

Manaaki Whenua Landcare Research

### Hieracium pilosella (syn. Pilosella officinarum)

- Often just called hieracium or mouse-ear hawkweed.
- At least four other 'hawkweed' species but *H. pilosella* is most common.
- Hieracium excludes other plants and reduces feed availability and represents a threat to conservation values in South Island high country and in the central North Island.
- Concern about hieracium invasion in the 1980s led to the formation of the Hieracium Control Trust in 1993 and biocontrol agents were sourced and imported.

### **Biocontrol agents released onto hieracium since 1999**

Gall wasp

Gall midge

Root hover fly







Plume moth





Crown hover fly



### Only the gall wasp and midge established





### Gall wasp (Aulacidea subterminalis)







## Gall midge (Macrolabis pilosellae)





# How well have wasps and midges spread, and what impacts have they had? (56 release sites checked)





PAGE 12

### North Island gall wasp and midge sites

- Wasps only established at 3 of 20 sites and no spread or damage yet.
- Midges established at 11 of 13 sites and spread over 10 km<sup>2</sup>.

PAGE 13



### North Island gall midge impact experiment - methods

- Paired plots were set up in 2003.
- 12 sites randomly assigned release and control plots at each.
- Percentage cover of hieracium measured between 2006 and 2012.



### North Island gall midge impact experiment - results

- Midges established at 11 out of the 12 sites.
- At half of the sites midge densities were too low by 2012 to have an impact.
- At the other half, midges galled up to 33% of plants and hieracium cover reduced.



### North Island gall midge impact experiment - results

- Cover ↓ 29% in high density midge plots.
- Cover ↓ 11% in control plots.
- 18% difference could be attributed to midge damage.
- So why an 11% ↓ in control plots?



### North Island gall midge impact experiment - results

- Cover ↓ 29% in high density midge plots.
- Cover ↓ 11% in control plots.
- 18% difference could be attributed to midge damage.
- So why an 11% ↓ in control plots?
- Kaimanawa horse grazing ↓ ?



### South Island gall wasp and midge establishment and dispersal



- Wasps found at 11/12 release sites and are now widespread in Canterbury and Otago!
- Midges at 8/11 release sites but still restricted in range found just a few hundred meters to 15km from release sites.

### **South Island impacts - methods**



PAGE 19

| 20 x 20 cm quadrat measurements along 40 m transects at gall wasp and gall midge release sites for SFFF 19028 |        |        |        |        |                 |        |        |        |        |      |         |           |       |           |       |        |
|---|--------|--------|--------|--------|-----------------|--------|--------|--------|--------|------|---------|-----------|-------|-----------|-------|--------|
| Site  |        |        | GPS    |        |                 | Date   |        |        |        |      |         |           |       |           |       |        |
| Agent released Photo Y/N  |        |        |        |        | Any rust found? |        |        |        |        |      |         |           |       |           |       |        |
| % cover & plant counts  |        |        |        |        |                 |        |        |        |        |      |         |           |       |           |       |        |
| Hiepil=H.pilosella, Hiepra=H.praealtum, Hiecae=H.caespitosum, Hielep=H.leipidulum                             |        |        |        |        |                 |        |        |        |        |      |         |           |       |           |       |        |
|   |        |        |        |        |                 |        |        |        |        |      | stolons | plants    |       | plants    |       |        |
| Dist  | Hiepil | Hiepil | Hiepra | Hiepra | Hiecae          | Heicae | Hielep | Hielep | Bare   |      | in      | galled by | wasp  | galled by | midge | Photo  |
| (m)   | cover  | plants | cover  | plants | cover           | plants | cover  | plants | ground | Rock | quadrat | wasp      | galls | midge     | galls | number |
| 1   |        |        |        |        |                 |        |        |        |        |      |         |           |       |           |       |        |
| 2   |        |        |        |        |                 |        |        |        |        |      |         |           |       |           |       |        |
| 3   |        |        |        |        |                 |        |        |        |        |      |         |           |       |           |       |        |

## Geordie Hills – an example



# 60% cover, 87% of stolons galled by wasps and midges present but <1% plants galled.



### South Island attack levels

- On average wasps had galled 67% of stolons but only 7% of plants had stolons.
- 10% of plants were galled by midges.

