracoorte, South Australia 45,000 years ago. 'Australian Archaeology', no.54, 53-55.
SHORT REPORTS

LAST RECORDED EVIDENCE FOR MEGAFANA AT WET CAVE, NARACOORTE, SOUTH AUSTRALIA 45,000 YEARS AGO

F. Donald Pate
Department of Archaeology, Flinders University, Adelaide, SA 5001, Australia

Matthew C. McDowell and Rod T. Wells
School of Biological Sciences, Flinders University, Adelaide, SA 5001, Australia

Andrew M. Smith
Australian Nuclear Science and Technology Organisation, PMB 1, Menai, NSW 2234, Australia

Over 85 percent of Australian terrestrial vertebrate genera with a body mass greater than 44 kg became extinct during the late Pleistocene. These included all marsupials exceeding 100 kg (19 species) and 22 of the 38 species between 10 and 100 kg. Dwarving occurred in many other species (Flannery 1990; Miller et al. 1999). The larger of these extinct animals have been categorised as megafauna.

Roberts et al. (2001) provide chronometric evidence for a continent-wide extinction of these megafauna at about 46,000 years ago. Others argue for regional variability in the timing of Australian megafaunal extinctions and the survival of some species to much later periods, e.g. Lake Eyre Basin of inland northeastern South Australia, Miller et al. (1999). The larger of these extinct animals have been categorised as megafauna.

Evidence suggests that large mammal carcasses and individual bones entered the caves from the above ground surface via pitfall entrances. Thus a majority of the faunal remains at Naracoorte have accumulated in sedimentary cones and associated fans immediately below pitfalls. As the cave accumulations sit above the local groundwater table (in the vadose zone), the bone deposits have been subjected to minimal re-working by water flow and remain relatively closely associated. Some slight re-working has been caused by runoff water flowing through the pitfall entrances redistributing sediments from the cones to distal fans (Wells et al. 1999; Brown and Wells 2000; Wroe and Field 2001).

To address the timing of megafaunal extinctions in the arid Lake Eyre Basin of inland northeastern South Australia, Miller et al. (1999) employed a range of dating techniques on more than 700 eggshells of the extinct ostrich-sized flightless bird *Genyornis newtoni*. These included amino acid racemisation (AAR), accelerator mass spectrometry (AMS), radiocarbon and thermal ionization mass spectrometry (TIMS) uranium series analyses. In addition, optical stimulated luminescence (OSL) was employed on associated sediments. Uranium series and OSL dates indicated that *Genyornis* was common in the Lake Eyre Basin until extinction occurred at 50 ± 5 ka cal BP. Radiocarbon measurements on carefully treated eggshell carbonate gave much younger ages with an effective maximum at 46 ka cal BP, which the authors concluded corresponded to the limit of radiocarbon dating for this type of sample. As the bones of *Genyornis* are associated with some of the youngest stratigraphic levels containing megafaunal remains, it is argued that the extinction of the Australian megafauna in general is likely to be coincident with *Genyornis* extinction (Telford and Wells 1990).

The large number of stratified fossil bearing karst caves in the Naracoorte region of southeastern South Australia provide a natural laboratory to address the timing of megafaunal extinctions in southern temperate Australia. Uranium thorium dates on speleothems, luminescence dates on quartz, and electron spin resonance (ESR) dates on megafaunal tooth enamel indicate sedimentary accumulation in the Naracoorte caves over the past 500 ka (Ayliffe et al. 1998; Moriarty et al. 2000).

Evidence suggests that large mammal carcasses and individual bones entered the caves from the above ground surface via pitfall entrances. Thus a majority of the faunal remains at Naracoorte have accumulated in sedimentary cones and associated fans immediately below pitfalls. As the cave accumulations sit above the local groundwater table (in the vadose zone), the bone deposits have been subjected to minimal re-working by water flow and remain relatively closely associated. Some slight re-working has been caused by runoff water flowing through the pitfall entrances redistributing sediments from the cones to distal fans (Wells et al. 1994; Brown and Wells 2000; Moriarty et al. 2000). Coring across the cones and associated fans was employed to demonstrate stratigraphic continuity and to provide further

