Weed Biocontrol

WHAT'S NEW?

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Contents

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COVER IMAGE:
Air potato beetles on host plant.
Illustration by Mindy Lighthipe.

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Assessment reveals that gorse remains healthy

Gorse biocontrol began in the 1930s with the release of the gorse seed weevil (*Exapion ulicis*), which was intended to reduce the spread of gorse but not affect its use as a hedging plant. Six more agents were released during the 1980–90s, including the gorse pod moth (*Cydia succedana*), the gorse soft shoot moth (*Agonopterix umbellana*), the gorse colonial hard shoot moth (*Pempelia genistella*), gorse thrips (*Sericothrips staphylinus*), the gorse spider mite (*Tetranychus lintearius*), and the gorse hard shoot moth (*Scythris grandipennis*). The gorse hard shoot moth failed to establish.

Various investigations have been conducted to assess the individual impacts of some of these biocontrol agents for gorse in New Zealand and Australia, but no formal, wide-scale assessment has been completed to assess agent occurrence and prevalence, impacts on seed production, and gorse condition and growth.

This study, completed between 2022 and 2024, measured current levels of seed predation and impacts from foliage feeding by gorse biocontrol agents throughout New Zealand. "We wanted to determine if impacts of biocontrol agents released since the 1930s have been sufficient to reduce gorse cover on a landscape scale", said Paul Peterson, the senior technician who led this work.

The investigation was split into two components: one was an intensive, focused study to measure the impacts of the two seed predators (the gorse seed weevil and gorse pod moth) on seed banks in the soil at two sites; the other was a non-intensive survey to get a snapshot of impacts from the four established foliage-feeding biocontrol agents (the gorse spider mite, gorse thrips, gorse soft shoot moth, and gorse colonial hard shoot moth), covering all regions of New Zealand.

"We chose two sites for the first study – one in the North Island and one in the South Island – to measure annual addition to the seed bank after accounting for seed predation," said Paul. "We tagged individual seed pods at various times throughout the year on 30 plants and very carefully followed the fate of each." Pods were opened and seed predation by the agents assessed.

Gorse seed weevil larvae.

Gorse pod moth larva.

Data from each site were compared with a model produced by Rees and Hill in 2001, which predicts gorse cover based on seed fall and the probability of disturbances, such as fire and overgrazing. At the site in Christchurch, with seed predation at 60%, the model predicted that gorse cover would decline over time if the site remains undisturbed and seedling recruitment is low. However, at the Palmerston North site, where seed production was higher and seed predation only 24%, gorse cover was likely to increase over time regardless of disturbance regimes.

Paul and his team then focused on the four established foliar-feeding biocontrol agents. Seventeen sites, including one on the Chatham Islands, were visited and measurements taken to assess the occurrence and prevalence of biocontrol agents, the general condition of gorse, gorse growth rates, and soil seed banks. The study also included a questionnaire for landowners to find out about changes to land management that could affect gorse – aside from biocontrol impact. They were able to replicate growth rate measurements that were carried out intensively in the Dunedin area in the mid-1980s and compare the current growth rates to the 'pre-biocontrol' snapshot for that region.

Weeks of scrambling around through gorse taking measurements and speaking to landowners made one thing clear: despite the biocontrol agents being present at most of the sites, gorse is as healthy and as dense as it has ever been. In fact, dead gorse made up just 8.8% of gorse stands on average.

There were some exceptions. For example, at the Palmerston North site the gorse spider mite appeared to be severely damaging and/or killing up to 18% of gorse, and a potentially damaging outbreak of soft shoot moth was also seen.

Two native insects that bore into the stems of gorse were also commonly found on dead or dying plants. Lemon tree borer (*Oemona hirta*) damage was found at nearly all North Island sites, and gorse stem miner (*Anisoplaca ptyoptera*) damage at nearly all South Island sites. In fact, the amount of native borer damage found in live plants was the only predictor of the percentage of dead gorse.

Other species found inside dying gorse included the moth species *Erchthias capnitis* and *Barea confusella*; however, these species are recorded as only feeding on dead plant material, and they are unlikely to be contributing to plant mortality.

Seed banks varied by region but were particularly high in Otago, where a record 32,000 seeds/m^2 were collected. On the flip side, the lowest seed bank density was measured from the Chatham Islands at 204 seeds/m^2. It is possible that a lack of pollination by honeybees at this site was the cause. Honeybees have previously been identified as a critical driver of pollination and seed production for broom, which has a 'spring-loaded' flower, very similar to gorse. This pollination mechanism can only be tripped by large exotic pollinators.

