# Community involvement in distributing the bridal creeper leafhopper *Zygina* sp., a biocontrol agent for bridal creeper, *Asparagus asparagoides*

Kathryn L. Batchelor and Tim L. Woodburn
CRC for Weed Management Systems, CSIRO Entomology, Private Bag 5, PO Wembley, Western Australia 6913, Australia

**Summary** Bridal creeper, *Asparagus asparagoides* (L.) Wight., is a widespread weed of southern Australian bushland and remnant vegetation. It is recognised as the major threat to biodiversity in those habitats, and has been declared a Weed of National Significance. The bridal creeper leafhopper, *Zygina* sp. was released in Australia in 1999. Damage caused by both adult and nymph feeding is obvious, and appears as silver zigzag 'etchings' on the foliage that is readily recognisable. The insect has many generations per year thus populations can increase rapidly. These features of the insect's biology make it an ideal candidate for rearing by non-specialists. This was soon recognised, and starter colonies were provided to school and community groups. The mechanisms and infrastructure required in such a project are outlined. The role that such groups have played in extending the range of leafhopper establishment is discussed, along with the potential and limitations that community groups offer in gathering data on the insect's establishment and spread.

**Keywords** Bridal creeper, *Asparagus asparagoides*, *Zygina* sp., community involvement, rearing, biological control.

## INTRODUCTION

Bridal creeper, *Asparagus asparagoides*, is an exotic weed that poses a major threat to biodiversity and conservation in Australia's temperate natural ecosystems. Originally introduced as a garden plant in the 1850s, it became naturalised in the early 1900s and is now listed as a Weed of National Significance (WONS). In the early 1990s, surveys for natural enemies of bridal creeper in its native range, South Africa, identified several potential agents. One of these, the leafhopper *Zygina* sp., was approved for release across southern Australia in May 1999 (Batchelor and Woodburn 2002a), following extensive studies on its biology and demonstration of its specificity towards *A. asparagoides*. Since that time, two other agents have been approved for release, the rust fungus *Puccinia myrsiphylli* (Thuem.) Wint. (Morin *et al*. 2002) and leaf beetle *Crioceris* sp. (Batchelor and Woodburn 2002b).

This paper outlines the process required to involve community, Landcare and school groups in rearing leafhoppers. Participation by community groups in redistribution of biocontrol agents is recognised as playing an important part in technology transfer (Briese and McLaren, 1997). The benefits of community involvement in the biological control of bridal creeper are outlined.

## METHODS

**Selection of participants** Suitable release sites for the leafhopper were sought using Landcare/Bushcare information networks. The response was immediate and overwhelming. Given that the research project was not funded to redistribute the leafhopper, our rearing facilities could not meet demand. It was decided to empower community groups by conducting workshops, so that they could rear their own leafhoppers.

The intention to hold workshops was communicated to potential participants via the Science Teachers Association newsletter, various environmental education magazines and electronic mailing lists. Participants at the workshops held in WA and SA, included teachers, state agriculture, nature conservation, and Landcare officers. In WA the workshops were conducted during weekdays and weekends, thus allowing 'working volunteers' an opportunity to attend. To enable a far wider audience to be reached, a website was set up explaining how to rear leafhoppers (www.ento.csiro.au/bridalcreeper).

**Materials required for rearing** The leafhopper lends itself to rearing by non-specialists: in reality they require little more than healthy *A. asparagoides* plants and a rearing cage. Feeding damage is immediate and obvious, with both the nymphs and adults feeding external to the plant. There are many generations per year.

*Asparagus asparagoides* plants can be readily removed from roadside/private property infestations (permission must be sought before removing plants from conservation areas), by simply digging up the tubers and removing the above ground parts. This is best done in late autumn/early winter. The tubers

are trimmed to about 6 cm lengths that must include the area from where the shoot was cut (crown). They are then potted up in a nursery area that is situated in a shaded position. A supply of 100–200 potted *A. asparagoides* plants would ensure a steady stream of plants available for rearing purposes.

A rearing cage in which plants can be inoculated with the leafhoppers (e.g. an old aquarium or polystyrene fruit box) is essential. Voile (nylon curtain material) is suitable to use as a cover for the rearing cage. A starter colony of leafhoppers provided by CRC/CSIRO completes the basic requirements. Groups wanting to be involved in rearing were encouraged to approach local government, Landcare officers etc. for assistance in obtaining these materials.

**The rearing process** *A. asparagoides* plants are at a suitable size for inoculation when they have approximately 20 cladodes ('leaves'). A starter colony, supplied by the research group, consisted of 3–4 plants infested with leafhopper eggs, nymphs and the occasional adult. For school groups, 50–100 adults were also sent in a dialysis tube cage (breathable plastic) so students could see the adults before their introduction to the rearing cage. The infected plants were placed into the rearing cage, filled with *A. asparagoides* plants from the nursery, such that the infested foliage touched the new culture plants' foliage. The cage was then covered with a voile cover. The dialysis cage was gently dismantled inside the rearing cage to release adults.

