Application ERMA200683

Proposal to introduce two beetles as biological control agents for the weed *Tradescantia fluminensis*

ERMA New Zealand
Agency Advice
Summary and Recommendations

1.1. This application, from Auckland Council, proposes to introduce two beetles to New Zealand to act as biological control agents for tradescantia. The beetles, *Lema basicostata* and *Neolema abbreviata*, come from Brazil the home range of tradescantia, and feed on the stems and shoot tips of tradescantia. The beetles are intended to work synergistically with *Neolema ogloblini* (approved for release in 2008) to control tradescantia.

1.2. *Tradescantia fluminensis*, commonly known as tradescantia or wandering Jew, is a serious weed in the conservation estate and a problem in home gardens.

1.3. Auckland Council considers tradescantia to be a significant weed in their region, and believe successful biological control of this weed would be of significant benefit.

1.4. ERMA New Zealand has previously assessed the benefits of successful biological control of tradescantia as being significant. The same significant benefits will result from releasing *L. basicostata* and *N. abbreviata* to control tradescantia.

1.5. Auckland Council believes that the potential risks of releasing the two beetles are very low, and are outweighed by the potential benefits.

1.6. The main risk of introducing the two beetles is non-target feeding. Host range testing indicated that no native species are at risk from non-target feeding from either beetle species. However it is likely non-target feeding on some closely related ornamental species will occur. The impacts of this would be small as the beetles could be treated with insecticide treatments, and indoors plants are unlikely to be colonised by the beetles. Therefore the risks of non-target feeding are not significant.

Agency recommendation

1.7. The organisms pose a negligible risk to the New Zealand environment. The benefits of release of those organisms outweigh the risk, and the minimum standards are not triggered.

1.8. It is recommended that the application to release the beetles *Lema basicostata* and *Neolema abbreviata* be approved without controls.
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2. The application process

Purpose of the application
2.1. This application is to import for release two beetles, *Lema basicostata* and *Neolema abbreviata* as biological control agents for the weed *Tradescantia fluminensis*.

2.2. The Authority has previously approved an application (NOR07001) for the release of the beetle *Neolema ogloblini* as a biological control agent for *Tradescantia*.

The applicant
2.3. This application has been made by Auckland Regional Council on behalf of the National Biocontrol Collective. The National Biocontrol Collective is a consortium of New Zealand’s regional councils and the Department of Conservation (DOC).

2.4. The work leading to this application has been carried out by Landcare Research, and has been primarily funded by the National Biocontrol Collective, with a major contribution from DOC.

Public notification
2.5. The application was formally received for processing on 11 March 2011 and publicly notified on 16 March, for 30 working days. The notification period was extended by 10 working days following the receipt and notification of further information from Landcare Research on behalf of the applicant.

2.6. The further information consisted of a revised Appendix Four, replacing the incorrectly submitted draft appendix. The notification period was extended to allow submitters time to consider this corrected information.

Submissions
2.7. Eleven submissions were received, eight in support and three in opposition to the application. The Ministry for Agriculture and Forestry (MAF), and the Department of Conservation (DOC) were also notified of this application, and given the opportunity to provide comments (summarised in Appendix 1 and addressed in Section 9).

Consultation
2.8. The applicant conducted level one national consultation with Maori in 2007 and 2010 regarding the potential introduction of biological control agents for *Tradescantia*.
3. The organisms proposed for release

**Neolema abbreviata**

<table>
<thead>
<tr>
<th>Kingdom:</th>
<th>Animalia</th>
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<tbody>
<tr>
<td>Phylum:</td>
<td>Arthropoda</td>
</tr>
<tr>
<td>Class:</td>
<td>Insecta</td>
</tr>
<tr>
<td>Order:</td>
<td>Coleoptera</td>
</tr>
<tr>
<td>Family:</td>
<td>Chrysomelidae</td>
</tr>
<tr>
<td>Subfamily:</td>
<td>Criocerinae</td>
</tr>
<tr>
<td>Genus:</td>
<td>Neolema</td>
</tr>
<tr>
<td>Species:</td>
<td>abbreviata Lacordaire, 1845</td>
</tr>
</tbody>
</table>

3.1. *Neolema abbreviata* adults are 4-5mm in length and have yellow and black alternating longitudinal wing case stripes. Females lay white elliptical eggs on the under-surface of leaves. Larvae initially feed within the leaves of tradescantia, moving to feed on the surface as they grow.