"Insights from landowner questionnaires agree with our field measurements", said Paul. Landowners were generally not aware of any impacts from biocontrol agents (except a mention of seed feeders and gorse spider mites), and gorse was mostly described as getting denser over time.

"The repeat sampling at gorse sites in and around Dunedin added even more interesting data to our study", explained Senior Researcher, Simon Fowler. Not only did gorse appear to be unimpeded by biocontrol, but there was a significant increase in the stem diameter of plants compared with data from the 1980s, suggesting, if anything, that gorse growth rates have increased over time! "Whether this is due to increased temperatures or carbon dioxide concentrations, or some other factor, is yet to be determined, but we do know that the impact biocontrol agents are currently inflicting on gorse is insufficient to overcome those factors," said Simon.

Webs of gorse spider mite.

Our results confirm that the gorse biocontrol agents are struggling to have a meaningful impact on gorse in most circumstances. New biocontrol agents for gorse can be pursued if there is interest and funding. It won't be a quick fix, though, and land management practices such as minimising disturbance and controlling seedlings following disturbance will remain significant tools in the medium term, alongside minimising gorse pollination.

Further reading:

Lee WG, Allen RB, Johnson PN 1986. Succession and dynamics of gorse (*Ulex europaeus* L.) communities in the Dunedin ecological district South Island, New Zealand. New Zealand Journal of Botany 24(2): 279–292.

Rees M, Hill RL 2001. Large-scale disturbances, biological control and the dynamics of gorse populations. Journal of Applied Ecology 38(2): 364–377.

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Beetle arrival to help Niue

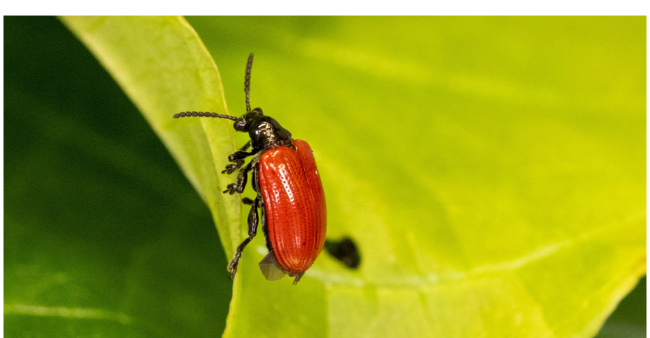
In November last year Niue welcomed the air potato leaf beetle (*Lilioceris cheni*), which researchers hope will turn the tide against the invasive weed known as air potato (*Dioscoria bulbifera*), or locally as hoi. As the technical lead for the Pacific Regional Invasive Species Management Support Service (PRISMSS) Natural Enemies – Natural Solutions (NENS) Programme, MWLR researchers made the first delivery of the leaf-feeding beetle in the Pacific.

The beetles were reared in MWLR's Invertebrate Containment facility at Lincoln and were released in collaboration with Niue's Environment Department, with the help of the National Invasive Species Coordinator, Huggard Tongatule. "Using natural enemies against invasive weeds in Niue can provide long-term, cost-effective and natural control that is so desperately needed here," said Huggard. "Hoi is widespread here and has proven to be a very costly and labour-intensive weed to remove, especially for farmers with crop plantations." Huggard noted that a workshop in early 2020 ranked hoi as a top priority for action against weeds in Niue.

Air potato, a fast-growing vine with heart-shaped leaves and potato-like bulbils, is native to Asia. It has become invasive in several Pacific Islands, including Fiji, French Polynesia, Niue, Palau, Tonga, and Wallis and Futuna. Air potato is also widely naturalised in tropical and subtropical regions around the world.

Thick mats of air potato can quickly smother native vegetation, causing native plant communities and other biodiversity to decline, which in turn affects ecosystem functioning. Air potato also infests agricultural land, reducing crop yields. Evidence suggests that vines benefit from increasing carbon dioxide in the atmosphere and will become even more invasive and harmful in the future.

Since air potato grows on and becomes entangled with other plants, including native ones, it is difficult to apply herbicide without also harming them. Manual removal is very time-consuming and challenging because the controlled plants can quickly resprout from their network of underground tubers and will also grow from cut vines and bulbils, which can survive for months even if they are buried under soil.



