

Weed biocontrol

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Key messages

- Between 1988 and 2005, entomologists tested and released insects to control thistles and Paterson's curse.
- 130 of the releases were made in collaboration with the Harden-Murrumburrah Landcare Group.
- The insects are having a measurable impact on weeds and their combined impact is greater than one agent alone.

Background

Thistles (*Onopordum* spp.) and Paterson's curse (*Echium plantagineum*) are significant weeds that cost the grazing industries of Australia over \$250 million annually through lost productivity, control costs and stock management. Biological control has resulted in, and will continue to provide, a significant reduction in the losses attributable to these weeds species.

Collaborative biocontrol

A multi-agency national project involving CSIRO Entomology was carried out in 1988-2005 to deliver biological control agents for *Onopordum* thistles and Paterson's curse. The project was financially supported by Australian Wool Innovation Ltd and Meat and Livestock Australia. The key project outcomes were:

- Delivery to producers of a complementary guild of host-specific biological control agents for these weeds
- A network of nursery sites enabling the biological control agents to be redistributed throughout the areas of infestations of these weeds
- Provision of appropriate skills and information to key personnel and landholders to ensure continued management of agent populations to maximise impact and benefits
- An improved understanding by producers of weeds in farming systems and of the benefits of an integrated weed management approach, incorporating the concepts of biological control, herbicide control, grazing management and pasture renovation
- Active participation by producers in biological weed control leading to ownership of the process and outcomes
- Measurement of the performance of the biological control agents on a paddock and regional scale

- A measurable reduction in direct costs (e.g. weed toxicity, herbicide use, low pasture productivity) and indirect costs (stock management issues) associated with these weeds

As part of this project, CSIRO pioneered the development of community-based networks to fast track the release and establishment of biological control agents. Close collaboration between state agencies, Landcare groups and CSIRO underpinned the agent distribution and communication network that was a unique characteristic of this project. It allowed the project to advance on all fronts in all states despite problems caused by drought or local issues.

CSIRO, in partnership with Harden Murrumburrah Landcare Group, have facilitated a more rapid resolution of problems associated with these weed species by:

- setting up a network of over 100 graziers involved in the project and integrating biological control into their pasture management regimes
- developing a close working relationship between CSIRO and HMLG to train landholders in biological and integrated weed control
- providing 40 nursery sites for the establishment of biological control agents
- holding weed control training workshops, talks, interviews and field days, and
- improving the understanding by producers of weeds in a farming system.

In the case of *Onopordum* thistles, from more than 120 insect species found to feed on them in their native European range, six were selected to form a complementary herbivorous guild targeting different life stages of the weed. Four of these successfully established:

- the crown weevil, *Trichosirocalus briesei*, and rosette moth, *Eublemma amoena*, both of which attack the rosettes at different times of the year, reducing their size or even killing them;
- the weevil, *Lixus cardui*, which attacks the foliage and elongating stems, reducing growth and flower production, and the seed weevil, *Larinus latus*, which destroys seed developing in the flower and prevents it from reaching the soil seed reserves.

Early monitoring of these agents on properties, including those in HMLG, has shown that they are having a measurable impact on the size and seed production of thistle infestations and that the combined impact of agents is greater than one agent alone.

In the case of Paterson's curse, agents are not only able to attack the plant at different periods of its life-cycle, but are also active across the relatively broad range of geographic and climatic conditions across southern Australia. Three agents have been redistributed through this project;

The crown weevil, *Mogulones larvatus*, and root weevil, *Mogulones geographicus*, which attack the crown and root of Paterson's curse rosettes at different times of the year, and the flea beetle, *Longitarsus echii*, which feeds deep within the tap root of the weed.

Together, these insects attack Paterson's curse throughout its vegetative and reproductive growth, from low to high rainfall districts and under low to heavy grazing regimes. Redistributing all of these insects therefore maximised impact on the weed not only within a single paddock but also across the geographic range of the weed.

Practical implications

The extent to which these biological control techniques have been adopted and incorporated into weed management systems by wool and meat producers as well as other sections of the grazing industry is clear testament to the level of their support (over 1700 farmers were directly involved in the project). In particular, the collaboration between CSIRO and HMLG provided an excellent model for community involvement in biological control. Farmers whose land is affected by the Paterson's curse and *Onopordum* thistles are enthusiastic about the weed control benefits they have received from these biological control agents, even to the point of not using herbicides anymore.



> Figure 1. The rosette weevil *Trichosirocalus briesei* is one of 4 introduced insects that is helping to control thistles.