**Lema basicostata**

<table>
<thead>
<tr>
<th>Kingdom:</th>
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<td>Subfamily:</td>
<td>Criocerinae</td>
</tr>
<tr>
<td>Genus:</td>
<td>Lema</td>
</tr>
<tr>
<td>Species:</td>
<td>basicostata Monros, 1947</td>
</tr>
</tbody>
</table>

3.2. *Lema basicostata* adults are also 4-5mm in length, and are black. Adults feed on leaves and notch the stems of tradescantia. Females lay canary yellow eggs in leaf axils and shoot tips. Larvae are stem boring, meaning they enter the stem when they hatch, then hollow out the stem and complete development within the stem.
4. Why introduce a biological control for tradescantia?

Tradescantia is a serious weed for New Zealand

4.1. The history and biology of Tradescantia fluminensis (tradescantia, wandering Jew, or wandering Willie), in New Zealand has been fully reviewed by the Authority in its consideration of the release of Neolema ogloblini (NOR07001) and is not further elaborated here.

4.2. The Authority in considering N. ogloblini (NOR07001) has acknowledged that tradescantia is a problem weed in home gardens and a growing conservation threat in many parts of the country (ERMA, 2008). Tradescantia remains a serious weed in New Zealand today, and will continue to be a serious weed in the foreseeable future.

Potential for biological control against tradescantia

4.3. The Authority has approved the release of the beetle N. ogloblini for use as a biological control agent for tradescantia (ERMA, 2008). This beetle has just been released from containment.

4.4. In their application to release N. ogloblini (NOR07001) the applicant stated:

“However, one agent is unlikely to reduce the significance of tradescantia as a weed so the research strategy being pursued by Landcare Research is to find a number of other insects and pathogens to work synergistically with [N. ogloblini] to manage tradescantia.”

4.5. This current application is the result of the search for further biocontrol agents to supplement N. ogloblini and seeks approval for two further agents, L. basicostata and N. abbreviata.
5. What will happen if the biocontrol agents are successful?

Context
5.1. Biocontrol agents can take many years to establish widely and have an impact on the target species, and there is uncertainty about whether the beetles will establish and disperse successfully and how long this will take. If the beetles do not establish, it can be assumed that there will be no significant effects (either adverse or beneficial) from the release of those beetles. If high numbers of the beetles establish, it is expected that both risks and benefits will be at the highest level. Therefore, when looking at the impacts of releasing these beetles we look at a scenario where both beetles have established widely in high numbers.

Successful biocontrol of tradescantia
5.2. The applicant considers the biocontrol of tradescantia would be successful if there was a reduction in the density of tradescantia. Tradescantia biomass can reach up to 800g/m$^3$ at some sites, and if this were reduced to less than 200g/m$^3$ through feeding it would be considered a significant and useful reduction (Standish, 2001).

Benefits of successful biocontrol of tradescantia
5.3. The Authority has previously considered the benefits of successful biological control of tradescantia, when assessing Application NOR07001. In considering that application the Authority considered that the combined benefits of releasing a biological control agent, Neolema ogloblini, were significant. As the same benefits will result from the release of L. basicostata and N. abbreviata no further assessment is required.
6. What about non-target impacts?

6.1. When introducing a new organism into the environment, the major concern is what damage that organism could do. In this case, the intention of the introduction is for the two beetles to damage tradescantia (the target weed), reducing the impacts of this weed on the environment. However there is also potential for those beetles to cause damage to other species through non-target feeding, or through impacting on the ecosystem and food webs at infestation sites.

Context

6.2. As discussed earlier, biocontrol agents can take many years to establish widely and have an impact on the target species, and there is uncertainty about whether the beetles will establish and disperse successfully and how long this will take. If the beetles do not establish, there will be no significant non-target effects from the release of those beetles.

6.3. Therefore, when looking at the non-target impacts of releasing these beetles we look at a scenario where both beetles have established widely in high numbers. This means that any potential non-target impacts will be at the highest possible level.

