UPDATE OF BIOLOGICAL CONTROL RESEARCH FOR CAT'S CLAW CREEPER AND MADEIRA VINE

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ABSTRACT

Cat's claw creeper and Madeira vine are Weeds of National Significance. Both invasive vine species threaten riparian and rainforest ecosystems in Queensland. New biological control agents for both these species have recently been approved for release in Australia. The leaf mining jewel beetle *Hylaeogena jureceki* that feeds on cat's claw creeper was approved for release in August 2012, while the leaf-feeding Madeira vine beetle *Plectonycha correntina* was approved in May 2011. Approximately 11,000 *H. jureceki* beetles have been released at 23 sites in Queensland. Approximately 35,000 *P. correntina* beetles have been released at 86 sites in Queensland. The Madeira vine beetle is persisting at 58% of sites that have been monitored and feeding damage is evident at some sites. The cat's claw beetle can be found at all monitored release sites and has completed development to provide a second generation at most sites. These insects are in addition to the leaf-tying moth *Hypocosmia pyrochroma* and the tingid *Carvalhotingis visenda*, both released to attack cat's claw creeper in 2007. This paper provides an overview of rearing and release techniques and the spread and efficacy of these insects. Community groups have a role in the rearing and release of biological control insects, providing more rapid spread and establishment.

Keywords: *Hylaeogena jureceki*, *Plectonycha correntina*, biological control, Madeira vine (*Anredera cordifolia)*, cat's claw creeper (*Dolichandra unguis-cati*).

INTRODUCTION

Cat's claw creeper (*Dolichandra unguis-cati*) and Madeira vine (*Anredera cordifolia)* are two 'Weeds of National Significance' that threaten riparian and rainforest ecosystems in Queensland. These vines are often located in inaccessible locations that are not suitable for mechanical or chemical control methods, making them good candidates for biological control. The two biological control insects discussed in this paper, *Plectonycha correntina* Lacordaire (Coleoptera: Chrysomelidae) and *Hylaeogena jureceki* Obenberger (Coleoptera: Buprestidae) are both in the early stages of release programs. The leaf mining jewel beetle *H. jureceki* was approved for release on cat's claw creeper in August 2012 and the leaf-feeding Madeira vine beetle *P. correntina* was approved for release in May 2011. *H. jureceki* is the third agent released against cat's claw creeper in Australia. The leaf-tying moth *Hypocosmia pyrochroma* and the tingid *Carvalhotingis visenda* were both released in 2007.

This paper gives an overview of the rearing and release techniques and early observations regarding the spread and efficacy of these insects.

MATERIALS AND METHODS

The insects

Both the larval and adult stages of these insects are leaf feeders, with the larvae of *H. jureceki* being leaf-miners. *P. correntina* is multivoltine and has a life span ranging from 20-130 days. Females lay 289-1613 eggs (mean ±SEM: 771±155; n=8) during a lifetime in batches of 1-35 eggs (Snow *et al*. 2012). After 5-6 days incubation, the emergent larvae take 9-16 days to complete development before pupating in the soil for a further 19-21 days (Cagnotti *et al*. 2007).

Hylaeogena jureceki adults are long lived (up to 314 days) and feed predominantly on new leaflets. Females lay eggs on the outer margins of the undersides of basal leaves with eggs taking 12-17 days to hatch (Williams 2003). The neonates enter the leaf, mine through the leaf for 14-24 days and then pupate in a disc-like pupal case for 11-24 days. The pupal case can remain in the leaf or drop to the ground. Average duration of development is 55.4±0.2 days (range 52-63) (Dhileepan *et al*. 2013).

Mass rearing method

Madeira vine

Plectonycha correntina beetles were reared in air conditioned glasshouse (22-27°C) facilities at the Ecosciences Precinct in Brisbane. Beetles were reared in enclosed cages (90 x 90 x 40 cm and covered with polyester voile fabric 45 gsm) containing 6-8 Madeira vine plants in 14 cm pots. Potting mix was spread on the cage floor as a pupation medium. Fifty adults were placed in each cage for approximately two weeks until an adequate number of egg batches were laid. Removing adults reserves foliage for newly emerged larvae. Larvae usually require supplementary feeding with cut foliage as they consume large amounts of leaves during this stage. Newly-emerged adults were harvested approximately 42 days after culture was established. Adult beetles were taken to the field using small plastic containers lined with absorbent paper and filled with Madeira vine cuttings. Containers were ventilated using a mesh layer between the container and the lid with a hole cut in the centre.

