Hieracium pilosella **System:** Terrestrial

Kingdom	Phylum	Class	Order	Family
Plantae	Magnoliophyta	Magnoliopsida	Asterales	Asteraceae

Common name mouseear hawkweed (English), mouse-ear hawkweed (English), épervière piloselle (French)

Synonym *Pilosella officinarum* , F. W. Schultz & Sch. Bip.

Similar species

Summary Several of the European hawkweeds Hieracium spp. have been introduced to New Zealand and North America. The mouseear hawkweed Hieracium pilosella invades pastures, road sides and natural areas. It is a rapid colonizer and forms dense mono-specific patches due to its vegetative (stolons) and sexual reproduction; seeds also form asexually by apomixis. Mouseear hawkweed has the ability to alter soil nutrient status, replace native flora and decrease palatable forage in pastures. Sheep and livestock avoid the mouseear hawkweed becuse of its prostrate growth habit and highly pubescent leaves.

[view this species on IUCN Red List]

Species Description
Hieracium pilosella is a perennial, stoloniferous flatweed with extensive underground root mass. Patches of *H. pilosella* usually range from 0.5 to 1.2 m in diameter, with almost 100% cover within the patch. Patches are often surrounded by a 15 cm wide “halo” of bare ground which is drier, lower and nutrients and higher in acidity than soil outside the halo (Scott *et al*., 2001). *H. pilosella* is genetically and morphologically highly variable. Zhan (1923 in Trewick *et al*., 2004) reported 624 variants of the species.

Notes
The two direct children listed under *Hieracium pilosella* are *Hieracium pilosella* var. *niveum* Muell.-Arg. and *Hieracium pilosella* var. *pilosella* L. (ITIS, 2010).The systematics of the genus *Hieracium* is extremely complex and contentious, probably due to recent speciation, hybridization, polyploidy, and diverse reproductive strategies. In its native European range five cytopes of *H. pilosella* have been identified, ranging from diploid to heptaploid, but the range is dominated by sexual tetraploids and asexual pentaploids (Trewick *et al*., 2004).
In its invasive range in New Zealand initial studies indicated that most *H. pilosella* populations were pentaploid. However further studies revealed aneuploids and hybrids. Tetraploid sexual plants have been confirmed in some populations. New Zealand populations are morphologically and genetically diverse, apparently surprisingly so, given that the initial introduction is thought to have been recent, small and asexual. Hybrids of a related taxon (probably *H. praealtum* have also occurred at least three times (Trewick *et al*., 2004 and references therein).

Lifecycle Stages
Hieracium pilosella is a perennial plant.

Habitat Description
Invasive populations of *Hieracium pilosella* in Australia, New Zealand and North America occupy different climatic niches to those realized in their native ranges. Particularly in eastern North America its invasive regions tend to be wetter than its native range. Furthermore, geographically separate invasive populations of these two species have distinct climatic niches (Beaumont *et al*. 2009a).

Reproduction
Hieracium pilosella spreads by seed and stolons; it also produced seeds asexually by apomixis. Hawkweed seeds are wind dispersed, with most seeds falling within 2 m of the parent plant, and long-distance events are rare. This limited dispersal may hinder the ability of hawkweeds to realise their full geographic potential under current and future climates (Williams & Holland, 2007 and references therein). Plants are highly fecund producing up to 40,000 seeds/square metre of cover/year (Burton & Dellow, 2005 in Beaumont *et al*., 2009b).

Nutrition
Hieracium pilosella plants can tolerate heat, frost and snow (Beaumont *et al*., 2009b).

General Impacts
In New Zealand, *Hieracium pilosella* is considered a “sleeper weed”, as it was first introduced to the country in 1878 but remained localised for around 80 years. After this “lag” phase of at least 80 years the population suddenly increased its range dramatically. It has now spread significantly into tussock grasslands used for grazing and into conservation areas (Klöppel *et al*., 2003; Groves, 2006).
This weed forms dense patches of small, flat rosettes than can cover up to several hectares in area. *H. pilosella* excludes native species by outcompeting them. The ability of *H. pilosella* to outcompete native New Zealand plants has been confirmed in laboratory experiments (Moen & Meurk, 2001). Although *H. pilosella* is thought to be eradicated in Australia, *Hieracium* potentially threaten tussock grasslands and tablelands in alpine and temperate regions of the eastern states of Australia (Barker *et al*., 2006 in Beaumont *et al*., 2009b).
H. pilosella affects soil properties and nutrient cycling in areas it inhabits. Soils under *H. pilosella* are higher in P (Beaumont *et al*., 2009b), N and C (Saggar *et al*., 1998; McIntosh *et al*., 1995), higher in soil microbial biomass C, N and P and have greater microbial decomposition (Saggar *et al*., 1998). *H. pilosella* alters the nitrogen cycle under patches, converting more mineral N into organic microbial forms, and may be one of the reasons for its success in invading N-deficient environments in New Zealand. Indeed soil processes under this plant are profoundly different from those occurring in areas it invades, which may only be a metre away (Saggar *et al*., 1998). One reason for these differences may be due to the fact that H. pilosella is a perennial and thus returns more C and N to the soil from dying leaves and roots than do surrounding herbfield annuals (McIntosh *et al*., 1995)
The ability of *H. pilosella* to extract large proportions of moisture and nutrients from the surrounding soil results in a “halo” of soil around patches that is drier, more acidic and less favourable for growth of other species (McIntosh *et al*., 1995). McIntosh *et al* (1995) found that *H. pilosella* patches their diameter c. 13cm each year by expanding the halo of bare soil surrounding them. The halo appears to be a zone in which nutrients are depleted to the benefit of the plant.
Furthermore, increased acidification, may increase labile aluminium in the soil, which could further enhance the spread of *H. pilosella* and reduce establishment of other species (Boswell & Espie, 1988 in Scott *et al*., 2001). Glasshouse experiments have recorded that increased carbon dioxide levels have a fertilisation effect on *H. pilosella*, suggesting increased competitive ability of this species in future climates (Leadley & Stöcklin, 1996 in Beaumont *et al*., 2009b).
The weed also has agricultural impacts, which may have serious financial consequences for farmers in New Zealand (Scott, 1993 in Moen & Meurk, 2001). It is a serious weed for high country farmers in New Zealand as it reduces species richness and of short tussock grasslands and total forage available to sheep. Although *Hieracium* is palatable, the low growth form makes it unavailable to sheep (Moen & Meurk, 2001)

