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The ecosystem effects of the biocontrol of heather (*Calluna vulgaris*) with the heather beetle (*Lochmaea suturalis*).

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# Abstract

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The biological control of invasive plants has the ability to affect sustainable and targeted control over large areas. Such biological control programs are an important tool in the control of invasive plants in conservation areas. The ultimate aim for these programs is to provide a net ecosystem benefit via the reduction of invasive plant densities. However, whether this aim is fulfilled is rarely evaluated. Invasive plant control results in large scale disturbance to ecosystems by removing the novel but often utilised habitat and resources provided by the invasive plant. Biological control is also complicated by having a novel organism introduced into the ecosystem with potential flow on effects for species and trophic level interactions.

This research evaluated the ecosystem impact of the heather (*Calluna vulgaris*) biological control program using the heather beetle (*Lochmaea suturalis*) on the native tussock grassland in the central North Island of New Zealand. This was achieved by comparing invertebrate communities in a small scale experiment and over three large heather beetle outbreak sites. This work provides an extension to Keesing's (1995) research on the effects of heather invasion on communities.

Heather provides a novel and unsuitable food source to many native phytophagous insects, may disrupt host finding behaviours of these insects, and alter habitat structure and complexity affecting Araneae abundance. Changes in invertebrate community composition following control were related to the removal of these effects. This outcome was consistent with predictions from Keesing (1995) and in both small and large scale studies. Heather beetle presence was found to have a positive effect on Araneae and Collembola abundance.

Heather control also had a positive for the common skink (*Oligosoma nigriplantare polychroma*) Overall the biological control of heather caused invertebrate communities to revert back to a composition resembling more closely those found in non-invaded habitats. This suggests that the biological control of heather provides a net positive conservation benefit to native tussock grasslands.

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# Thesis outline

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This thesis is broken up into five chapters; general introduction, three research chapters written as individual stand-alone publications, and a general summary & recommendations.

As methods and study sites are often similar between chapters there is overlap and repetition of some aspects of introduction and results in chapters two and three and repetition of methodology throughout all chapters to maintain the stand-alone nature of the research chapters.

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