Air potato leaf beetle – *Lilioceris cheni.*

Although the air potato leaf beetle is a new natural enemy for the Pacific, the beetle has been extensively studied by researchers in the United States, and was first released in Florida and other southern states in 2012. Adult beetles chew many round holes in the leaves and larvae eat the leaf tissue, leaving only the skeletonised veins of the leaf. The beetle provides an effective and low-cost way of controlling air potato.

Lynley Hayes, leader of the NENS Programme, said that while the air potato beetle is a first for Niue, beneficial organisms have been used before on the island to manage invasive weeds. "It has been 20 years since four natural enemies were released in Niue to control two weeds: giant sensitive plant (*Mimosa diplotricha*) and lantana (*Lantana camara*)," Lynley said. "The release of the air potato beetle marks a restart in the use of this important technique for managing key invasive weeds in Niue."

No other plants are at risk from the air potato beetle, including closely related cultivated yams such as *Dioscorea alata* (ufi), *D. esculenta* (ufilei), and *D. pentaphylla* (pilita). David Moverley, Invasive Species Advisor of the Secretariat of the Pacific Regional Environment Programme (SPREP), commented that "It is great to see some relief in sight for the people of Niue from air potato. The use of natural enemies will hopefully reduce the work required to constantly manage this plant across the landscape, allowing time and effort to be spent on more rewarding activities in daily life. Its impact on natural ecosystems in Niue should also be reduced."

The beetles have been released in the field, where they will gradually build up in numbers, dispersing to all air potato infestations on the island over time. This process can be accelerated by collecting and moving beetles around if necessary.

The air potato beetle is expected to play an important role in the management of a key invasive species in Niue. This project paves the way for similar projects in other Pacific islands also affected by this weed, and for projects against other serious weeds, such as taro vine (*Epipremnum pinnatum* cv *Aureum*), for which natural enemies are currently being sought.

The research work on air potato is a part of the PRISMSS Restoring Island Resilience Programme, which is funded by New Zealand's Ministry of Foreign Affairs and Trade and administered by the Secretariat of the Pacific Regional Environment Programme (SPREP). The introduction of the air potato to Niue is also supported by the Global Environment Facility's Regional Invasives Project (GEF-6).

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Vanuatu welcomes pico beetle

In November, MWLR and our partners in Vanuatu released the pico beetle (*Leptinotarsa undecimlineata*) to tackle the spread of the invasive weed prickly solanum (*Solanum torvum*), known as pico weed in Vanuatu. This follows on from the successful release of the hibiscus bur lace bug (*Haedus vicarius*) in July last year, all part of a larger and ongoing effort to restore pasture lands that have been overrun by invasive weeds in Vanuatu.

Prickly solanum is a thorny shrub or small tree with broad, hairy leaves. It overtops most herbs, grasses, and shrubs, limiting the growth of other species. The weed has long posed a serious problem for farmers, particularly in cattle-grazing regions, where its thorny structure and toxicity make it unsuitable as fodder.

The plant's rapid spread has forced some farmers to reduce livestock numbers or abandon parts of their grazing land. The weed produces attractive berries that are rapidly dispersed by birds, and in some Pacific countries these berries provide habitat for pests such as fruit flies, which damage valuable crops, compounding the challenges faced by local farmers.

"Prickly solanum has created a serious challenge for our livestock sector," said Biosecurity Vanuatu's Senior Plant Health Officer Leisongi Bulesulu. "Farmers have struggled with limited grazing land, and we've had to explore alternative methods to control its spread. The introduction of the pico beetle is a critical part of our long-term strategy to restore our pastures."

The pico beetle, which is native to Mexico, Central America, and northern Colombia, is the first natural enemy ever released globally to target prickly solanum. Both the adult beetles and their larvae feed on the leaves, effectively stripping the plant and allowing pasture to regenerate.

A team from MWLR delivered the beetles to Biosecurity Vanuatu on Efate in November last year after spending 5 years determining the beetle's suitability as a biocontrol agent, and assessing the potential risks of releasing it. Another team delivered beetles to the Vanuatu Agricultural Research and Technical Centre (VARTC) on Santo a few weeks later.

"This release is of great significance for Vanuatu, where it was recently estimated that 34% of grazing land is lost to weeds. The most problematic pasture weed is prickly solanum, which was ranked the worst or second worst weed on 81% of farms," said Quentin Paynter, who leads the Vanuatu Pasture Weeds Programme. "The release of the pico beetle means a natural enemy has now been released for three of the four worst pasture weeds in Vanuatu."