Cat's claw creeper

Hylaeogena jureceki beetles were reared in the same air conditioned glasshouse facilities as *P. correntina,* using the same type of cages. Cages were filled with approximately 20 cat's claw creeper plants and 60 adult beetles were then added. Adults were removed after approximately 30 days to preserve foliage for larvae. Adult beetles were harvested approximately 60 days after the culture was established.

Adult beetles were collected using a vacuum aspirator and taken to the field in small plastic containers filled with cat's claw creeper cuttings. Containers were ventilated using a mesh layer between the container and the lid with a hole cut in the centre.

Releases

Releases were generally made in any areas infested by the weeds that were not candidates for herbicide spraying or mechanical removal of weeds. Decisions were often made in consultation with local councils.

Madeira vine

Single releases were mostly used for Madeira vine infestations, however larger infestations were treated multiple times. Adult beetles were released at a single point so that dispersal time and distance could be measured if required. Cuttings with insects were then draped onto Madeira vine.

Cat's claw creeper

Both single and multiple releases (over a number of weeks/months) were made at cat's claw creeper sites. Sites were categorised as riparian areas (most common) and non-riparian areas. These categories will be used for later comparative analysis of establishment success rates. Cuttings with adult beetles were draped over cat's claw vine and the remaining insects gently tapped out onto the vine.

Monitoring

Searches were conducted at release sites for 10-minute intervals. The number of adults, larvae (and larval mines for jewel beetles) and egg batches (for Madeira vine) were counted during search. Outer edges of weed infestations were also searched, where possible, for signs of insect dispersal.

RESULTS

Madeira vine

The average (± SEM) number of beetles from a cage was 498±58. Approximately 35,000 Madeira vine beetles have been released at 86 sites in Queensland to date. The number of insects released at each site varied depending on availability and ranged between 50-1000 beetles. *Plectonycha correntina* was recovered from 58% of sites (n=31) that were checked during April and May 2013.

Cat's claw creeper

The average (± SEM) number of beetles from a cage was 632±89. Approximately 11 000 *H. jureceki* beetles have been released at 23 sites in Queensland since August 2012. The number of insects released at each site ranged between 50-1590 beetles (depending on availability). Pupal cases were dispersed at sites during early releases. All life stages of *H. jureceki* were observed at all sites surveyed during April and May 2013. A preliminary estimate of insect dispersal at one site was around 60 m over an eight month period.

DISCUSSION

Early indications are that both of these insects will probably establish in Queensland. The Madeira vine beetle has now overwintered twice since initial release in 2011. While the insect has not been recorded at all release sites, many of these sites have heavy infestations of Madeira vine and are very difficult to access (in terms of terrain and canopy height) so insects may be present but were not observed. The presence of the insect may become more obvious at these sites in future.

All stages of *H. jureceki* have been found at all cat's claw creeper release sites and long-term establishment of this insect appears highly likely. The beetle also appears to have

spread at release sites and hopefully this will translate to widespread distribution of this insect over a short time period.

The tingid has severely damaged foliage at some sites and appears well established in most areas. The leaf-tying moth does not appear to have established, however release sites are still being monitored for signs of the larvae. Widespread establishment and subsequent impact from biological control agents may take up to 10 years in some cases [e.g. the rubber vine moth *Euclasta walleyi* (Mo *et al*. 2000) and *Zygogramma bicolorata* on *Parthenium hysterophorus* (Dhileepan *et al.* 1996).

More rapid spread and establishment of *P. correntina* and *H. jureceki* can be achieved through the involvement of landcare groups, regional councils, schools and community groups commencing mass rearing and release programs. Some Landcare groups and individuals in south-east Queensland have already begun rearing programs for both beetles. This approach has been very effective in boosting the numbers and spread of insects such as the tingid (Dhileepan *et al.* 2010).

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