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**Genetic diversity and relationships of New Zealand totara
(*Podocarpus totara*)**

A thesis presented in partial fulfilment of the requirements
for the Degree of

Master of Science
in
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New Zealand.

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E kore te totara e tu noa ki te parae, engari me tu ki roto I te wao.

A totara is not found growing out in the open country, but in the heart of the forest

ABSTRACT

Totara (*Podocarpus totara*) is an iconic and endemic New Zealand species and its use as a timber for carving is still highly preferred by Tohunga whakairo (Māori carving experts). Current mature totara timber resources are scarce and mass replanting of totara is very costly. The ability to distinguish between species (especially *P. totara* and *P. hallii*) - identifying species from seed and seedlings – would be of much interest for nursery and restoration projects. Existing methods relying on bark characteristics, seed classification, and needle morphology are inadequate for this purpose. Hybridization can also make problematic species designations. This thesis reports the successful development of ten High Resolution Melting DNA markers that can differentiate New Zealand totara species. The chloroplast genome sequence of *P. totara* x *P. hallii* was completed and annotated, providing a further resource for developing additional molecular markers. The findings of this thesis will help ensure the “true” totara species (*P. totara*) is retained as a resource in perpetuity for Māori, conservationists, foresters and home gardeners.

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Ehara taku toa, he taki tahi, he toa taki tini

*My success should not be bestowed onto me alone, as it was not individual success but
success of a collective*

MY POSITION WITHIN THIS RESEARCH PROJECT

Ko Takitimu me Horouta te waka

Ko Whakapunake rāua ko Okahuatū te maunga

Ko Te Wairoa-Hopupu-Honengenenge-Matangirau raua ko Waipaoa te awa

Ko Ngāti Kahungunu rāua ko Te Aitanga-a-Māhaki te iwi

Ko Ngāti Te-Apatu rāua ko Whanau a Kai te hapu

Ko Takitimu rāua ko Te Rongopai te marae

Ko Wi Pere te tipuna

Ko Christina ahau

Tihei Mauri Ora!

Previous to the commencement of this study I completed a summer project at Massey University where I investigated the taxonomy of the New Zealand kamokamo or *C. pepo*. The project involved the use of molecular techniques such as PCR, Sanger sequencing, and also networking with local Māori growers. At the conclusion of the project it became clear that a research field that used such research skills and also provided some benefit to Māori would bring utmost satisfaction to me. As a Māori science student I also felt obliged to partake in a research project that would be of some significance to my whanau, iwi, and I. By coincidence I was briefed on the commencement of my summer project about the Totara, Forestry project at Scion. I was very interested in being part of a project where modern research techniques could be utilised to gain knowledge and help solve the issue of declining timber resources for Tohunga whakairo (carving). This thesis is written in hope that the future resources of totara will be sustained in a manner that allows the use of timber for whakairo by Māori throughout New Zealand.

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