This release builds on previous introductions, including the nail grass psyllid (*Heteropsylla spinulosa*) and the hibiscus bur lace bug, which were released on Efate in July, with the lace bug also being released on Santo at the same time as the pico beetles in November. Work on natural enemies for wild peanut (*Senna* spp.) is still in progress.

Pico beetles.

"Invasive weeds like hibiscus bur and prickly solanum have devastated grazing lands across Vanuatu. Farmers have faced reduced livestock numbers, lower yields, and escalating costs for chemical or manual weed removal. The introduction of natural enemies is a game-changer, offering a sustainable, cost-effective solution to these challenges," said Steglar Tabi Aga, CEO of VARTC. By allowing the natural enemy to control the weed's growth, it is hoped the beetles will significantly reduce the weed's presence over time, providing much-needed relief to farmers and allowing pasture cover to thrive once again.

"When in abundant numbers the pico beetle can completely defoliate and debark the prickly solanum weed, killing it. It is also important to note that this beetle only affects prickly solanum in Jamaica, where it has not been recorded affecting any crops of economic importance. Its safety has also been demonstrated in laboratory tests. We're optimistic that this novel natural enemy will significantly reduce the weed's presence and allow pastures to recover over time," said Quentin.

Following the release, researchers, and staff at Biosecurity Vanuatu and VARTC are closely monitoring the beetles' establishment and effectiveness in controlling prickly solanum. If successful, the project could serve as a model for other Pacific nations facing similar invasive species challenges. Sustainable biocontrol solutions strengthen the region's resilience to natural disasters, such as the recent devastating earthquake and cyclones in Vanuatu, and to the impacts of climate change.

The Vanuatu Pasture Weeds project is a part of the Pacific Regional Invasive Species Management Support Service's (PRISMSS) Natural Enemies – Natural Solutions programme. PRISMSS is administered by the Secretariat of the Pacific Regional Environment Programme. The Vanuatu Pasture Weeds project is funded by New Zealand's Ministry of Foreign Affairs and Trade.

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Disentangling food webs with old man's beard leaf miner

The old man's beard leaf miner (*Phytomyza vitalbae*) was introduced into New Zealand in 1996 to help control the introduced clematis vine, old man's beard (*Clematis vitalba*). However, old man's beard leaf miners are parasitised in New Zealand, reducing their impacts on old man's beard. There are seven known native and exotic parasitoids that parasitise the old man's beard leaf miner and two of these also parasitise the closely related native clematis leaf miner (*Phytomyza clematadi*), which utilises several New Zealand native *Clematis* species. The diagram of this food web on the opposite page shows who eats whom.

As part of a study investigating the non-target impacts of introduced weed biocontrol agents, researchers at MWLR have been working to untangle the impacts of the parasitoids and the introduced leaf miner on the native clematis leaf miner. Specifically, we investigated whether the introduction of the old man's beard leaf miner has increased parasitism on the native leaf miner by increasing the abundance of their shared parasitoids (known as 'apparent competition').

Non-target impacts are impacts that do not relate to the target host plant, in this case old man's beard. Non-target impacts can be direct, for example, if old man's beard leaf miners feed on other plants instead of old man's beard; or indirect, for example, through apparent competition if the presence of old man's beard leaf miner has impacts on other food web links through intermediary species.

As an example of *direct* impacts, the old man's beard leaf miner adults occasionally lay eggs (and larval mines can develop) on native *Clematis* species when old man's beard and native clematis vines are growing close together (although the native *Clematis* species are a less preferred host). In a previous study investigating this non-target impact, we found no native leaf miners present on old man's beard, and very few old man's beard leaf miners on native *Clematis* species compared to old man's beard. We also found that the introduced old man's beard leaf miner is much more abundant on old man's beard than the native leaf miner is on native *Clematis* species.

In the current study we investigated whether the introduction of the old man's beard leaf miner is having *indirect* non-target impacts on the native *clematis* leaf miner by increasing the number of shared parasitoids in the environment, resulting in increased parasitism of the native leaf miner. To do this we checked vines of native *Clematis* species and old man's beard for leaf miners and recorded the percentage of leaves mined. We then tried to determine the fate of each leaf miner to see whether they successfully developed into adult leaf miners (flies) or if they were parasitised. A total of 15,773 leaves on 81 vines (71 native and 10 old man's beard) were checked, and 753 (294 native and 459 old man's beard) mined leaves collected. Of the vines that were assessed, 5% of native *Clematis* species and 25% of old man's beard leaves were mined.