Management Info
Preventative measures: Predicting Distribution- Ecological niche modelling (ENM) is a way of assessing potential spread of non-native organisms ENM was carried out on *Hieracium pilosella* using just native range data versus entire range (invasive and native) showed that climatic niches of invasive populations differed substantially from their native ranges. A number of populations were shown to exist in areas where there is no current climate analogue in its native European range. In eastern North America *H. pilosella* invasive regions it inhabits tend to be wetter than in its native range. In western North America it occupies a subset of its native range, and in Australia and New Zealand populations occupy a climatic niche more similar to their native range than those of North American populations. Modelling using only native range data or only invasive range data is not sufficient to accurately predict distributions, and failed to capture known distributions in North America, New Zealand and Australia. Entire range data was more effective at predicting current distributions. These differences are likely to occur due to release from biotic constraints in invasive range, allowing species to fulfil their entire fundamental niche (Beaumont *et al*., 2009a).
For example, in Europe *Hieracium* has several insects which are specialist feeders and cause significant damage, whereas specialist herbivores are less common in its invasive range and do not cause significant damage (Sárospataki, 1999 in Beaumont *et al*. 2009a; Syrett & Smith, 1998 in Beaumont *et al*., 2009a). In its native range geographical barriers may also limit *Hieracium* spread; little is known about limiting range margins in its introduced range. Populations of *H. pilosella* in New Zealand have a high degree of genetic and genome size variation due to interspecific hybridisation, which may have contributed to its invasive success in New Zealand (Morgan-Richards *et al*., 2004 in Beaumont *et al*., 2009a).
Biological control In New Zealand a biological control project was initiated in the 1990s. Five insect species associated with *H. pilosella* in central Europe were selected for introduction into New Zealand that were chosen. The insects were chosen as they have narrow host ranges and are damaging to the plant (Syrett *et al*., 2001 in Klöppel *et al*., 2003). There were: *Oxyptilus pilosellae*, a plume moth feeding on the above-ground plant parts, *Aulacidea subterminalis*, a gall wasp causing galls at stolon tips, *Macrolabis pilosellae*, a gall midge attacking the stolon tips and rosette centres, and *Cheilosia urbana* and *Cheilosia psilophthalma*, hoverfly species which feed externally on the roots and on the above-ground plant parts, respectively. All five insect species were released in New Zealand, and the two gall-forming insects established in the field (CABI, 2010).\r\n
Laboratory trials of the gall wasp *A. subterminalis* were conducted on stressed (water, nutrient and plant competition) and non-stressed plants. The authors concluded that galling by the wasp is likely to reduce vegetative reproduction of *H. pilosella* whether or not the plants are stressed, indicating that the wasp may be a successful biocontrol agent (Klöppel *et al*., 2003).
Grazing: Grazing by sheep has been suggested as a low-cost method of removing *H. pilosella* inflorescences in order to reduce seedling establishment. Three studies in New Zealand have provided evidence that sheep grazing can reduce the percentage of plants with flowers (Norton & Reid, 2009 and references therein). However there is evidence that grazing of inflorescences can result in increased stolon production. Further research is necessary to confirm whether grazing is an effective management tool as suggested by Espie (2001 in Norton & Reid, 2009).

Pathway
Introduced by acclimatisation societies.

Principal source:

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[1] ARGENTINA
[2] AUSTRALIA
[1] CANADA
[1] CHILE
[1] FALKLAND ISLANDS (MALVINAS)
[1] NEW ZEALAND
[1] SAINT PIERRE AND MIQUELON
[3] UNITED STATES

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Summary: This compilation of information sources can be sorted on keywords for example: Baits & Lures, Non Target Species, Eradication, Monitoring, Risk Assessment, Weeds, Herbicides etc. This compilation is at present in Excel format, this will be web-enabled as a searchable database shortly. This version of the database has been developed by the IUCN SSC ISSG as part of an Overseas Territories Environmental Programme funded project XOT603 in partnership with the Cayman Islands Government - Department of Environment. The compilation is a work under progress, the ISSG will manage, maintain and enhance the database with current and newly published information, reports, journal articles etc.
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