What's New In Biological Control Of Weeds?

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What's Inside:

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A Bug for Bugweed?

In recent years we have been exploring the possibility of developing a biological control programme for woolly nightshade (*Solanum mauritianum*), or bugweed to give it its South African name. This tree is native to Argentina, Uruguay, Paraguay and southern Brazil, and is naturalised widely in several Atlantic, Pacific and Indian oceanic islands, India and southern African countries. A lace bug (*Gargaphia decoris*) was released to attack the plant in South Africa in 1999, and we have been considering whether it might be suitable for release here too. Richard Hill (Richard Hill and Associates) recently prepared a report which has come out in favour of proceeding with the lace bug, and we will now begin to prepare an application to ERMA to release this agent.

The *Solanum* genus contains many important crops (e.g. potatoes, tomatoes and eggplant), and we also have three native *Solanum* species (*S. laciniatum*, *S. aviculare*, *S. americanum*) so a high level of specificity from any potential agent is required. Thanks to help from Terry Olckers and Candice Borea of the University of KwaZulu-Natal, we now have the information we need to show that this insect would be safe to release in New Zealand. The lace bug is another of those insects that displays an artificially wide host-range when tested indoors so comprehensive testing was needed to build a convincing case that it would not pose a danger to useful plants in New Zealand. Of the species tested, eggplant (*S. melongena*)

Arne Witt

Woolly nightshade damaged by the lace bug in South Africa.

appeared to be the most at risk, but the chance of it being attacked to any significant extent in New Zealand seems to be extremely low. It is reassuring that open-field trials and surveys undertaken in South Africa since the agent was released have failed to uncover any non-target feeding of this nature.

There was also uncertainty about how effective the lace bug might be if released in New Zealand. Preliminary trials carried out in South Africa indicated that 2–4 weeks of sustained feeding by these tiny bugs could reduce the leaf, stem and root biomass of potted woolly nightshade plants by about a third. Initial reports from South Africa confirmed that the lace bug had established at some sites, but not brilliantly, and that populations appeared to be remaining low. However, recent surveys have found that the lace bug is more widely established than previously thought, and a recent outbreak has shown that under the right conditions it can do a lot of damage.

The first outbreak was reported from Sabie, in Mpumalanga Province (NE South Africa), in April this year. "Large numbers of adults and nymphs had caused severe damage to woolly nightshade, resulting in extensive and sometimes total defoliation, an absence of fruit and flowers, and even mortality of seedlings and larger trees," explained Arne Witt, of the Plant Protection Research Institute. Where plants were resprouting the lace bugs were attacking this new growth too. Unfortunately a massive fire went through the area soon after the outbreak was discovered, ruining the opportunity to begin long-term monitoring.

Arne Witt

Adult and young lacebugs.

Cold winter temperatures were originally suspected of suppressing the lace bug population's growth rates and limiting establishment in cooler climates in South Africa. However, temperature-tolerance trials have revealed the lace bugs are cold tolerant and that minimum temperature extremes were not the reason for poor establishment. The areas in which woolly nightshade causes problems in South Africa tend to be much warmer than in New Zealand. However, indicative daily temperatures of the colder sites at which the lace bug has established tend to be comparable with warm New Zealand climates. "The lace bug seems to prefer shaded sites as opposed to plants growing in full sun, so in that respect forestry and natural forested areas of New Zealand invaded by woolly nightshade should be well suited to this insect," said Terry.

The slowness of the lace bug to get out of the starting blocks in South Africa has been attributed to heavy predation of the nymphs and eggs. Such predation is not thought to be likely in New Zealand. In South Africa, woolly nightshade plants support high numbers of generalist predators, notably ants, ladybirds and mirid bugs. A survey of woolly nightshade we did here in 2000 showed that New Zealand has fewer of these generalist predators and, with the exception of aggressive Argentine ants (*Linepithema humile*) at a small number of sites, nothing was found that looked likely to throw a major spanner in the works of a biocontrol programme. Adult lace bugs guard their young, and can successfully deter predators when the diversity and abundance of predatory species is relatively low.

