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***THE BIOGEOGRAPHY AND ORIGIN OF
NEW ZEALAND SOPHORA (Leguminosae)***

A Thesis presented in partial fulfillment of
the requirements for the degree of
Master of Science in Plant Molecular Genetics
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Abstract

The application of DNA sequencing to studies of the biogeography and origin of New Zealand plant groups is illustrated by evolutionary relationships of *kowhai* (*Sophora* spp.; sect. *Edwardsia*; Sophoreae: Papilionoideae: Leguminosae). DNA sequences from an intergene region of the chloroplast *atpB-rbcL* were determined for 12 species by the use of the polymerase chain reaction. Signals in the molecular data were evaluated using phylogenetic algorithms to reconstruct the evolutionary history of the species.

The extremely high genetic similarity between *Edwardsia* *Sophora* resulted in an inability to fully resolve the phylogenetic tree. Three hypotheses are presented to account for the patterns of sequence differences between the New Zealand *Edwardsia*. One proposes a recent origin of *Sophora* section *Edwardsia* in New Zealand (4-10 million years ago), with subsequent dispersal of buoyant *Sophora microphylla* seeds to offshore and oceanic islands, where they might occasionally colonise. A second hypothesis suggests a recent radiation of *Sophora microphylla* and *Sophora prostrata* populations during the Pleistocene (0.1 - 1.6 million years ago), but is not well supported by the available sequence data. A third hypothesis proposes that the Lord Howe Island and New Zealand *Sophora* are derived from a Miocene (5-16 million years ago) oceanic migration of a Chilean ancestor of *Sophora* section *Edwardsia*. Predictions of the three hypotheses and strategies to test them are discussed.

Some of the conclusions derived from analyses of the chloroplast DNA sequences conflict with those obtained from morphological and chemotaxonomical studies. Analyses of all data sets indicates that the variations in morphology and secondary metabolic constituents between *Sophora prostrata* and *Sophora microphylla* obscures a small amount of genetic diversity. The question of hybrid origins for *Sophora microphylla* is not supported by tree reconstructions from the molecular data set, and further genetic and ecological studies are required to investigate this.

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But most of all I thank my parents, with much love.

Dedication

This thesis is dedicated in loving memory to my father, David James William Hurr, who passed away suddenly on September 16, 1995. He was a kind and intelligent man, who always took great interest in my university studies, and would have been very proud of my achievement. It is with much regret that he is unable to share this with me.

*"The Gods of the earth and sea
Sought thro' nature to find the Tree;
But their search was all in vain:
There grows one in the Human Brain."
(Blake)*

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