

DNA find: Tiny wallaby the last living link to extinct giant kangaroos

December 10 2018, by Rose Trapnell



Credit: Queensland University of Technology

A QUT-led collaboration with University of Adelaide reveals that Australia's pint-sized banded hare-wallaby is the closest living relative of the giant short-faced kangaroos which roamed the continent for millions of years, but died out about 40,000 years ago.

Published in Systematic Biology, the research involved the first near-



complete mitochondrial (mt) genome sequencing from extinct Australian megafauna.

- DNA was sequenced from inner ear bones (petrous bones) of a 45,000-year-old giant short-faced kangaroo, Simosthenurus occidentalis, part of the Sthenurinae sub-family, found at Mt Cripps in Tasmania
- These are the longest DNA sequences ever recovered from Australia's extinct megafauna, with more than 16,000 base pairs of mtDNA, which is used to help understand evolutionary relationships
- The results support an evolutionary link between giant shortfaced kangaroos (Sthenurinae) and the threatened banded harewallaby, Lagostrophus fasciatus
- The study also combined the DNA evidence with fossil and anatomical data to trace body size change over the evolutionary history of kangaroos and wallabies

The analysis was conducted by QUT evolutionary biologists Ph.D. researcher Manuela Cascini and Associate Professor Matthew Phillips, from the Science and Engineering Faculty, in collaboration with University of Adelaide's Professor Alan Cooper and Dr. Kieren Mitchell, who undertook the DNA sequencing at the Australian Centre for Ancient DNA.

Lead author Ms Cascini, a <u>molecular biologist</u> who moved from Italy to undertake her Ph.D. research with Associate Professor Phillips, said her project also involved analysis of mtDNA sequenced from the inner ear bones of another ancient extinct macropod that was found in Tasmania – the giant wallaby, Protemnodon anak, which weighed up to 150 kilograms.





Extinct short-faced kangaroo Simosthenurus occidentalis. Credit: Joseph Burgess

Small fragments of ancient DNA sequenced from this giant wallaby species and from the giant short-faced kangaroo were first reported on by University of Adelaide scientists in 2015.

"Our analysis confirmed their conclusion that the giant wallabies are close relatives of the iconic living Macropus genus of kangaroos and wallabies," Ms Cascini said.

"However that earlier study provided insufficient DNA to confidently place the giant short-faced kangaroos on the evolutionary tree.



"We've now been able to show the strongest evidence yet that the closest living relative of these massive Sthenurinae kangaroos, which weighed up to about 240 kilograms, is the tiny, 2-kilogram banded hare-wallaby. These wallabies live in the wild only on islands off Western Australia and are classified as vulnerable."

Associate Professor Phillips said the larger amount of mtDNA sequenced in this study by the University of Adelaide collaborators helped enable the strong finding on the banded hare-wallaby link.



The diminutive banded hare-wallaby linked to the giant Sthenurinae kangaroos. Credit: Queensland University of Technology



"This is by far the most genetic data that anyone has extracted out of Australian megafauna, and it was taken from the petrous bones which are denser and often seem to hold DNA better," he said.

"You find a lot of ancient DNA studies of megafauna from permafrost in northern Europe and northern America because the cold helps preserve the DNA. But in Australia the hotter climate and older age of the megafauna is far less favourable for DNA preservation."

Dr. Mitchell said Tasmania's cooler climate and higher-altitude caves "make for much better DNA preservation than we find elsewhere in Australia, so we focused our hunt for high-quality megafaunal DNA there".

Associate Professor Phillips said other findings of the study on the evolution of kangaroos and wallabies (macropods) included:

- The macropod ancestors diverged from tree-living possums around 41 to 46 million years ago
- They remained small, in the 2-15 kg range, while Australia was more dominated by rainforest
- As the climate cooled and dried, and as the forests opened up over the past 10 million years, at least four different <u>kangaroo</u> lineages independently evolved to megafaunal size (more than 44 kg)
- This includes the short-faced kangaroos, the giant Protemnodon wallabies, and the living red and grey kangaroos.

More information: Manuela Cascini et al. Reconstructing the Evolution of Giant Extinct Kangaroos: Comparing the Utility of DNA, Morphology, and Total Evidence, *Systematic Biology* (2018). DOI: 10.1093/sysbio/syy080



Provided by Queensland University of Technology

Citation: DNA find: Tiny wallaby the last living link to extinct giant kangaroos (2018, December 10) retrieved 28 April 2024 from <u>https://phys.org/news/2018-12-dna-tiny-wallaby-link-extinct.html</u>

This document is subject to copyright. Apart from any fair dealing for the purpose of private study or research, no part may be reproduced without the written permission. The content is provided for information purposes only.