After 2–3 weeks, or when plants inside the cage were 50% white with damage, plants were likely to be heavily infested with leafhopper eggs and a release could be made. To remove plants without depleting the colony, foliage was rustled to shake off the adults. One plant remained in the cage to replenish the colony. The rearing cage was then filled with new *A. asparagoides* plants from the nursery. The infested plants were then taken to an *A. asparagoides* infestation and placed amongst the foliage. Groups were advised to cover the base of the pot with a plastic bag or ice-cream container before placing into the bushland to reduce the spread of soil-borne pathogens. The eggs on the damaged plants eventually hatched and the nymphs moved onto the local infestation. After about six weeks, the potted plants were collected from the field and returned to the nursery to regenerate.

Leafhoppers were reared in this manner between April and October, after which the entire colony was released. Community and school groups interested in rearing leafhoppers the following year, either collected attacked foliage from the field or obtained a new rearing colony from the CRC.

**Record keeping** When a release was made, school and community groups were asked provide feedback about where and when releases had taken place. In order to facilitate this two 'Release Details' forms were supplied with the colony (also available from the website), the first being for the initial release details. In addition, they were asked to return to the release site near the end of the bridal creeper growing season (late spring/early summer) to determine whether the release had successfully established. This information was recorded on the second form and provided back to the research group

## RESULTS AND DISCUSSION

By the end of 2000, over 40 primary schools and community groups were rearing leafhoppers for release. This increased to a minimum of 206 locations by the end of 2001. The number is likely to be far greater as release site details were only supplied by a third of the groups involved. Experience to date has indicated that a more proactive approach to collecting release site data is required, which will be addressed in the current year. The project, now in its third year, has just been independently funded by the NHT, and expects another 50 schools and in excess of 100 new community groups to become involved (see Woodburn *et al*. 2002).

The project was extremely effective as a vehicle to communicate the impact of *A. asparagoides*' on bushland, while also raising the profile of other invasive weed species. Prior to biological control, *A. asparagoides* could only be managed by weeding and/or herbicide application, both of which are short-term strategies that produce mixed results. The leafhopper enabled students and community groups to participate in weed management without negative impact on surrounding vegetation.

The project also informed the community about the concepts of biological control and of beneficial insects. Before working with leafhoppers, many groups' only experiences with insects did not go beyond domestic pests. Their knowledge of biological control was limited to well publicised, highly spectacular successes, such as prickly pear. However, most people fail to realise that even the prickly pear program involved the introduction of 51 biological control agents over a 22-year period (1913–1935) and that once *C. cactorum* had been introduced in 1925, it took a further seven years to control most infestations (Wilson 1960).

This project illustrates that biological control is very seldom a silver bullet, and is a process that usually takes many years to impact on its target at a population level. This will probably be the pattern for bridal creeper, given that it has such vast tuber reserves.

The leafhopper has become a very valuable educational tool, especially in schools starved for practical, cost effective science projects. Communities associated with the schools become involved too. Since the project's first trial, the leafhopper has been the inspiration of at least two plays and one song 'The Leafhopper Hop'! Many schools have received local media attention for their efforts.

Limitations to the project mainly lie in the areas of unrealistic expectations, poor host plant quality and the researchers' limited capacity to follow-up schools' and community groups' involvement. In a few instances the leafhoppers took either a long time, or failed to establish. This naturally resulted in disappointment and less enthusiasm to continue! Some leafhopper culture colonies failed, most likely due to poor host plant quality that resulted from groups eager to start rearing, collecting plants from the field, and potting them complete with their foliage attached. Plants then suffer from transplant shock and leafhoppers reject them as oviposition sites because of their declining quality.

An area in need of addressing is the capacity to ensure community groups are more than just 'on the right track' with their rearing efforts. It requires, in most instances, a phone call offering additional support or to troubleshoot problems soon after the colony has been received. In addition, better lines of communication need to be created toward the end of the growing season to encourage groups to return 'Release Details' forms. With hindsight it was probably unrealistic to expect that this second form, designed to be used to report establishment, could even be located by the majority of community groups! This should be addressed in the current year with the appointment of two officers dedicated to redistribution bridal creeper agents.

The success of the leafhopper rearing encouraged researchers to expand the community involvement in the biological control of *A. asparagoides* to spreading rust fungus *P. myrsiphylli* (see Woodburn *et al*. 2002).

## CONCLUSION

Involving community groups and schools in a biological control program is an effective method to increase the number of release sites. It also raises the profile of biocontrol, and helps to counter the pockets of resistance to this science that exist in the community. However, the model developed here may not be suitable for all biocontrol agents, especially if rearing is involved, e.g., agents that have only one generation a year with an extended dormancy stage. Community, landcare groups and schools have limited biological knowledge and will struggle to understand the biology of complicated insects such as wasps and some beetles. Even though the leafhopper is a relatively simple agent, community groups need extensive guidance and supporting materials (photos and thorough explanations of rearing methods). Arranging this material can be extremely time-consuming. However, the cost involved in facilitating community involvement in biological control is far outweighed by the benefits to community education and to weed management.

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