Large plants like woolly nightshade have sufficient root reserves to tolerate occasional defoliation, as its ability to regenerate from cut stumps following mechanical clearance demonstrates. So questions still remain about the future efficacy of this agent. Will lace bug outbreaks be episodic, allowing the plant to regain its growth rate and reproductive ability between attacks? Is the first outbreak a forerunner of similar events across the South African range of woolly nightshade or a local phenomenon? Now that we know that high densities of lace bugs can occur, what limits the development of large populations elsewhere? Only time will allow us to know these things.

"All the information that is available suggests the lace bug is a valid candidate as a biocontrol agent for woolly nightshade in New Zealand," concluded Richard. However, as with all biocontrol projects, especially against as resilient a target this one, it is unlikely that a single agent will provide adequate control, and further work will need to be undertaken to develop additional agents. The priority for South African researchers has been to either limit the development of seed banks, the colonisation of new sites, or the reinvasion of sites where control has been achieved, by the development of agents that will limit the dispersal of seed by birds. This approach is equally valid for New Zealand. Terry has recently gained approval to release a flowerbud-feeding weevil (*Anthonomus santacruzi*) and with Karen Hope will be helping us evaluate whether it is safe to release here too.

This project is funded by a National Collective of regional councils and the Department of Conservation.

Assigning Success in Weed Biocontrol: A Cautionary Tale

One of the questions we are commonly asked, after the old favourite "what will they eat next?", is "how good is this agent going to be?" The latter is always a tricky one to answer. Apart from the fact we cannot predict with any real accuracy just how successful an agent is likely to be (because the world is just so darned complex!), we all have a different idea of what we mean by 'success'. Even in the biological control literature 'success' and 'failure' are not usually clearly defined.

Often it is assumed that a biocontrol project has failed unless it has caused a substantial decline in the overall abundance of the target weed. This perception is probably a legacy of the early outstanding biocontrol programmes against cactus weeds (*Opuntia* spp.) in Australia and St John's wort (*Hypericum perforatum*) in the USA. These examples have raised expectations that almost-complete extermination of the target should be the objective of every biocontrol programme, and projects are perceived as failures when weed densities do not decline dramatically. John Hoffmann of the University of Cape Town gave a paper at the Biological Control of Weeds Symposium earlier this year, that clearly showed we need to be careful not to make such hasty judgements as more subtle benefits could easily be overlooked. He illustrated this with the example of a biocontrol programme against a cactus in South Africa.

Opuntia stricta is a widespread weed in South Africa with one of the most badly affected areas being Kruger National Park (KNP), the flagship region of South African conservation, where the weed became naturalised during the 1950s. By the 1980s the problem was out of control in spite of a protracted and expensive herbicide programme. As a last resort moves were made to initiate a biocontrol programme against the cactus. This project looked straightforward because the cactus had been controlled so superbly by the cactus moth (*Cactoblastis cactorum*) in Australia, and the moth was already well established on another species (*Opuntia ficus-indica*) elsewhere in South Africa and therefore immediately available for introduction into the park.

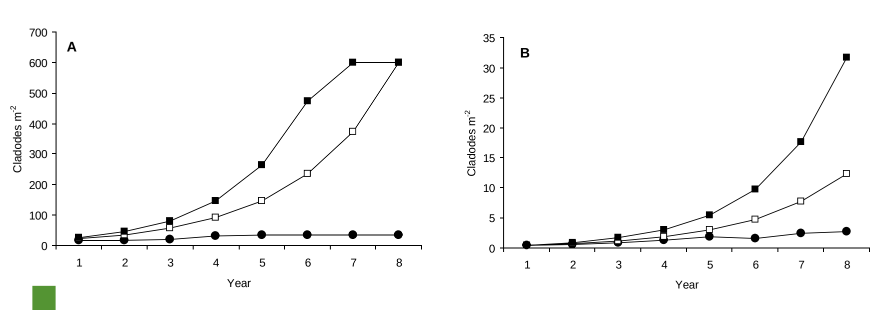
The release of the moth in KNP during 1987 was greeted with much enthusiasm, fuelled by visible and impressive evidence of larval damage that became apparent over an ever-increasing area of the cactus invasion. The initial euphoria gradually waned as the extent of damage equilibrated at lower levels than were optimistically expected on the basis of the Australian precedents – and the cactus remained abundant over a wide area. By 1993 most observers were disillusioned and some were openly critical of the biocontrol programme, considering it to have aggravated rather than contained, let alone alleviated, the problem. "This scepticism and hostility to biological control was the catalyst for the initiation of a research project to quantify the impact of the moth and thereby determine whether or not there have been any benefits from its presence within KNP," explained John.