<table>
<thead>
<tr>
<th>Sample No.</th>
<th>Lab No.</th>
<th>C Mass (ug)</th>
<th>% Modern C</th>
<th>Conventional Age (yr BP)</th>
<th>Depth (cm)</th>
<th>Sedimentary Stratigraphy</th>
<th>Munsell Soil Colour</th>
</tr>
</thead>
<tbody>
<tr>
<td>WeC 36</td>
<td>OZE 539</td>
<td>2570</td>
<td>91.2</td>
<td>740 ± 40</td>
<td>42</td>
<td>brown clayey sand</td>
<td>7.5 YR 3/2</td>
</tr>
<tr>
<td>WeC 4</td>
<td>OZD 504</td>
<td>1320</td>
<td>17.6</td>
<td>13,920 ± 130</td>
<td>134</td>
<td>yellow-brown sand</td>
<td>10YR 5/6</td>
</tr>
<tr>
<td>WeC 25</td>
<td>OZD 714</td>
<td>1380</td>
<td>2.2</td>
<td>30,500 ± 400</td>
<td>233</td>
<td>brown sand</td>
<td>7.5 YR 4/6</td>
</tr>
<tr>
<td>WeC 27</td>
<td>OZD 717</td>
<td>1950</td>
<td>0.6</td>
<td>40,900 ± 850</td>
<td>268</td>
<td>top of brown sandy clay</td>
<td>7.5 YR 4/6</td>
</tr>
<tr>
<td>WeC 35</td>
<td>OZE 538</td>
<td>1360</td>
<td>0.4</td>
<td>45,200 ± 1800</td>
<td>277</td>
<td>near bottom of brown sandy clay with megafauna</td>
<td>7.5 YR 4/6</td>
</tr>
<tr>
<td>WeC 16</td>
<td>OZD 506</td>
<td>1640</td>
<td>0</td>
<td>&gt;45,000*</td>
<td>358</td>
<td>red clay with abundant megafauna</td>
<td>2.5 YR 2/5/4</td>
</tr>
</tbody>
</table>

* not distinguishable from background

Table 1. AMS radiocarbon results for charcoal samples from Wet Cave, Naracoorte, South Australia.
support for minimal re-working of sediments and associated bones (McDowell 2001).

Dating of charcoal associated with faunal bone from these stratified sequences should provide improved correlations between chronologies for charcoal and megafaunal deposition. Sequential dates for charcoal samples from the top to the bottom of the deposits will provide additional evidence for minimal post-depositional disturbance of the sediments and allow portions of the stratigraphic sequences that have been re-worked to be identified.

This paper reports the results of AMS radiocarbon dating of six charcoal samples obtained from a deeply stratified sequence in one of these caves, Wet Cave (SU10), located in the Naracoorte World Heritage Area approximately 300 km southeast of Adelaide, South Australia.

Methods

A total of 36 samples of charcoal were collected from a 3.5 m stratigraphic sequence in two adjacent excavation pits (Pit 1 and Pit 2) in Wet Cave from which fossil material had been recovered. Sampling was restricted by the availability of charcoal pieces that were of sufficient size for AMS radiocarbon dating. Thus, samples could not be taken at regular intervals down the profile. Where possible, charcoal samples were collected at levels that represented obvious changes in the sedimentary stratigraphy. Due to the small size of the charcoal deposits in Wet Cave, backup samples were taken for the various levels.

Charcoal samples were submitted to the Australian Nuclear Science and Technology Organisation (ANSTO) AMS dating facility (Lawson et al. 2000). Standard elemental carbon extraction procedures involving acid-base-acid pretreatment and bulk combustion were employed. In order to further minimise dating errors associated with contamination from younger carbon, AMS radiocarbon results for charcoal samples with extracted carbon masses of less than 100 mg were discarded. To correct for carbon isotope fractionation by the plant, 813C determinations were made on all samples with extracted carbon masses of greater than 500 mg.

Radiocarbon ages associated with strata containing megafauna were converted to calendar ages using the equation Calib Age = 5.85 x 10^-6 (Conv 14C Age)^2 + 1.39 (Conv 14C Age) - 1807 following Miller et al. (1999). This calibration equation is based on paired U-series and radiocarbon dates from corals.

Results

Conventional radiocarbon ages range from 740 ± 40 BP near the top of the sequence to > 45 ka BP at the base (Table 1). A conventional radiocarbon age of 40.9 ± 0.85 ka BP, corresponding to a calendar age of 45.3 ± 0.85 ka cal BP, was obtained for a sample of charcoal located just above the stratum where at least four species of megafauna disappear. These include associated remains of Protemnodon brehus, Sthenurus brownei, Thylacoleo carnifex and Zygomaturus trilobus. In addition to these taxa, Sarcophilus laniarius and Sthenurus sp. cf. S. newtonae occur in underlying sediments bracketed by conventional radiocarbon ages of 45.2 ± 1.8 ka BP above and > 45 ka BP below. The latter date expresses the fact that the radiocarbon content of the sample was not distinguishable from background.

Discussion

The date of 40.9 ± 0.85 ka BP, corresponding to a calendar age of 45.3 ± 0.85 ka cal BP, provides a probable indicator of the timing of extinction of at least four species of megafauna, Protemnodon brehus, Sthenurus brownei, Thylacoleo carnifex and Zygomaturus trilobus, in the Naracoorte region of mainland southeastern South Australia. An additional two taxa in the Wet Cave sequence, Sacrophilus laniarius and Sthenurus sp. cf. S. newtonae, are last seen in sediments with a calendar age of 49.1 ± 1.6 ka BP. A range of extant taxa including large macropods, eg Macropus spp., were recovered from all layers in the upper levels of the cave sediments (McDowell 2001).

These results provide a chronology for the disappearance of megafauna in the Naracoorte region of southeastern South Australia that is similar to that demonstrated by Miller et al. (1999) for the extinction of Genyornis and other associated megafauna in the Lake Eyre Basin of inland northeastern South Australia at about 50 ± 5 ka BP. Thus, the AMS radiocarbon dates from Wet Cave, Naracoorte provide additional evidence for the disappearance of megafauna in South Australia at or beyond the effective limits of radiocarbon dating.

Acknowledgements

This research was funded by Special and Collaborative AMS Quaternary Science grants from the Australian Institute of Nuclear Science and Engineering (AINSE) and the Australian Research Council (ARC). The authors thank Kevin Moriarty, School of Chemistry, Physics and Earth Sciences, Flinders University for assistance with the initial stages of the research program.

References


McDowell, M.C. 2001 The Analysis of Late Quaternary Fossil Mammal Faunas from Robertson Cave (SU17, 18, 19) and Wet Cave (SU10, 11) in the Naracoorte World Heritage Area, South Australia. Unpublished M.Sc. thesis, School of Biological Sciences, Flinders University, Adelaide, South Australia.


**BUANG MERABAK: EARLY EVIDENCE FOR HUMAN OCCUPATION IN THE BISMARCK ARCHIPELAGO, PAPUA NEW GUINEA.**

M.G. Leavseley
School of Archaeology and Anthropology, The Faculties, Australian National University, Canberra, ACT 0200, Australia

M.I. Bird
Research School of Earth Sciences, Australian National University, Canberra, ACT 0200, Australia

L.K. Fifield, P.A. Hausladen, G.M. Santos, M.L. di Tada
Department of Nuclear Physics, Research School of Physical Sciences and Engineering, Australian National University, Canberra, ACT 0200, Australia

This paper reports new radiocarbon estimates for the age of human occupation of Buang Merabak, an archaeological site in central New Ireland, Papua New Guinea (Fig. 1). Previously, the oldest radiocarbon date for human occupation in New Ireland was 35,410 ± 430 BP (Leavesley and Allen 1998:80). The radiocarbon determinations reported here, although preliminary, may extend the first evidence of human occupation in New Ireland to beyond 40,000 BP (uncalibrated) and indirectly support the evidence presented by Groube et al. (1986) and Chappell et al. (1994), for the occupation of the Huon Peninsula at a similar antiquity.

**Background**

The archaeological potential of the Buang Merabak cave site was first identified by Allen et al. (1984:13) and later excavated under the auspices of the Lapita Homeland Project (Allen and Gosden 1991). The mouth of the cave is ca.10 m wide and the roof is ca. 8 m high. The cave extends back ca. 30 m and is joined to a second larger chamber by a small passage.

*Figure 1* Map indicating sites mentioned in the text.