

RAGWORT FLEA BEETLE

Longitarsus jacobaeae

The history of ragwort flea beetle in New Zealand

Ragwort flea beetle was imported from the USA by the DSIR in 1981. The beetle is native to Europe, and the American population originated from Italy. Nucleus beetle populations were mass reared and liberated widely during the late 1980s and early 1990s. As a result the beetles are now established in every region of New Zealand and are becoming widespread. Although the flea beetle has only one generation per year in its native range, in some parts of New Zealand it appears to be completing two.

How would I find a ragwort flea beetle?

The best time to look for the adult beetles, and their small square-shaped feeding holes, is on leafy ragwort plants during autumn. However, you may be able to easily see adult beetles in winter and spring if they are completing two generations per year in your area. The golden-brown beetles are small (2.5–3.8 mm long) with large hind legs adapted for jumping – when disturbed they can easily leap 1 m. You may also



Plant with feeding holes



Adult beetle

see new pale-coloured adults when they first appear in early summer, but you are likely to have difficulty finding beetles in late summer as they undergo a resting stage (aestivation). This behaviour ensures that the beetles lay their eggs in autumn not summer, when they would desiccate. You are unlikely to see the eggs as they are tiny (less than 1 mm long) and are laid singly around the crown of plants or in the surrounding soil.

During the cooler months of the year you can search for the damaging larval stage. Larvae hatch after 2–3 weeks and you may see them feeding on the roots, inside the crown, and within the leaf petioles (the stem where the leaf is attached to the plant) from autumn to spring. The easiest way to find the whitish grubs is to pull a leaf off a rosette plant and examine the end of the petiole. You may need to rip the petiole in half to find the grub inside.

Alternatively dig up a rosette plant and cut it open to look for the larvae inside. You will not see the pupae as mature larvae pupate in earthen cells in the soil for 2–3 weeks.

The ragwort flea beetle is easy to differentiate from other ragwort biocontrol agents. See *Cinnabar moth*, *Ragwort crown-boring moth*, *Ragwort plume moth*, *Ragwort seedfly*.

How does the ragwort flea beetle damage ragwort?

The adult beetles feed on leaves but the damage is inconsequential. The major damage is caused by the larvae feeding on the roots and crown of the plant. Heavily infested rosette plants die. Plants that are not killed produce fewer flowering stems and therefore less seed.

Will ragwort flea beetle damage other plants?

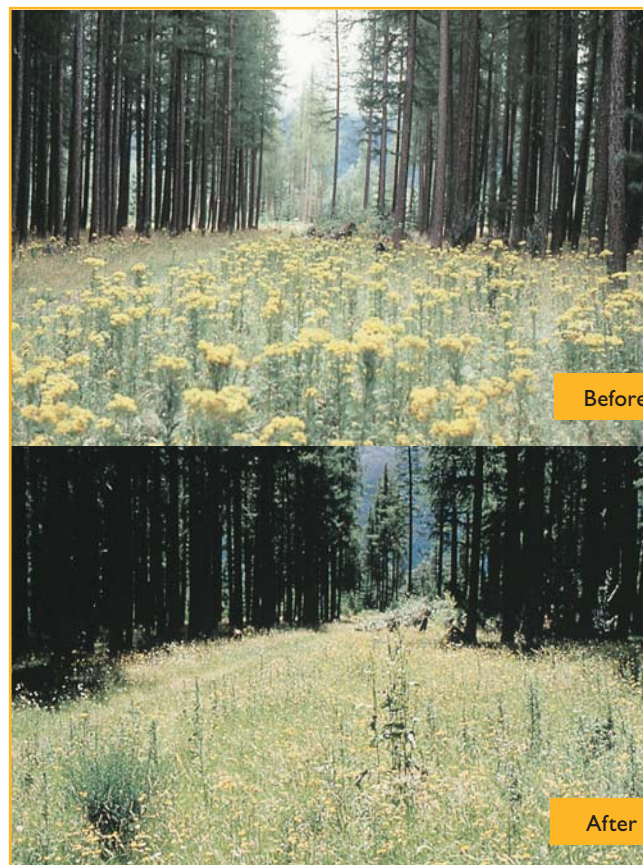
No, the beetle will damage only ragwort.

How effective is the ragwort flea beetle?

The ragwort flea beetle has been highly successful at controlling ragwort in many countries overseas. Landcare Research scientists have undertaken trials to measure the impact of the ragwort flea beetle in different parts of New Zealand. The trials were designed to show that the beetles were responsible for declining ragwort populations. At every site the amount of ragwort declined, often dramatically, soon after the beetles were added.