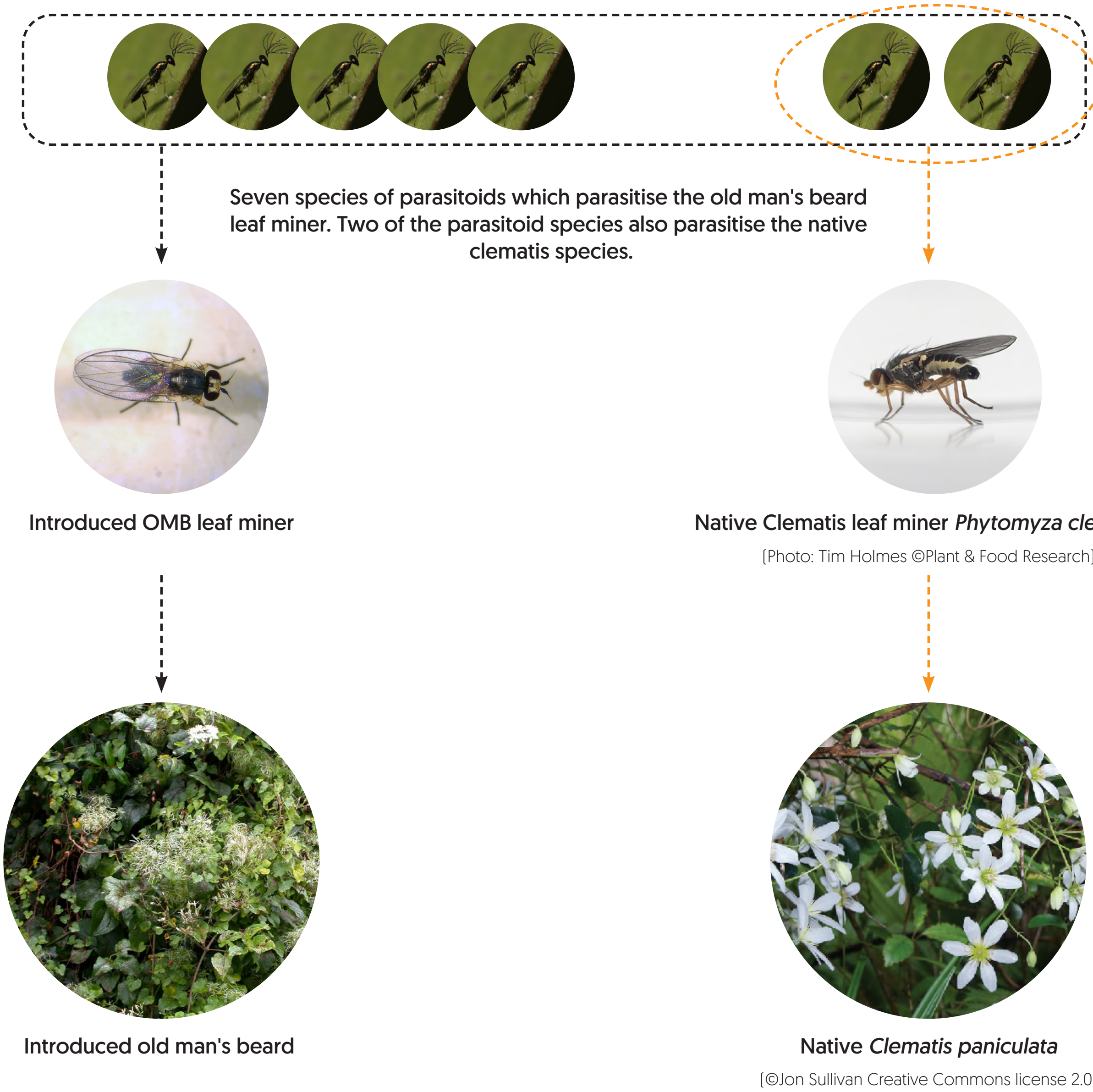
Native clematis vines were selected at sites with and without old man's beard present. At the sites where old man's beard was not growing with native clematis vines, we measured the distance to the nearest old man's beard. It was important to measure this for two reasons. Firstly, increased numbers of parasitoids may only occur close to old man's beard, where the old man's beard miner is often common. Secondly, we know from work by Quentin Paynter and colleagues that adult female old man's beard leaf miner flies can only lay eggs if they have fed on the leaves of old man's beard: feeding tests showed that the flies never feed directly on native clematis leaves. As a result, old man's beard mines are unlikely to be found on native clematis unless the plants are close to old man's beard plants.