Monitoring was carried out over a 9-year period from 1993 to 2001, in areas where the cactus had been sprayed with herbicides a year before the initiation of the study and an adjacent area where no herbicides had been used. Only a few small plants that had been overlooked remained in the area that had received the herbicide treatment. In the untreated area the plants were large (up to 2.5 m in height) and dense. The cactus moth populations fluctuated both annually and seasonally, but overall stayed about the same. Despite the presence of the moth the density of the cactus steadily increased in both the untreated and treated infestations (increasing 4-fold and 6-fold respectively) and the weed continued to spread. The biomass of the cactus plants increased in both areas too, but at a much higher rate in the treated area. It had been hoped that the long-

Kruger National Park before (1993 (left)) and after (right) the release of the second cactus biocontrol agent.

range dispersal of the cactus, courtesy of fruit-eating animals, could be curtailed, but unfortunately damage by the moth did not diminish fruit production.

It was easy to consider the project an abject failure by conventional definitions of success until John addressed the question "what would the situation have been without any biological control?" He used a simple spreadsheet model to estimate how much cactus there would have been if the cactus moth had not been introduced into the system. Comparisons of expected and observed biomass over an 8-year period show that the weed would have been much worse without biocontrol and, even though the problem was getting worse, the rate at which this was happening had been slowed considerably (see graphs). Only by undertaking a careful evaluation over almost a decade was it possible to show that the moth was having a dramatic effect, even though the weed remained abundant.



Observed (closed circles) and expected (closed squares = growth at 100% of capacity; open squares = growth at 75%) in (A) an untreated infestation and (B) a herbicide-treated infestation of *Opuntia stricta* in KNP over an 8-year period.

All good stories of triumph and toil in the face of adversity deserve a happy ending! John was able to report that the introduction into KNP more recently of a second agent, a cochineal insect (*Dactylopius opuntiae*), has resulted in a massive decline in the abundance of *O. stricta* and the weed is now considered by everyone to be under excellent biological control.

While we can sometimes achieve visually obvious and stunningly successful results with biocontrol we need to get away from the perception that a reduction in density is the primary, if not the sole, requirement for success. To do so is to underestimate subtle but very real benefits that accrue from otherwise seemingly ineffective agents. It might be worth undertaking biocontrol even if the only outcome is a slowing of the growth rate and/or rate of spread of a weed, or a reduction in the size of plants and their longevity and fecundity.

Ginger Goes Wild in New Zealand

Ginger seems to be growing pretty much unrestrained in New Zealand, according to the results of a national survey of its natural enemies. A wide range of native and introduced invertebrates were found associated with wild (*Hedychium gardnerianum*) and yellow ginger (*H. flavescens*) but they cause minimal damage. The most noticeable damage to leaves was caused by caterpillars, slugs, snails, and thrips. No invertebrates that feed specifically on ginger were found during the survey and currently no herbivore niches are very well occupied on the weed in New Zealand.

Similar results were found for pathogens on ginger. All plants sampled showed moderate to low levels of infection. This was usually superficial damage to stems and leaves that did not have a major impact on weed growth. A total of 27 fungal species were identified from infected material and the most frequent leaf pathogens were *Mycosphaerella* cf. *heydichii, Phoma exigua* and *Colletotrichum gloeosporioides*. Most of the fungi identified were weak pathogens – ones that cannot infect a plant unless it is already infected, or saprophytes that live on dead tissue.

During the survey a keen eye was kept out for *Ralstonia solanacearum*, the bacterium successfully used as a biocontrol agent for ginger in Hawai'i. It has previously been recorded in New Zealand but not from ginger. About 15 bacterial isolates appeared to be similar to this agent but molecular studies confirmed they are a different species (*Erwinia* sp.). Further work to explore the potential of *Ralstonia solanacearum* for New Zealand is planned.

The results of the survey suggest there would be good potential for developing biocontrol for ginger in New Zealand and there is some good news on that front. An international consortium of countries concerned about ginger, including New Zealand, is currently forming to fund surveys for natural enemies in its native range.