### South Island impacts – combined results<sup>1.</sup>

• No overall change in hieracium cover between 2005 and 2020 (limited data due to Marlborough trip cancellation)

| Site          | Released | 2005 % | Agents       | 2020 % | Proportion of | 2005 - 2020 | Management |       | agement          |
|---------------|----------|--------|--------------|--------|---------------|-------------|------------|-------|------------------|
|               |          | cover  | present in   | cover  | plants galled | % cover     |            |       |                  |
|               |          |        | 2020         |        |               |             |            |       |                  |
| Ben Ohau      | wasp     | 18.0   | wasp & midge | 6.6    | 0.13          | -11.4       |            | -11.4 | Lack of grazing  |
| Galloway      | wasp     | 49.0   | wasp & midge | 62.0   | 0.02          | 13.0        | 13.0       |       | No change        |
| Geordie Hills | wasp     | 51.0   | wasp & midge | 60.6   | 0.10          | 9.6         | 9.6        |       | No change        |
| Lake Hawea    | wasp     | 16.0   | wasp         | 31.8   | 0.08          | 15.8        | 15.8       |       | No change        |
| Ben Ohau      | midge    | 20.0   | wasp & midge | 11.9   | 0.05          | -8.1        |            | -8.1  | Lack of grazing  |
| Breast Hills  | midge    | 15.0   | wasp & midge | 0.0    | n/a           | -15.0       |            | -15.0 | Fertiliser added |
| Galloway      | midge    | 54.0   | wasp & midge | 48.0   | 0.08          | -6.0        | -6.0       |       | No change        |
| Glenrock      | midge    | 26.0   | wasp         | 31.8   | < 0.00        | 5.8         | 5.8        |       | No change        |
| Averages      |          | 31.1   |              | 31.6   | 0.1           | 0.5         | 7.6        | -11.5 |                  |

### South Island impacts – combined results<sup>1.</sup>

- No overall change in hieracium cover between 2005 and 2020
- At sites with no change to management cover up by 7.6%

| Site          | Released 2005 % |       | Agents       | 2020 % | Proportion of | 2005 - 2020 | Management |       | agement          |
|---------------|-----------------|-------|--------------|--------|---------------|-------------|------------|-------|------------------|
|               |                 | cover | present in   | cover  | plants galled | % cover     |            |       |                  |
|               |                 |       | 2020         |        |               |             |            |       |                  |
| Ben Ohau      | wasp            | 18.0  | wasp & midge | 6.6    | 0.13          | -11.4       |            | -11.4 | Lack of grazing  |
| Galloway      | wasp            | 49.0  | wasp & midge | 62.0   | 0.02          | 13.0        | 13.0       |       | No change        |
| Geordie Hills | wasp            | 51.0  | wasp & midge | 60.6   | 0.10          | 9.6         | 9.6        |       | No change        |
| Lake Hawea    | wasp            | 16.0  | wasp         | 31.8   | 0.08          | 15.8        | 15.8       |       | No change        |
| Ben Ohau      | midge           | 20.0  | wasp & midge | 11.9   | 0.05          | -8.1        |            | -8.1  | Lack of grazing  |
| Breast Hills  | midge           | 15.0  | wasp & midge | 0.0    | n/a           | -15.0       |            | -15.0 | Fertiliser added |
| Galloway      | midge           | 54.0  | wasp & midge | 48.0   | 0.08          | -6.0        | -6.0       |       | No change        |
| Glenrock      | midge           | 26.0  | wasp         | 31.8   | < 0.00        | 5.8         | 5.8        |       | No change        |
| Averages      |                 | 31.1  |              | 31.6   | 0.1           | 0.5         | 7.6        | -11.5 |                  |