Non-target feeding

6.4. When looking at non-target feeding, that is the beetles feeding on and damaging plant species other than the target (tradescantia), we rely on the host range testing data provided by the applicant and observations in the field to give an indication of the risks.

6.5. In this case the applicant has provided details of the host range testing carried out by Landcare Research in Appendix 4 (revised) of the application.

6.6. The applicant states that only limited host range testing was carried out because tradescantia is not closely related to any New Zealand native species, or any highly valued introduced species (eg, crop species).

6.7. The host range testing showed that host range of both *L. basicostata* and *N. abbreviata* is limited to plants within the Family Commelinaceae, and in natural conditions it may be limited to species within the Tribe Tradescantiae. Commelinaceae is the spiderwort family, consisting of over 600 species of mainly terrestrial herbs and climbers, including tradescantia.

*Tradescantia albiflora*

6.8. The host range testing showed that both *L. basicostata* and *N. abbreviata* fed as well, or better, on *T. albiflora* as on *T. fluminensis*. Both tradescantia species are naturalised in New Zealand, and would be available as hosts for the beetles if they were released.

6.9. This means that it is very likely that non-target damage to *T. albiflora* will occur. The level of damage will depend on the preferences of the beetles, and the proximity of any *T. albiflora* to sites where the beetles establish. *Tradescantia albiflora* has no economic or environmental value in New Zealand. Therefore non-target feeding on *T. albiflora* would not cause adverse effects on the environment or economy.
Ornamental plant species

6.10. A number of species in the Commelinaceae Family are imported and sold in New Zealand as ornamental garden and indoor plants. These include Commelina coelestis (widow’s tears), Commelina dianthifolia, T. cerinthoides, T. navicularis, T. spathacea (Moses-in-the-cradle) and T. virginiana (flowering inch plant).

6.11. The host range testing showed that most of the ornamental/indoor species tested were fed on at very low levels, much lower than the target species. There were, however, some species that were fed on at similar levels to the target species and could be suitable hosts for the beetles. Therefore they may be damaged through non-target feeding.

6.12. The extent of damage caused by non-target feeding on ornamental species will vary from site to site, depending on the local biomass of tradescantia and the ornamental species, the accessibility of those ornamental species, and the preferences of the beetles. Indoor plants are unlikely to be targeted by the beetles, as they will not be easily accessible; outdoor plants are more likely to be targeted, particularly if there is a lot of tradescantia in the area.

6.13. Damage to ornamentals could potentially be a nuisance to nurserymen and home gardeners, adding another herbivore to the ‘garden pests’ that they deal with. However, the beetles can be dealt with using common pesticides that also target other garden pests. Therefore any non-target feeding on ornamental plants impacting on nurserymen and home gardeners will be insignificant.

Native plants and crop species

6.14. No New Zealand native or crop species belong to the Family Commelinaceae. Therefore the applicant considers that there is no risk of non-target feeding on native or valued plant species, and the Agency agrees with this assessment.

Removal of tradescantia as habitat for invertebrates

6.15. A concern that the removal of tradescantia could have a negative effect on the native snail (Powelliphanta travsei) which utilises tradescantia as a refuge for juveniles and sub-adults of this native snail species (Standish et al, 2002).

6.16. Tradescantia is an introduced plant, and is not the natural habitat for Powelliphanta travsei. Tradescantia is having a significant deleterious effect on all native flora and fauna in the infested area and the benefits of its removal on native habitat is greater than any deleterious effect from its removal on a specific species.
7. Potential impacts to Māori culture

Impacts on Taonga

7.1 One of the outcomes of importance to Māori is the productive and life sustaining quantity and quality of a range of taonga or valued resources. Of particular relevance to this application is the potential for adverse effects to native and/or valued species (taonga koiora and/or taonga tuku īho) and to the integrity and availability of taonga.

7.2 Whakapapa (the shared genealogy of Māori with native flora and fauna species) is core to the importance and significance of taonga. Whakapapa is the mātauranga Māori (Māori knowledge) framework by which the nature of relationships between people and the environment is explained. Any disruption to this framework of relationships poses potentially significant risk to Māori due to the highly interdependent nature of its components.