This faunal and pathogen survey was funded by a National Collective of regional councils and the Department of Conservation.

Plant Identification Set to Become Easier

Have you ever tried to use the *Flora of New Zealand* books to key out a plant specimen that you wanted to identify? If so, you may well have encountered difficulties understanding the technical language used, the lack of illustrations, and problems due to your specimen lacking the critical characters the keys rely upon.

While the *Flora of New Zealand* series are invaluable reference works, it is fair to say they are not particularly user-friendly. Help will soon be at hand with new computer-based identification keys. These keys are powerful and can handle information on hundreds or even thousands of species at a time. Many are also multi-access and interactive, so you can enter the key at any level and choose the plant characters that you want. In comparison traditional dichotomous keys have only one start point and you must choose between two character states, so you can quickly run into trouble if your specimen is lacking characters such as flowers. Computer-based keys are also able to incorporate many more images. This is especially important in representing the full range of features such as growth habit, leaves, flowers, fruit, and any specific diagnostic characters. For the user, they are intuitive, easy and fun to use, and a quick and efficient way to identify plants.

Landcare Research is currently creating two interactive keys for plants in New Zealand using software called Lucid (developed by the Centre for Biological Information Technology in Australia).

NPPA Key

This key is for the identification of plants on the National Pest Plant Accord (NPPA), their close relatives and similar species. The NPPA list currently includes about 140 specified species that are banned from propagation, sale, and distribution within New Zealand (see www.biosecurity.govt.nz/pests-diseases/plants/accord.htm). The key will help avoid confusion between closely related and look-alike species.

This key will link out to an electronic version of the *Flora of New Zealand, Vol. 4, Naturalised Pteridophytes, Gymnosperms, Dicotyledons* (Webb et al. 1988), as well as other resources.

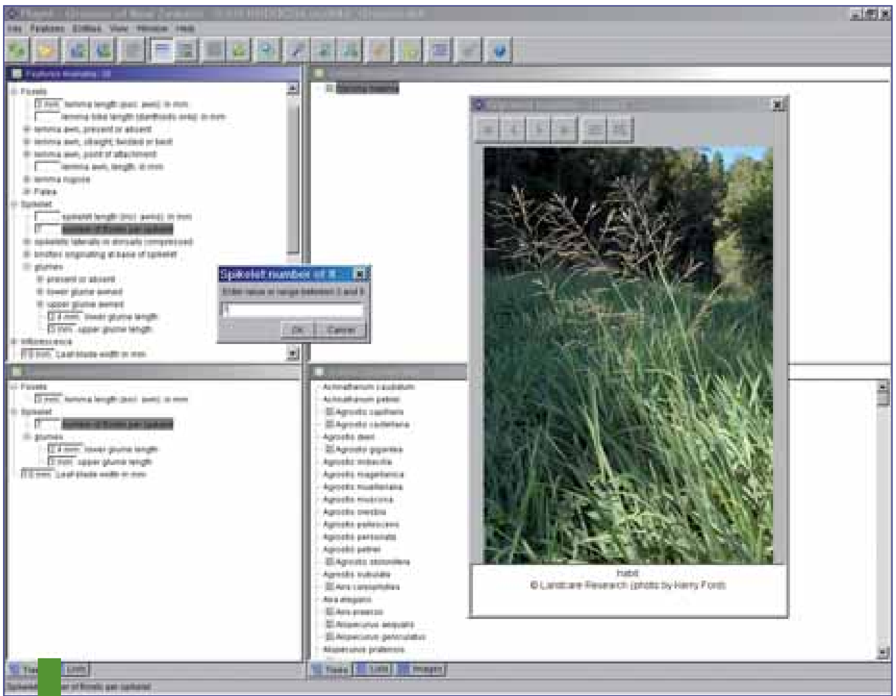
The NPPA key is a cooperative project involving Murray Dawson and Peter Heenan (Landcare Research) and other collaborators, including Paul Champion (NIWA), Trevor James (AgResearch), Carolyn Lewis (Weedbusters), Biosecurity New Zealand, the Department of Conservation, and various regional authorities.