- After 4 years at Hampden, Otago, ragwort had disappeared completely from the area where the beetles were released.
- After 3 years at another Otago site, Woodside, the beetles reduced ragwort to less than 2% of its former density.
- At Cheviot, in North Canterbury, the beetles were responsible for a 94% reduction in ragwort plants after only 2 years.
- The beetles caused a decline in ragwort at Pahiatua, Manawatu-Wanganui, of 90% after 3 years, and a year later only a few widely scattered plants remained.

These results show that ragwort flea beetle can be effective at controlling ragwort. The beetles can even find and attack isolated plants once



most of the ragwort has disappeared. However, ragwort grows in a wide variety of habitats and under many different management regimes, some of which will suit the activity of the ragwort flea beetle more than others. High levels of control may not be achieved at all sites throughout New Zealand, nor every year. Experience has shown that the beetles have not been able to control ragwort in areas such as the West Coast of the South Island, and an intensive study has shown why.

Ragwort grows very well on the Coast. Overseas studies have shown that ragwort populations do best when there is high rainfall and ground disturbance. Both these events are common on the West Coast. At the same time high rainfall probably has a negative effect on flea beetle populations as beetle density appears to be lower at higher-rainfall sites. The level of beetles per plant was lower at West Coast sites than at some East Coast sites where control has been achieved. Previous work has suggested that you need at least four beetles per rosette in order to get control. On average in our Coast study we never counted more than three. The highest number of beetles recorded on a single rosette was only 10 whereas as many as 50 have been recorded from a single rosette in Auckland.

Figures from Oregon, USA, show that a similar biological control of ragwort programme using ragwort flea beetle in conjunction with cinnabar moth:

- benefits the region by US \$5 million p.a.
- reduces livestock losses by US \$3.7 million p.a.
- increases pasture productivity by US \$1.27 million p.a.
- saves on the cost of herbicides by US \$0.85 million p.a.

Every \$1 invested in biological control has provided \$13 in benefits. The cost of biological control has been calculated at \$5/ha. Oregon Department of Agriculture

Unlike other parts of New Zealand the beetle is only able to complete one life cycle a year on the Coast. So it seems that West Coast conditions conspire to let ragwort do very well but not the beetles.

How can I get the most out of ragwort flea beetles?

Although ragwort flea beetles can fly, they take a long time to invade new areas. Studies of the beetles' dispersal patterns have shown that they may take more than 5 years to spread 1 km. If beetles are not present in your area you can accelerate dispersal by collecting and shifting beetles from well established sites. The best time to relocate the beetles is in the autumn. In March the beetles' wing muscles degenerate, encouraging them to stay in one place while laying eggs. However, it may be possible to shift



Garden leaf vacuum fitted with a sleeve

the beetles any time the adults are present in good numbers.

How do I choose a release site?

See *Guidelines for selecting release sites for biocontrol agents*.

How do I collect beetles for release?

See *Guidelines for collecting, relocating, and releasing insect biocontrol agents*.

You can easily collect ragwort flea beetles using a garden leaf-vacuum machine. These machines comprise a petrol motor attached to a long tube for sucking up leaves, and you can purchase one from a garden equipment supplier or borrow one from an equipment hire firm. You could also use an ordinary vacuum cleaner if you have access to a portable generator.

Modify the tube of the garden-leaf vacuum so that the beetles are collected and not sucked through. Take a sleeve of coarsely-woven material, with one end sewn or tied shut and the other end open (old socks or pantyhose could also be used), and fit it securely around the end so that it forms a bag in the mouth of the tube.

Vacuum ragwort rosettes one at a time. For best results touch the leaves and form a seal with the ground — for large rosettes you will not be able to vacuum the whole plant at once so mentally divide the plant into sections and vacuum each section for 2-3 seconds. Every 10 minutes or so take the sleeve off the end and tip the beetles into a holding container.

We recommend that you use at least 300 beetles as a nucleus population to release at a new site. Initially you will need to count the beetles out to be sure there are enough, but with practice you should be able to estimate the right number by eye. The only practical way to count the beetles is by sucking them up individually with a pooter. This also enables you to separate the beetles from other material collected, such as pasture pests that you do not want to be moving around, during the vacuuming process.

How do I manage the release sites?

Ensure that the ragwort at the release point is not heavily grazed and if possible it is best to avoid areas that will need to be sprayed with herbicide.

See Ragwort flea beetle & herbicides, Ragwort biocontrol agents & sprays.

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