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Colonisation and spread of *Hieracium* weed species 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



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Changes on permanent vegetation transects over 25 years

We sampled 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.

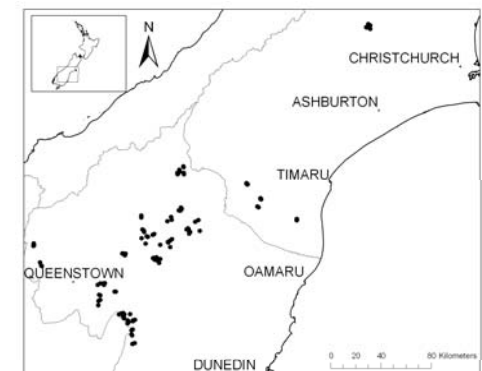


Figure 1: Locations of 124 permanently-marked tussock grassland transects.

Two spatial scales of invasion over 25 years

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).

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 all three species were less likely to colonise transects that had been previously oversown.

Precipitation: All three species showed lower rates of increase in abundance where precipitation was high, and other studies have shown a similar pattern.

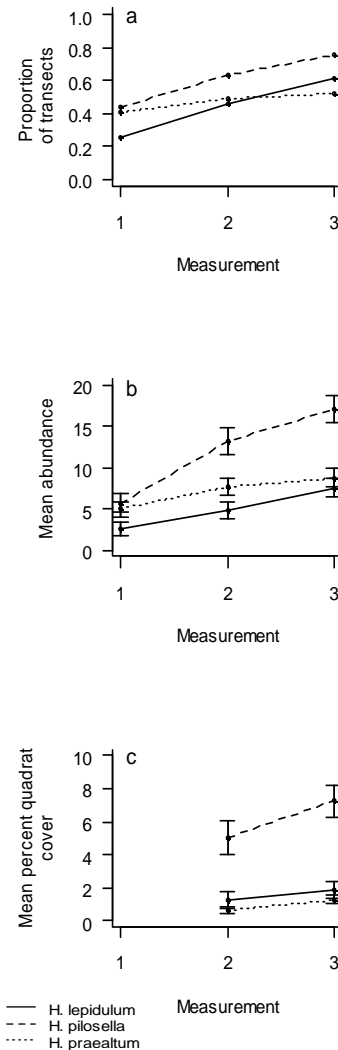


Figure 2: Change across the three measurement times in the (a) proportion of transects occupied out of 124, (b) mean abundance, measured as the mean number of occupied quadrats per transect, and (c) percent cover of *Hieracium lepidulum*, *H. pilosella* and *H. praealtum*. Error bars represent standard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

Hieracium species have different ecological tolerances

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

Tall-tussocks: *H. lepidulum* was more likely to colonise and increase locally where tall-tussocks were abundant during both periods, but this had no significant effect on *H. pilosella* or *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 is related to species interactions; short-tussock grasslands, and/or areas that have not been oversown are most susceptible to invasion.
- There was no consistent relationship between tenure and the increase in *Hieracium* spp.

Acknowledgements

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