Grass Key

This key is for the identification of indigenous and naturalised grasses in New Zealand, and was initiated by Kerry Ford and David Glenny (Landcare Research). About 42 species of naturalised grasses in New Zealand feature on regional biosecurity lists and 17 are listed in the current NPPA. The interactive grass key will link to an electronic version of *Flora of New Zealand, Vol. 5, Grasses* (Edgar & Connor 2000).

Both the Grass and NPPA keys are 2-year projects, scheduled for completion in July 2008 and July 2009 respectively. Once completed, the interactive keys will be available free of charge and hosted on the Landcare Research web servers and also in limited numbers as CDs. Landcare Research will offer training workshops to teach people how to use interactive keys, with the first one being held in December 2007.

These projects are funded by the Terrestrial and Freshwater Biodiversity Information System (TFBIS) programme. TFBIS is a Government fund to make information on the flora and fauna of New Zealand more accessible, and is administered by the Department of Conservation. We would like to thank everyone who has already supplied illustrations or helped in other ways to make these keys possible.



Example of what a page of the new grass key will look like.

We need your plant images please!

For the NPPA identification key, we are presently gathering digital images to be considered for inclusion. We require images of all the species (see lists below), covering a range of vegetative and floral characters. Those providing images used in the final key will be fully acknowledged.

Our requirements are:

- Images of reliably identified material
- Single species per image
- Preferably high resolution JPG format with the file name matching the species name (we also have capacity to scan slides and prints).

Please contact Murray Dawson (dawsonm@landcareresearch.co.nz) if you can help. If you are providing several images they are best sent as CDs or DVDs by post to:
Murray Dawson
Landcare Research
PO Box 40
Lincoln 7640
Canterbury

National Pest Plant Accord (NPPA) species

We welcome images of all NPPA species, but below is a short list of those that we are particularly lacking:

Cardiospermum grandiflorum
Cardiospermum halicacabum
×Carpophyma (Carpobrotus edulis × Disphyma australe)
Cestrum parqui
Egeria densa
Equisetum fluviatile
Eragrostis curvula
Hieracium argillaceum group
Hieracium aurantiacum subsp. carpathicola
Hieracium murorum
Hieracium pollichiae
Hieracium sabaudum
Megathyrsus maximus (syn. Panicum maximum)
Menyanthes trifoliata
Myrica faya
Pennisetum alopecuroides
Pennisetum latifolium
Pennisetum purpureum
Pittosporum undulatum
Potamogeton perfoliatus
Sagittaria montevidensis
Utricularia arenaria
Utricularia livida
Utricularia sandersonii
Vallisneria gigantea

