

Moa's ark

New Zealanders are fond of the notion that their biota is a fragment of ancient Gondwana. So botanist Dr Mike Pole risks being branded unpatriotic for his argument, first published in 1994, that New Zealand's vegetation arrived by long distance dispersal.

'By this, I meant that the ancestors of present plants reached New Zealand after maximum development of the Tasman and Southern Oceans,' says Pole, now at the University of Queensland.

'Anything that was a direct import from Gondwana had probably died out along the way as the land rafted north. In other words, I suggested that there has been a complete biotic turnover at the lineage level.'

This view is provocative, but not so far fetched.

Take a look at the rich vegetation of Norfolk and Lord Howe Islands, all of which must have arrived by sea, because both these oceanic islands are 'volcanic piles' of quite recent origin (two and 10 million years ago, respectively) and they have never been attached to other land.

Pole is now revisiting the question of origins, asking how the fossil record helps or hinders his view. For example, the beech genus, *Nothofagus*, is widely regarded as a 'classic' Gondwana group, its global distribution reflecting ancient land connections.

It has a good and superabundant pollen record in New Zealand, but is strangely absent from virtually all fossil pollen samples of the Early Eocene, an 8-million-year gap. One of two things could have happened: either *Nothofagus* was very rare during this time (an unseen 'ghost' group), or it became extinct.

'If it was extinct,' says Pole, 'it might be expected that the recolonisation of New Zealand was from nearby Australia, and to some extent this is what we find. Three of the four beech species that appear after the 'gap' also occur in Australia'.



This fossilised eucalyptus fruit was found along with eucalypt leaf fossils in southern New Zealand and dates back to the Miocene – evidence of early migration from Australia and subsequent extinction.

'The point here is that *Nothofagus* occurs in New Zealand today, it was certainly inherited from the country's initial connection to Gondwana, but its existence in that country may not have been continuous', Pole says.

How many other 'genuine Gondwana' groups share this history? Is New Zealand really a Moa's Ark that broke away from the supercontinent and subsequently remained biologically isolated from the rest of the outside world, or has long distance dispersal and climate, over the ages, shaped its flora and fauna? Pole still favours the latter idea.

Another aspect of the fossil record that lends support to the dispersal view is the observation of other scientists that the date of 'first appearance' of plant taxa in the fossil record in Australia mostly pre-dates the first appearance in New Zealand.

If taxa were simply expanding by evolution when conditions were right,

the first appearances ought to be random with respect to either country, but they're not.

Australia has four times as many first appearances in the fossil record as New Zealand. A possible explanation for this is that dispersal was facilitated by westerly winds or ocean currents.

Pole looks forward to some sort of response or further research from other scientists. 'New Zealand is a natural laboratory for studying island biogeography,' he says.

'Long ago, New Zealand set off on a slow journey from the south to the Pacific and it kept a diary. This has been well preserved in the fossil record and we just need to understand it.'

Pole M (2001) Can long-distance dispersal be inferred from the New Zealand plant fossil record. *Australian Journal of Botany*, 49:357–366.

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