

Biggest Moa Was Actually 'Mum'

Watch this space,' says David Lambert, a propos of recent news that three species of moa have been reduced to two. 'In the next three to five years we'll see some really amazing things.'

David Lambert is one of the authors of a scientific paper in *Nature* which argues the largest moa of the *Dinornis* genus are females, and not a separate species as previously believed. As professor of molecular ecology and evolution at the Albany campus of Massey University in Auckland, David Lambert works with a team at the university's Wilson Centre for Molecular Ecology and Evolution, to perfect a technique for sexing genetic material from sub-fossil bones, in this case from 115 moa.

Until their breakthrough, DNA studies depended on evidence from mitochondrial DNA sequences, of which there are hundreds of copies, but which don't provide evidence of sex. Lambert and others used 'single-locus' nuclear genes, which exist in only two copies — one from the male parent and one from the female — and which tend to be fragmented in sub-fossil specimens and therefore difficult to use.

Most people had assumed replicating them was impossible, says Lambert, but now that the technique has been achieved, this useful bit of DNA will likely reveal a whole raft of information about creatures long since departed — including more about moa.

One of his next aims is 'to paint' the bird because nuclear genes also determine colour. While a small number of fossils have feathers attached to them, inevitably our ideas about the moa's appearance are largely conjectural.

Then there is the question of whether the male incubated the eggs — as is the case for other ratites [flightless birds]. To solve this query, Prof. Lambert is busy

sexing bones found in association with eggs. If they turn out to be mostly male, then an answer may have been found for another moa conundrum: why the remains of a disproportionately large number of female birds have been found in swamps — 25 females and four males from two North Island swamp sites, Makirikiri and Riverlands. Were the females more adventurous foragers, or did the males tend to be otherwise occupied?

The new technique will enable scientists to genotype moa as is done with sheep and cattle and this will lead to a broadening of our knowledge about the birds' habits: their levels of relatedness, whether they lived in family groups, and what their mating systems were. It also has applications for research into the distribution and genetic variation of kiwi and tuatara and is being used in the attempts to save the world's rarest seabird, the Chatham Island taiko.

As far as a reassessment of moa taxonomy is concerned, Lambert's work has confirmed what had been in the wind since the mid-1970s when American ornithologist Joel Cracraft suggested more or less the same thing: that the largest moa were females. Starting from that premise, Lambert worked first on bones from living ratites — emus, ostriches, cassowaries, kiwi — using nuclear genes which are more easily replicated when taken from new bones than from fossils.

The number of moa species has been steadily declining since the discovery of an extraordinary diversity of moa specimens in the nineteenth century. These led to their classification into at least 64 species and 20 generic names. Gradually the number was reduced to 38 and, over the last 25 years, this has been whittled down to 11.

Prof. Lambert would have it

as 10. This is because *Dinornis*, the heaviest moa, used to be considered to consist of three species: *struthoides*, *novaezelandiae*, and *giganteus*. He writes: 'Collectively, our data suggest that the three *Dinornis* "species" are not biologically distinct, and that there were, at most, two geographically isolated species of *Dinornis* in New Zealand during the Holocene period.' [The post-glacial epoch of the past 10,000 years.]

The femurs of *D.giganteus* and *D.novaezelandiae* found in both North and South Island all turned out to be from females, and specimens from *D.struthoides* were the males. In scientific jargon, *Dinornis* exhibited what is called 'extreme reverse sexual dimorphism' — the females were often significantly larger than the



Giant moa depicted in comparison with kiwi in this 1863 image from Ferdinand von Hochstetter's *Neue Seeland*.

males. In the South Island, the size range was even larger. There, madam *giganteus* was estimated, from the length of her femur, to be almost twice as large as her mate — at 3.5 metres tall and weighing 250 kilograms.

— PAT BASKETT is an Auckland journalist.

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