We found old man's beard leaf miner attacking only 0.14% of native clematis leaves, confirming previous conclusions that direct non-target impacts are rare. As with the previous study, we found a decline in old man's beard leaf miner attack on native clematis as we moved further away from old man's beard plants: beyond 1 km even the minor non-target attack we found vanished.

However, our main goal was to determine the levels of parasitoid attack in both the native and introduced leaf miners. To do this, we either diagnosed exit holes if leaf mines were vacant, or reared resident leaf miners through to adulthood. The larva of the old man's beard leaf miner exits its mine and drops to the soil to pupate, leaving a tell-tale semi-circular flap behind at the end of its mine. In contrast, the larva of the native leaf miner pupates inside the end of the mine: the adult fly then emerges directly from the leaf mine, leaving a messy hole, and sometimes an empty pupal case behind. With both miner species, if the larva has been parasitised, the emerging adult parasitoid leaves a small round hole, which can be seen towards the end of the mine.

The big question for our study was whether the old man's beard leaf miner could be harming the native leaf miner through apparent competition via the shared parasitoid species. Our hypothesis was that parasitoid numbers would be increased around old man's beard plants because of the high levels of old man's beard leaf miner, and that these parasitoids could then cause increased levels of attack on the relatively rare native clematis leaf miner – a potentially harmful indirect non-target impact on a native species.

The data suggest this is not happening. They show that parasitism of the native leaf miner did not increase when native *Clematis* species were growing close to old man's beard. In fact, the native leaf miner appeared less likely to be parasitised when surrounded by an abundance of the old man's beard leaf miner.



This result was unexpected. A possible explanation is that high densities of the old man's beard leaf miner act as a local 'sink' for parasitoids rather than a source. Optimal foraging theory, for example, predicts parasitoids should concentrate searches in dense patches of prey, which are most likely to be old man's beard leaf miner. To increase their success rates at finding prey, parasitoids may therefore avoid low density patches of leaf mines, meaning that the rarer native miners on native clematis tend to escape attack. This effect might be exacerbated because parasitoid success in attacking miners on old man's beard may be higher (per unit of parasitoid search time) as it probably takes less time for the female wasp to drill into mines in the thinner, deciduous leaves of old man's beard compared to the thicker, evergreen leaves of native clematis species.

Another fascinating contributing mechanism could be that relatively highly mined old man's beard vines are producing more herbivore-induced volatiles (HIVs), the plant 'cry for help' hypothesis: the plant's intention is that parasitoids will be attracted to these HIVs, resulting in higher parasitism levels where miners are abundant. There is a lot more research to undertake on biocontrol effects in this food web!

Regardless of the mechanism, we have shown that there are no negative food web effects on our relatively rare native clematis leaf miner, and perhaps even a small benefit. This is an important study because it demonstrates that food web impacts from introduced biocontrol agents should not be assumed to be always negative.

Further reading:

Paynter Q, Martin N, Berry J, Hona S, Peterson P, Gourlay AH, Wilson-Davey J, Smith L, Winks C, Fowler SV 2008. Non-target impacts of *Phytomyza vitalbae* a biological control agent of the European weed *Clematis vitalba* in New Zealand. Biological Control 44(2): 248–258.

This project is part of MWLR's Beating Weeds Programme, funded by the Ministry of Business, Innovation and Employment's Strategic Science Investment Fund in collaboration with B3 partners. Ruth Fleeson (Horizons Regional Council) is thanked for her help locating clematis vines.

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Autumn Activities

Gall-forming agents

Early autumn is the best time to check many gall-forming agents.