7.3 Māori continue to raise concerns that the introduction of an exotic species might disrupt the delicate nature of these relationships and have previously requested assurances, that the release of biological control agents poses no threat to taonga species and ecosystems.

7.4 As noted elsewhere in this report, host range testing indicated that no native species are at risk from non-target feeding from either beetle species. It is considered therefore that the chance for disruption to whakapapa and mauri to be low given the highly host specific nature of Neolema abbreviata and Lema basicostata.

7.5 Given this assessment we anticipate a minimal effect on taonga species to be highly improbable. The level of effect is therefore deemed to be negligible (Level A).

Impacts on Kaitiakitanga responsibilities

7.6 This application poses potential adverse effects to kaitiakitanga through unanticipated impacts on the mauri of native and valued species, ecosystems and the traditional values and practices of Māori in relation to taonga.

7.7 Mauri is a key element of kaitiakitanga. Within a Māori world view, it is the responsibility of iwi/Māori to exercise kaitiakitanga to protect the mauri of significant resources to ensure their sustainability and availability for generations to come.

7.8 Although the biophysical risks posed by the introduction of Neolema abbreviata and Lema basicostata is indicated as low in other parts of this report, Māori continue to note concern that the release of the organisms could adversely affect mauri. This is often expressed as a concern for the ability of iwi to maintain rongoa stocks (traditional medicines), mahinga kai (traditional practices associated with food gathering), ngā tini ō Papatūānuku me ngā rerenga koiora (biodiversity), and waahi tapu.

7.9 Māori have consistently requested that applicants be rigorous in their pre-application research to provide the greatest degree of certainty regarding the potential adverse effects to the mauri of the taonga over which they have kaitiakitanga responsibilities. In addition they continue to encourage expert Māori peer review and involvement at all levels of the research and decision making. One respondent suggested that rigorous long term trials should be undertaken to ensure native flora and fauna are not impacted and suggested that current trials are completed and assessed as to their effectiveness, before importing further biological control agents.
7.10 The applicant has advised that first releases into the New Zealand environment will be made in close consultation with local iwi and that consultation and collaboration are ongoing. Using the results of scientific testing and feedback obtained from Māori during consultation, the applicant has identified and assessed a range of relevant risks arising from the proposed release of *Neolema abbreviata* and *Lema basicostata*.

7.11 The Agency considers the host specificity testing undertaken by the applicant to have been sufficient to provide useful information for assessment (see section 6 of this assessment and Appendix 4 of the application). Given this information we consider a minimal effect on the kaitiakitanga responsibility of Māori to be highly improbable. Therefore the level of effect is considered negligible (Level A).

**Treaty of Waitangi**

7.12 In accordance with the requirements of section 8 of the HSNO Act 1996 the Agency has considered any potential impact posed to the principles of the Treaty of Waitangi (Te Tiriti o Waitangi) and has considered the principle of active protection identified by the Court of Appeal decision in New Zealand Māori Council v Attorney General 1987.

7.13 Active protection has been defined as “not merely passive but extends to active protection of Māori people in the use of their lands and waters to the fullest extent practicable” (Cooke, 1987). The assessments provided in this section and in other parts of the report, indicate a negligible adverse biophysical effect to lands, native species and ecosystems.

7.14 Consequently the project team considers that the application provides sufficient information to take into account the principle of ‘active protection’, therefore this application is considered to be consistent with the principles of the Treaty of Waitangi.

7.15 Given this assessment we anticipate a minimal effect on the principles of the Treaty of Waitangi to be highly improbable. The level of effect is therefore deemed to be negligible (Level A).
8. Minimum Standards

8.1. Any organism being assessed for release must pass the five minimum standards as stated in the HSNO Act. ERMA New Zealand has assessed *Lema basicostata* and *Neolema abbreviata* against those standards here.

**Displacement of any native species within its natural habitat**

8.2. Based on the information available, *L. basicostata* and *N. abbreviata* do not have the ability to cause significant displacement of any native species within its native habitat. We note that by reducing levels of tradescantia, they may cause displacement of some native invertebrates. However, tradescantia is not the native habitat for those species and any displacement would not be significant.