Similar and related species to those in the NPPA list

Alisma lanceolatum
Alisma plantago-aquatica
Alternanthera denticulata
Alternanthera reineckii
Alternanthera sessilis
Asparagus densiflorus 'Meyersii' (syn. A. densiflorus 'Myers', A. meyerii, A. meyers, A. meyeri)
Asparagus officinalis
Asparagus setaceus
Austrostipa nitida
Austrostipa nodosa
Austrostipa scabra
Austrostipa stipoides
Baloskion tetraphyllum
Berberis glaucocarpa
Berberis ×stenophylla – and its cultivars
Calluna vulgaris – double-flowered cultivars (e.g. C. vulgaris 'County Wicklow', C. vulgaris 'HE Beale', C. vulgaris 'Kinlochruel')
Calystegia sepium
Carpobrotus aequilaterus
Carpobrotus aequilaterus × Disphyma australe
Carpobrotus chilensis
Cestrum ×cultum (C. elegans × C. parqui)
Cestrum fasciculatum 'Newellii'
Cestrum nocturnum
Cinnamomum camphora
Clematis flammula
Clematis montana
Clematis paniculata
Cortaderia fulvida
Cortaderia richardii
Cortaderia splendens
Cortaderia toetoe
Cortaderia turbaria
Cotoneaster franchetii
Cotoneaster frigidus 'Cornubia'
Cotoneaster glaucophyllus
Cotoneaster pannosus
Crassula lactea
Crassula sarmentosa
Crassula spathulata
Crepis capillaris
Disphyma australe
Drosera arcturi
Elegia capensis
Elodea canadensis
Erica carnea
Euonymus europaeus
Festuca novae-zelandiae
Ficus macrophylla
Fuchsia denticulata
Fuchsia fulgens
Fuchsia triphylla
Gunnera manicata
Heracleum sphondylium
Hedychium coccineum
Homalanthus polyandrus
Hypericum calycinum
Hypericum henryi
Hypericum kouytchense
Hypericum ×inodorum
Hypochaeris radicata
Ipomoea cairica
Ipomoea purpurea
Iris ensata
Iris laevigata
Jasminum mesnyi
Juglans ailantifolia
Kennedia rubicunda
Lamium maculatum
Lantana montevidensis
Leontodon taraxacoides
Libertia formosa
Ligustrum ovalifolium
Lilium regale
Lonicera ×americana
Lonicera periclymenum
Ludwigia peploides
Lythrum virgatum – and its cultivars (e.g. L. virgatum 'Dropmore Purple', L. virgatum 'Rose Queen')
Microseris scapigera
Myoporum laetum
Myrica pensylvanica
Myriophyllum robustum
Nephrolepis exaltata
Nephrolepis exaltata 'Maasii'
Nephrolepis falcata
Nephrolepis flexuosa
Nestegis cunninghamii
Nymphaea alba
Nymphaea 'Escarboucle'
Nymphaea – hardy cultivars and hybrids with yellow flowers (e.g. N. 'Marliacea Chromatella', N. 'Sulphurea')
Ottelia ovalifolia
Panicum dichotomiflorum
Panicum schinzii
Passiflora edulis
Passiflora pinnatistipula
Passiflora ×rosea
Pennisetum clandestinum
Pennisetum glaucum
Petasites fragrans
Pinus mugo
Pinus nigra
Pinus radiata
Pinus sylvestris
Pittosporum eugenioides
Plectranthus ecklonii
Plectranthus grandis
Plectranthus oertendahlii
Plectranthus purpuratus
Pleioblastus chino
Pleioblastus hindsii
Pleioblastus simonii
Polygala ×delmesiana 'Grandiflora'
Pontederia cordata
Potamogeton cheesemanii
Pseudosasa japonica
Pyracantha crenatoserrata
Pyracantha crenulata
Pyracantha coccinea
Pyracantha cultivars with orange fruit (e.g. P. 'Orange Glow', P. 'Shawnee')
Rheum palmatum
Salix ×reichardtii
Salix alba var. vitellina
Sanguinaria canadensis
Sanguinaria canadensis 'Plena'
Saururus cernuus
Schoenoplectus tabernaemontani
Sechium edule
Semiarundinaria fastuosa
Senecio angulatus
Setaria italica
Setaria viridis
Sicyos angulatus
Syzygium australe
Tamarix chinensis
Taraxacum magellanicum
Tecomanthe speciosa
Teucrium scorodonia
Tradescantia albiflora
Tropaeolum pentaphyllum
Typha laxmannii
Typha orientalis
Utricularia australis
Utricularia geminiscapa
Veronica americana
Zantedeschia aethiopica – as distinct from Z. 'Green Goddess'

Changes to Pages!

Just a reminder that *Te Whakapau Taru – The Biological Control of Weeds Book* is now online and you can download any pages you want (see www.landcareresearch.co.nz/research/biocons/weeds/). Since the notice in the last newsletter the following pages have been revised and new versions posted:

- Index
- Ragwort (*Senecio jacobaea*)
- Scotch Thistle Gall Fly

Things To Do This Summer

With temperatures rising and days getting longer things are starting to get busy in the world of weed biocontrol! Some activities you might like to schedule into your programme in the coming months include:

