



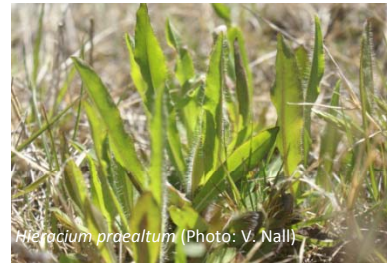
This research was conducted by Nicola Day MSc(Hons) and Dr. Hannah Buckley of the Department of Ecology, Lincoln University. For the full report, see www.linz.govt.nz. For more information, please contact Hannah.Buckley@lincoln.ac.nz



New Zealand's specialist land-based university

Colonisation and spread of *Hieracium* spp in the South Island high country over 25 years

The spread of *Hieracium* spp throughout the New Zealand high country has been a concern for a number of decades because it can degrade the quality of both native and pastoral grasslands. The three primary species in the South Island high country are *Hieracium lepidulum* (tussock hawkweed: right), *H. pilosella* (mouse-ear hawkweed: below right) and *H. praealtum* (king-devil hawkweed: below left).



Hieracium praealtum (Photo: V. Nall)



Hieracium pilosella



Hieracium lepidulum

Changes on permanent vegetation transects over 25 years at two spatial scales

We sampled *Hieracium* on 124 permanently-marked vegetation transects that were established on 27 properties in non-forest communities across Canterbury and Otago, in both conservation and pastoral tenure (Fig. 1). Each transect was measured three times (during 1980s, 1990s and 2000s). Each transect was 100 m long and comprised 50, square 0.25m² quadrats placed at two metre intervals.

We investigated the changes that occurred in the occurrence and abundance of each *Hieracium* species at two spatial scales: (1) landscape, between transect scale (colonisation) and (2) local, within-transect scale (changes in the number of quadrats each species occurs in per transect and percent quadrat cover).

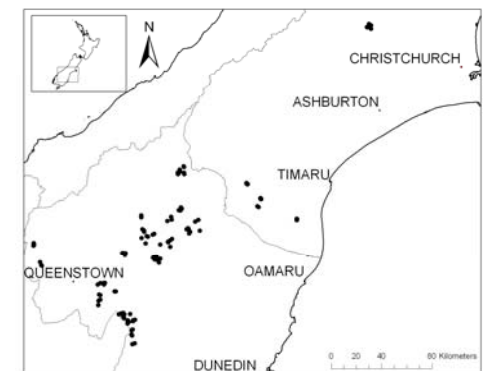


Figure 1: Locations of 124 permanently-marked tussock grassland transects.

***Hieracium* has increased since the 1980s**

All three *Hieracium* species have expanded their range and increased locally in the eastern South Island since the 1980s (Fig. 2).

Species interactions and composition was important for determining the spread of the three *Hieracium* species

Short-tussock: All three *Hieracium* species were more likely to colonise, and/or had higher rates of increase in abundance or percent quadrat cover, on transects where short-tussock (*Festuca novae-zelandiae*) was more abundant. Other studies have also shown short-tussock grasslands to be susceptible to invasion by *Hieracium*.

Oversowing: Consistent with other studies, we found that *H. praealtum* was less likely to colonise and increase locally on transects that had been previously oversown. However, *H. lepidulum* showed faster rates of increase in abundance on transects that had been oversown.

Precipitation: *H. lepidulum* and *H. praealtum* showed lower rates of change where precipitation was high, and other studies have shown a similar pattern. Precipitation had no significant effect on the colonisation or spread of *H. pilosella*.

Initial abundance: *H. lepidulum* and *H. pilosella* increased at a faster rate on transects where they were initially abundant. Initial abundance had no significant effect on the colonisation or spread of *H. praealtum*.

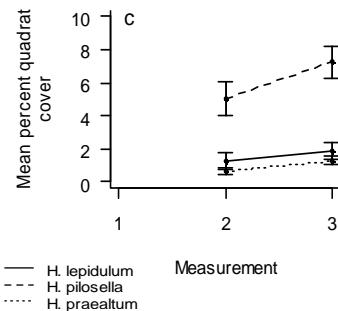
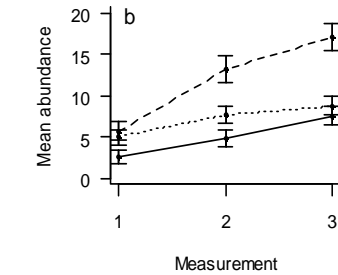
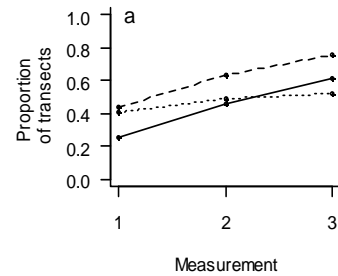


Figure 2: Change across the three measurement times in the (a) proportion of transects occupied out of 124, (b) mean abundance, measured as the mean number of occupied quadrats per transect, and (c) percent cover of *Hieracium lepidulum*, *H. pilosella* and *H. praealtum*. Error bars represent standard errors in the means.

***Hieracium* species have different ecological tolerances**

Solar radiation: *H. pilosella* increased in abundance at faster rates on sunnier slopes, but *H. lepidulum* increased in percent cover faster on shadier slopes.

Tall-tussocks: *H. lepidulum* and *H. pilosella* increased faster where tall-tussocks were abundant, but this had no significant effect on *H. praealtum*.

Effect of tenure differed for each species

H. lepidulum was more likely to colonise and increase in pastoral tenure, but there was no significant relationship between tenure and *H. pilosella* or *H. praealtum*.

Conclusions

The continued spread of *Hieracium* spp in the South Island high country since the 1980s appears to be related to environmental factors, management, and species interactions. However, there are ecological differences between the species that have resulted in different patterns of invasion.

Acknowledgements

This research was funded by Land Information New Zealand, Department of Conservation, the Struthers Trust, the Lincoln University Research Fund, the Miss E. L. Hellaby Indigenous Grasslands Research Trust, and the Marsden Fund administered by the Royal Society of New Zealand. We would like to gratefully acknowledge the leaseholders that allowed us on to their properties to remeasure vegetation in this study. In the interest of maintaining the lessees' privacy and professional working relationships in this area this report does not contain any identifiable information pertaining to the identities of lessees or their properties.