**Deterioration of natural habitats**

8.3. Based on the information available, *L. basicostata* and *N. abbreviata* do not have the ability to cause significant deterioration of natural habitats.

**Adverse effects on human health and safety**

8.4. Based on the information available, *L. basicostata* and *N. abbreviata* do not have the ability to cause significant adverse effects on human health.

**Adverse effect to New Zealand’s inherent genetic diversity**

8.5. Based on the information available, *L. basicostata* and *N. abbreviata* could not interbreed with any native species; therefore they could not cause significant adverse effects on New Zealand’s inherent genetic diversity.

**Cause disease, be parasitic, or become a vector for human, animal, or plant disease**

8.6. Based on the information available, *L. basicostata* and *N. abbreviata* could not cause disease, be parasitic or become a vector for human, animal or plant disease.

**Conclusion on minimum standards**

8.7. ERMA New Zealand considers that both *L. basicostata* and *N. abbreviata* meet the minimum standards as stated in the HSNO Act.
9. Concerns raised by submitters

Submissions in support of the application

9.1. Seven submissions were received in support of the application, six of which were from regional authorities. Those submissions noted problems with tradescantia in their respective areas and the difficulties in dealing with the weed. The submissions supported the release of the beetles as biological control agents (BCAs) for the weed.

Submissions opposed to the application

9.2. Three submissions were received in opposition to the application. These submitters voiced a variety of concerns including:
   - the introduction of additional BCAs for tradescantia when one has just been released, and the lack of a clear strategy for introducing BCAs for tradescantia;
   - the potential for the beetles to be harmful to the environment once released;
   - introduction of any new organisms damages remnant integrity of our indigenous biological diversity;
   - There is insufficient knowledge of the target weed to assess the efficacy of the proposed BCAs, individually or as a group;
   - host plant testing ignored phenotypic convergence occurring between taxonomically separate organisms;
   - the proposal does not limit geographical source of the beetles;
   - sequestration of plant toxins by BCAs and the consequences for predators has not been addressed; and
   - alternative methods of controlling tradescantia such as artificial shading have not been considered.

9.3. As noted in section 4.4 of this report the applicant group has clearly stated their intention to apply for the introduction of multiple BCAs for tradescantia.

9.4. The host ranges testing (section 6 of this report) shows that non-target effects will not be harmful to the environment.

9.5. The BCAs are intended to reduce the impact of tradescantia, which dominates the environments where it grows. By reducing this impact, it is expected that the indigenous biological diversity will be enhanced rather than damaged.

9.6. The efficacy of the beetles in controlling tradescantia will also depend on a range of factors including ability to establish in the New Zealand environment. Both beetles were observed to cause moderate damage in the field, and major damage under laboratory conditions.

9.7. The range of plants included in the host range testing was based on a centrifugal phylogenetic testing method, which starts with plants most closely related to the weed species, moving towards more distantly related plants. This is a widely accepted method of selecting plants for host specificity testing.

9.8. The proposal does not limit the geographical source of the beetles; this is supported by the host range testing, which showed that there was no significant difference between the host ranges of beetles from different areas.

9.9. As noted in the application, sequestration of plant toxins by the herbivores is common, but usually results in deterring predators rather than poisoning predators.

9.10. Alternative methods have not been considered in the assessment of this application; however it is unlikely that artificial shading would be suitable at all infestation sites.
10. References

ERMA Decision: Application NOR07001, 1 November 2008.