- Checking ragwort crown-boring moth (*Cochylis atricapitana*) and plume moth (*Platyptilia isodactyla*) release sites. Look carefully for clumps of fine sawdust-like frass in the root crown of rosette plants – this indicates the presence of caterpillars of either species. The crown-boring moth also feeds around the base of leaf stalks on bolting stems so look for frass there too. You could dissect some of these stems to look for the larvae feeding inside. We would like to know if you find evidence of either or these agents.
- Checking boneseed leafroller (*Tortrix* s.l. sp. *"chrysanthemoides"*) release sites. Look for curled leaves covered with webbing at the stem tips and sprinkles of black frass. Leaves will have "windows" where the caterpillars have eaten the green tissue away and may be turning brown. We would also like to know if you find any sign of the boneseed leafroller.
- Checking Portuguese gorse thrips (*Sericothrips staphylinus*) release sites when gorse isn't flowering and you won't be confused with flower thrips (*Thrips obscuratus*). In particular look closely at areas of new growth. If you can't see any thrips by eye use a hand lens or try gently beating some foliage over a white sheet. But don't disturb the bush any more than necessary.
- Checking hieracium gall midge (*Macrolabis pilosellae*) release sites – look for plants with swollen and deformed leaves caused by larval feeding.
- Checking gorse soft shoot moth (*Agonopterix ulicetella*) release sites. The best time to do this is early December so you need to get in quick. At this time the caterpillars are quite large but have not yet pupated. Look for dark brown or greyish green caterpillars inside webbed or deformed growing tips. In particular, check sites that have previously shown positive results from pheromone trapping.
- Checking old man's beard saw fly (*Monophadnus spinolae*) release sites – we have still not had a confirmed sighting of these in the field so keep your eyes peeled. Signs to look for include leaves with semicircular incisions along the margin or which have been completely skeletonised and black balls of frass, both of which are produced by the white caterpillar-like larvae. Please let us know if you find anything that looks a bit like this.
- Checking heather beetle (*Lochmaea suturalis*) release sites – unless they are present in large numbers and have caused a lot of damage heather beetles will be hard to find. The best way to check for their presence is to beat plants with a stick over a white sheet or by using a sweep net.
- Harvesting broom seed beetles (*Bruchidius villosus*) – beetles are easy to redistribute while they are still inside the pods. Harvest brown, mature pods but avoid green ones as the beetles will not be completely developed. Keep in mind that a period of hot weather can cause pods to ripen rapidly so don't delay once the first ones have started to burst.

Remember to read up the relevant pages in "The Biological Control of Weeds Book" (see www.landcareresearch.co.nz/research/biocons/weeds/book/) before embarking on any of these activities. Don't forget you can access release and monitoring forms online now too. Let us know how you get on!

Dissected ragwort stem showing crown-boring moth larval damage and frass.

Looking for Something to Bite Back

The alligator weed beetle (*Agasicles hygrophila*) and alligator weed moth (*Arcola malloi*) are both well established in New Zealand and are able to provide effective control of alligator weed (*Alternanthera philoxeroides*) in some situations, such as on lakes. However, more agents are needed to improve the level of control in flowing water, colder areas, and where the plant is growing on land. We are contributing to a project in Australia to seek additional biocontrol agents for this tenacious pest.

A potential new biocontrol agent for alligator weed has made it through preliminary host-specificity testing. A tiny midge (*Clinodiplosis alternantherae*) that galls the stem tips of alligator weed appears to be specific to the weed after being tested against nine other *Alternanthera* species. "The midge only formed galls on alligator weed, so it looks very promising at this point," said Shon Schooler of CSIRO.

The South American native had not been used as a biocontrol agent before and very little was known about its life cycle. Scientists at CSIRO had to determine how to rear the midge before any testing could go ahead. The tiny adults are very delicate and only live for a few hours. The females lay eggs in the growing tips of alligator weed. The developing larvae remain there and feed causing the leaf tissue to swell around them. These galls kill off the buds at the tip of the stem and cause severe shortening of the flower stalk.

Further testing of the midge is planned to coincide with that of two more potential agents. An application to import a foliage-feeding flea beetle (*Systena nitentula*) from Argentina has been approved, and CSIRO are currently working on another application to import a leaf-mining fly (*Ophiomyia alternanthereae*) for testing.

In addition to these insects, a recent survey for fungal pathogens on alligator weed in Argentina identified three species that look promising. *Colletotrichum orbiculare*, *C.* cf. *capsici* and *Fusarium* sp. are all widespread and have a high impact on alligator weed. They cause leaf spots or blisters and *C. orbiculare* also causes stem lesions. We are sure with this range of potential biocontrol agents that it is only a matter of time before we are well and truly able to bite alligator weed back.

This project is funded by a national collective of regional councils and the Department of Conservation. Surveys for potential new agents have been undertaken by the USDA ARS South American Biological Control Lab in Argentina (insects) and University of Bahia Blanca (pathogens).

Guadalupe Traversa, University of Bahia Blanca

One of the pathogens (*Colletotrichum* cf. *capsici*) being studied for its potential as a biocontrol agent.

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