Can modern-day plants trace their New Zealand ancestry?

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One hundred million years ago the earth looked very different from how it does today. Continents were joining and breaking apart, dinosaurs were roaming the earth, and flowering plants were becoming more widespread.

The southern hemisphere supercontinent known as Gondwana formed around 180-200 mya during the breakup of Pangaea and then began to split apart about 167 mya. As scientists reconstruct the history of these land masses and life during this period, many questions arise. For example, is the current flora of New Zealand derived from plants that grew on Gondwana before its breakup, or derived from plants that more recently dispersed to New Zealand?

Recent research published in the January issue of the American Journal of Botany by Dr. Gregory Jordan of the University of Tasmania and a team of researchers from New Zealand and Austria explore the answer to these questions based on observations of two macrofossils from the Late Oligocene/Early Miocene time period (28-15 mya) in New Zealand.

Based on observations and evolutionary analyses, Jordan and colleagues identified the two fossils as members of the epacrid subfamily of the plant family *Ericaceae*, known as the heath family. Their data demonstrate that by the Early Miocene, New Zealand was home to at least two different lineages of epacrids. Past examples of *Ericaceae* fossil pollen in New Zealand have suggested that the family's presence in New Zealand dates back to the Late Cretaceous period (66.5-99.6 mya),

but these recent evolutionary analyses suggest a much younger history for most groups of plants in that region.

"The epacrids encapsulate many of the problems that have fascinated botanists in the southern hemisphere," Jordan said. "How important was Gondwana? Why do we have so many sclerophylls? How do sclerophylls work? We have only just started to work these plants out."

Cyathodophyllum novae-zelandiae is the first unambiguous, pre-Pleistocene macrofossil from the tribe *Styphelieae* identified, and it appears to be from a lineage of plants that is now extinct. *Richeaphyllum waimumuensis* was identified as a member of the tribe *Richeeae*, but the scientists are unsure about whether it is from an extant or extinct lineage.

Although pollen from the fossil record has demonstrated that members of the *Ericaceae* plant family have been present in New Zealand since the Late Cretaceous, this research demonstrates that the presence of ancient fossils from a plant family may not provide evidence regarding the history of modern members of the family, providing a cautionary note to other researchers trying to reconstruct the history of a group of plants. Discovery of new macrofossils and/or detailed examinations of fossil pollen combined with evolutionary analyses may help to answer questions of whether the ancestors of current plants coexisted with dinosaurs in New Zealand.

"Delving into the details of plant fossils can give you surprises," Jordan said. "The fossil record of pollen could be read to say that this group of plants is a relic from the breakup of Gondwana—but by combining the leaf fossils and evidence from molecular biology, it looks like exactly the opposite is true."

More information: http://www.amjbot.org/cgi/content/full/97/1/59

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