

No impact of the invasive plant *Hieracium lepidulum* on montane plant communities at two spatial scales

Ross Meffin, Alice L. Miller, Philip E. Hulme and Richard P. Duncan

Bio-Protection Research Centre, PO Box 84, Lincoln University, Lincoln 7647, New Zealand

Corresponding author: meffinr@lincoln.ac.nz

INTRODUCTION

There is debate over whether invasive weeds necessarily impact the communities they invade, or if they can coexist without discernable impacts. Much of this debate may stem from the scale dependency of alien plant impacts. Negative interactions between alien and native species are most likely to occur at fine spatial scales ($<1 \text{ m}^2$), while at coarser scales native plant diversity and alien abundance may covary with favourable environmental factors, leading to positive associations between the two. We followed the fate of montane plant communities that were experimentally sown with seeds of the alien weed *Hieracium lepidulum*, looking for changes in plant community composition and structure at two spatial scales, over 6 years.

METHODS

Location The study was conducted in the Craigieburn Stream catchment, Craigieburn Range, New Zealand at elevations ranging from 800 to 2000 m. The vegetation is montane forest to approximately 1400 m, above which it gives way to subalpine scrub, tussock and alpine herbfields.

Trial design Seeds of *H. lepidulum* were added to 756 30×30 cm plots at densities ranging from 0–15625 seeds per plot in 2003. Each plot was further divided into 36×5 cm cells. The experiment was laid out as a randomised block design, with seed addition resulting in a gradient of invader density and cover. Measurements were made at the plot scale of native plant community richness, evenness and diversity, along with *H. lepidulum* density and cover, four times between 2003 and 2009. In 2009 all measurements

were also made at the cell scale. Richness was quantified as the number of species per plot or cell, while for diversity and evenness Shannon's indices were used. For these, cover was used as a measure of abundance. The relationships between invader density and cover and local community attributes were modelled using hierarchical mixed-effect models, thereby accounting for non-independence introduced by the blocking design and repeated measurements.

RESULTS

Hieracium lepidulum cover in the plots ranged from 0–52%, with a mean of 1.9%. Overall, native plant species richness increased in the plots from 2003 to 2009, with richness increasing more in plots that had a greater density of *H. lepidulum*. In 2009 plot species richness was positively related to *H. lepidulum* density at both the plot and cell scales; while the relationship between *H. lepidulum* cover and species richness was significantly positive at the cell scale. Other relationships between the plant community and *H. lepidulum* were generally non-significant.

CONCLUSIONS

Hieracium lepidulum has had no measurable impact on the native plant community after 6 years, even when introduced at high densities. Instead, *Hieracium lepidulum* appears to have entered these communities and to simply co-exist as an additional member. The results suggest that *H. lepidulum* has persisted preferentially at those sites with conditions already supporting species rich assemblages, and that similar environmental factors drive both native diversity and *H. lepidulum* invasion.