## Appendix 1: Submissions

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<thead>
<tr>
<th>Submission</th>
<th>Submitter/organisation</th>
<th>Support/ Oppose</th>
<th>Submitter comments</th>
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<tbody>
<tr>
<td>102401</td>
<td>Charles Drace</td>
<td>Oppose</td>
<td>“…there is no way of controlling the spread of the beetles and this could easily create another infestation that could easily harm our ecosystem.”</td>
</tr>
<tr>
<td>102405</td>
<td>Mary Trayes, West Coast Regional Council</td>
<td>Support</td>
<td>The introduction of the beetles could be of benefit eventually for West Coast where tradescantia is a problem in the milder coastal margins</td>
</tr>
<tr>
<td>102407</td>
<td>Craig Davey, Horizons Regional Council</td>
<td>Support</td>
<td>Tradescantia is directly causing significant effects on regeneration within established native forests across this region and in other areas of the country, as well as a social impact in managed parks and its allergic effects on dogs.</td>
</tr>
<tr>
<td>102408</td>
<td>Conrad Pattison, New Plymouth District Council</td>
<td>Support</td>
<td>“Tradescantia is an invasive weed problem in the Districts parks and reserves. Not sure if the biological control would be adapted to Taranaki conditions. Would be a useful tool to assist with Tradescantia control.”</td>
</tr>
<tr>
<td>102409</td>
<td>Jane Andrews</td>
<td>Support</td>
<td>“I think this is a great step forward in the right direction. As someone who has been involved in ongoing projects to restore bush and provide support for others involved in restoration of New Zealand ecosystems, this is one of the worst weeds we see and is a particular concern in the Auckland region.”</td>
</tr>
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| 102411     | Mary-Anne Macleod, Bay of Plenty Region Council | Support | Tradescantia is a well-established, widespread pest plant occurring throughout many areas of the Bay of Plenty region, particularly in areas with steep-sided gullies and fast-flowing streams
- it invariably smothers the forest floor and prevents regeneration of especially native species.
- it usually requires repeat applications of herbicide to effectively control. These herbicides can damage many native regeneration species.
- Bay of Plenty Regional Council receives an average of 200 enquiries per year regarding advice on how to control tradescantia and prevent further re-invasion. About ten of these complaints will be as a result of tradescantia causing an allergy to especially small dog breeds.
- the introduction and release of biocontrol agents will potentially be very helpful |
| 102413     | Lynne Garnham, Tui 2000 Inc | Oppose | Tui 2000 Inc. is community volunteer group with a mandate to actively encourage the restoration and reintroduction of New Zealand native bird life, indigenous flora and fauna and natural heritage landscapes in Hamilton and the greater Waikato region.
Any new BCAs for tradescantia should be delayed until the outcomes of releasing Noelema ogoblini have been assessed, and evidence about the three beetles interacting to better control the weed has been established. |
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</tr>
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<tr>
<td>102414</td>
<td>Phil Bell, Department of Conservation</td>
<td>Support</td>
<td>“The Department of Conservation strongly supports this application to import and release two beetles, <em>Lema basicostata</em> and <em>Neolema abbreviata</em>, as biological control agents for the weed tradescantia. It is our opinion that these two beetles pose negligible risk to the native flora of New Zealand. <em>Tradescantia</em> is a significant weed on conservation land. With increasing financial pressures on the Department, it is getting harder to control this weed at the many number of sites DOC manages around the country. Access to these beetles as biological control (which can be a cost-effective control method) will be of benefit in expanding our toolkit to manage this invasive weed. As such, the Department supports the introduction of these beetles as biological control agents to help control <em>tradescantia</em>.”</td>
</tr>
<tr>
<td>102416</td>
<td>Davor Bejakovich, Greater Wellington Regional Council</td>
<td>Support</td>
<td>Tradescantia is common weeded throughout the reserves, parks, QEII covenants, urban and rural properties of the Wellington region. Current control methods (herbicide/manual removal) are labour intensive, time consuming and expensive, and often not practical where <em>tradescantia</em> is present at steep/unstable sites. A successful BCA will ease reliance on those methods and allow resources to be allocated elsewhere.</td>
</tr>
<tr>
<td>102422</td>
<td>Dave Burt, Federated Farmers</td>
<td>Support</td>
<td>“On the basis of the information provided, the Federation supports the application and has no concerns around the adverse impact of the proposal”</td>
</tr>
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| 102423     | Cliff Mason | Oppose | • Introduction of BCAs damages remnant integrity of our indigenous biological diversity  
• There is insufficient knowledge of the target weed to assess the efficacy of the proposed BCAs  
• The host plant testing ignored phenotypic convergence occurring between taxonomically separate organisms  
• Sequestration of plant toxins by BCAs and the consequences for predators has not been addressed  
• Alternative methods of controlling *tradescantia* such as artificial shading have not been considered  
• The proposal does not limit geographical source of the beetles  
• There is no clear strategy for introducing multiple agents to target *tradescantia* |