Biological control of *Tradescantia fluminensis*: Consultation with Iwi Māori

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Two applications to introduce biological control agents for *Tradescantia fluminensis* have been submitted to ERMA and approved:

1. Release from containment the beetle, *Neolema ogloblini* (f*ormerly Lema obscura* F.) (Chrysomelidae), for the biological control of the weed tradescantia (*Tradescantia fluminensis*)

http://www.epa.govt.nz/search-databases/HSNO%20Application%20Register%20Documents/NOR07001.pdf

2. Importation and release of two beetles, *Lema basicostata* and *Neolema abbreviata,* as biological control agents for the weed tradescantia

http://www.epa.govt.nz/search-databases/HSNO%20Application%20Register%20Documents/ERMA200683_FINAL%20Application%20ERMA200683%20(2011%2003%2011).pdf

National consultation with the ERMA (EPA) Māori National Network was undertaken for both applications. The details of the consultation process were contained in appendices that are not available on the EPA website. The responses of the applicant to the issues raised by Iwi Māori were included in the application proper. These are reproduced below. EPA has advised that further consultation with the Network would not add significantly to our knowledge of Maori views on the application currently in preparation to introduce a fourth biological control agent, *Kordyana* sp. