

Scientists tease DNA from eggshell of extinct birds

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Fossil eggshell is a previously unrecognised source of ancient DNA. Copyright Dr Jean-Luc Schwenninger.

(PhysOrg.com) -- In a world first, scientists in Australia announced on Wednesday they had extracted DNA from the fossilised eggshells of extinct birds, including iconic giants such as the moa and elephant bird.

In a world first an international team of researchers have successfully extracted ancient DNA from the eggshells of various species of extinct birds.

The research, published in scientific journal *Proceedings of the Royal Society B*, shows that fossil eggshell is a previously unrecognised source of ancient DNA and can provide exceptional long-term preservation of DNA in warmer climates. The findings will boost research in archaeology and biology where species identifications can add significantly to our understanding of biodiversity, evolutionary processes, past environmental change and dispersal of animal and human populations.

The study includes samples of *Aepyornis* sp, the giant Madagascan elephant bird collected by Dr Jean-Luc Schwenninger, a Quaternary geochronologist based at the Research Laboratory for Archaeology and the History of Art (RLAHA) at Oxford University. The bird looked like an outsized ostrich, standing about three metres high and weighing in excess of half a tonne. It was the heaviest bird to have ever existed and produced eggs with a capacity of 11L (equivalent to over two hundred chicken eggs or seven ostrich eggs). Its eggs are the largest eggs ever known.

Since 1991, Schwenninger and a team from Sheffield University, the University of Colorado, and Antananarivo's National Museum of Art and Archaeology in Madagascar have conducted large scale archaeological surveys of the Southern region of Madagascar and studied the timing of extinction of these giant flightless birds. Whilst scouring the coastal dunes of Southern Madagascar they have found evidence of many of the bird's former nesting sites from concentrations of eggshell debris. They have also excavated archaeological sites which document the rise and fall of a lost civilization with long-distance trade contacts to Africa's Swahili coast, the Persian Gulf and China.

Dr Schwenninger and his colleague Professor Michael Parker Pearson, from the University of Sheffield, believe that by the time this civilization flourished, from the 11th to the 13th century, the population

of elephant birds was in serious decline. The precise cause of extinction is not yet fully understood but it is probably linked to the arrival of humans.

AMS radiocarbon dating of eggshell remains, carried out at the Oxford Radiocarbon Accelerator Unit based at RLAHA, indicate that most of the birds seem to have died out at about the same time as large numbers of settlements appear in the archaeological record at around AD 1000. The French governor Etienne de Flacourt refers to indigenous sightings of the Aepyornis in 1650 which describe the bird as a ‘type of ostrich which people cannot catch and which searches out the most deserted places’.

The DNA breakthrough was achieved when Dr Schwenninger and doctoral student James Haile, based at Oxford’s Ancient Biomolecules Centre considered analysing samples of sediment for his research. Dr Shwenninger said: ‘This time last year, I gave James a few samples from several of our archaeological and subfossil sites in Madagascar to see if any plant or animal DNA could be extracted. I also mentioned to him that I had some eggshell which might be worth looking at. In fact, we had already tried this back in 1998 and again in 2003 but without success. He was very keen to give it another go and he succeeded where others, including his thesis supervisor had previously failed.’

Provided by Oxford University

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