- Check broom gall mite (*Aceria genistae*) sites for signs of galling. Very heavy galling, leading to the death of bushes, has been observed at many sites. Harvesting of galls is best undertaken from late spring to early summer, when predatory mites are less abundant.
- Check hieracium sites, and if you find large numbers of stolons galled by the hieracium gall wasp (*Aulacidea subterminalis*), you could harvest mature galls and release them at new sites. Look, also, for the range of deformities caused by the hieracium gall midge (*Macrolabis pilosellae*), but note that this agent is best redistributed by moving whole plants in the spring.
- Check nodding and Scotch thistle sites for gall flies (*Urophora solstitialis* and *U. stylata*). Look for fluffy or odd-looking flowerheads that feel lumpy and hard when squeezed. Collect infested flowerheads and put them in an onion or wire-mesh bag. At new release sites hang the bags on fences, and over winter the galls will rot down, allowing adult flies to emerge in the spring.
- Check Californian thistle gall fly (*Urophora cardui*) release sites for swollen deformities on the plants. Once these galls have browned off, they can be harvested and moved to new sites (where grazing animals will not be an issue), using the same technique as above.
- Look for swellings on giant reed (*Arundo donax*) stems caused by the giant reed gall wasps (*Tetramesa romana*). These look like small corn cobs on large, vigorous stems, or like broadened, deformed shoot tips when side shoots are attacked. Please let us know if you find any, since establishment is not yet confirmed.

Honshu white admiral *(Limenitis glorifica)*

- Look for the adult butterflies at release sites, for pale yellow eggs laid singly on the upper and lower surfaces of the leaves, and for the caterpillars. When small, the caterpillars are brown and found at the tips of leaves, where they construct pier-like extensions to the mid-rib. As they grow the caterpillars turn green, with spiky, brown, horn-like protrusions.
- Unless you find lots of caterpillars, don't consider harvesting and redistribution. You will need to aim to shift at least 1,000 caterpillars to start new sites. The butterflies are strong fliers and are likely to disperse quite rapidly without any assistance.

Privet lace bug *(Leptoypha hospita)*

- Examine the undersides of leaves for the adults and nymphs, especially leaves showing signs of bleaching.
- If large numbers are found, cut infested leaf material and put it in chilly bin or large paper rubbish bag, and tie or wedge this material into Chinese privet at new sites. Aim to shift at least 1,000 individuals to each new site.

Tradescantia leaf, stem and tip beetles *(Neolema ogloblini, Lema basicostata, N. abbreviata)*

- Look for the distinctive feeding damage and adults. For the leaf and tip beetles, look for the external-feeding larvae, which have a distinctive faecal shield on their backs.
- If you find them in good numbers, aim to collect and shift at least 100–200 beetles using a suction device or a small net. For stem beetles it might be easier to harvest infested material and wedge this into tradescantia at new sites (but make sure you have an exemption from MPI that allows you to do this).

Tradescantia yellow leaf spot fungus *(Kordyana brasiliensis)*

- Look for the distinctive yellow spots on the upper surface of the leaves, with corresponding white spots underneath, especially after wet, humid weather.
- The fungus is likely to disperse readily via spores on air currents. If human-assisted distribution is needed in the future, again you will need permission from MPI to propagate and transport tradescantia plants. These plants can then be put out at sites where the fungus is present until they show signs of infection, and then planted out at new sites.

Tutsan moth *(Lathronympha strigana)*

- Look for the small orange adults flying about flowering tutsan plants. They have a similar look and corkscrew flight pattern to the gorse pod moth (*Cydia succedana*). Look, also, for fruits infested with the larvae. Please let us know if you find any, as establishment is not yet confirmed.
- It will be too soon to consider harvesting and redistribution if you do find the moths.

Woolly nightshade lace bug *(Gargaphia decoris)*

- Check release sites by examining the undersides of leaves for the adults and nymphs, especially leaves showing signs of bleaching or black spotting around the margins.
- It is probably best to leave any harvesting until spring.

National Assessment Protocol

For those taking part in the National Assessment Protocol, autumn is the appropriate time to check for establishment and/or assess population damage levels for the species listed in the table below. You can find out more information about the protocol and instructions for each agent at: https://www.landcareresearch.co.nz/discover-our-research/biodiversity-biosecurity/weed-biocontrol/

Target	When	Agents
Broom	Dec–April	Broom gall mite (*Aceria genistae*)
Lantana	March–May	Leaf rust (*Prospodium tuberculatum*) Blister rust (*Puccinia lantanae*)
Privet	Feb–April	Lace bug (*Leptoypha hospita*)
Tradescantia	Nov–April Anytime	Leaf beetle (*Neolema ogloblini*) Stem beetle (*Lema basicostata*) Tip beetle (*Neolema abbreviata*) Yellow leaf spot fungus (*Kordyana brasiliensis*)
Woolly nightshade	Feb–April	Lace bug (*Gargaphia decoris*)

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