PAGE 26

### South Island impacts – combined results<sup>1.</sup>

- No overall change in hieracium cover between 2005 and 2020
- At sites with no change to management cover up by 7.6%
- At sites with a lack of grazing or fertilizer added cover down by 11.5%

| Site          | Released | 2005 % | Agents       | 2020 % | Proportion of | 2005 -2020 | Managemen |       | agement          |
|---------------|----------|--------|--------------|--------|---------------|------------|-----------|-------|------------------|
|               |          | cover  | present in   | cover  | plants galled | % cover    |           |       |                  |
|               |          |        | 2020         |        |               |            |           |       |                  |
| Ben Ohau      | wasp     | 18.0   | wasp & midge | 6.6    | 0.13          | -11.4      |           | -11.4 | Lack of grazing  |
| Galloway      | wasp     | 49.0   | wasp & midge | 62.0   | 0.02          | 13.0       | 13.0      |       | No change        |
| Geordie Hills | wasp     | 51.0   | wasp & midge | 60.6   | 0.10          | 9.6        | 9.6       |       | No change        |
| Lake Hawea    | wasp     | 16.0   | wasp         | 31.8   | 0.08          | 15.8       | 15.8      |       | No change        |
| Ben Ohau      | midge    | 20.0   | wasp & midge | 11.9   | 0.05          | -8.1       |           | -8.1  | Lack of grazing  |
| Breast Hills  | midge    | 15.0   | wasp & midge | 0.0    | n/a           | -15.0      |           | -15.0 | Fertiliser added |
| Galloway      | midge    | 54.0   | wasp & midge | 48.0   | 0.08          | -6.0       | -6.0      |       | No change        |
| Glenrock      | midge    | 26.0   | wasp         | 31.8   | <0.00         | 5.8        | 5.8       |       | No change        |
| Averages      |          | 31.1   |              | 31.6   | 0.1           | 0.5        | 7.6       | -11.5 |                  |

### For those SI sites that didn't have historical veg data

Variance in hieracium cover is not explained by the proportion of plants galled. Something else is more important....



<sup>1.</sup>Data pooled at locations with more than one release site.

June 20

PAGE 29

.... probably due to changes in land management in Canterbury and Otago, i.e. irrigation, cultivation, reduced grazing pressure, fertilizer (lime, sulphur).

.... probably due to changes in land management in Canterbury and Otago, i.e. irrigation, cultivation, reduced grazing pressure, fertilizer (lime, sulphur)....

... and this theory is backed by anecdotal evidence from farmers in the Marlborough region.

f

### Awatere Valley farmers make a dent in "scourge of the high country"

pat deavoll + 17:10, Mar 06 2018



### Awatere Valley farmers make a dent in "scourge of the high country"

pat deavoll - 17:10, Mar 06 2018

0 🕐 🚭 🖸

"The Awatere has just had three of the best years for growth. They have feed as they have never seen before. That's because they have had a good rainy autumn and spring and summer. The other grasses have managed to seed and get themselves going and out-compete the hieracium."

## $\bigcirc$

### Awatere Valley farmers make a dent in "scourge of the high country"

pat deavoll - 17:10, Mar 06 2018

"In country that's been developed and seed and fertiliser put on, it is definitely on the decline"

"Put fertiliser on or alter the PH with a bit of lime and the other plants around it get a chance to establish."

### Awatere Valley farmers make a dent in "scourge of the high country"

pat deavoll - 17:10, Mar 06 2018

"In the tough areas with low rainfall like we have where it is not worth doing a lot of oversowing and topdressing, it is not on the decline."

"...the Department of Conservation has done some work at the Tekapo Scientific Reserve where they have taken away all the grazing [for stock and rabbits] and the natural plants are out-competing the hieracium."

### Conclusions

- While biocontrol agents have become common in some areas, population densities are still building and more time may be required to realise potential impacts.
- An 18% reduction in hieracium cover in the North Island was not seen in the South Island. It is possible that the gall midge is not doing as well in drier sites in the South Island.
- Hieracium cover is still high in areas with unimproved pasture.
- Further biocontrol agents may be required in future to control hieracium in unimproved pasture where dry and exposed conditions may be limiting midge impacts and seed feeders may need to be reconsidered.

#### Acknowledgements

- Hieracium Farmers Group
- Barry Wills
- The New Zealand Defence Force
- Sustainable Food & Fibre Futures Fund 19028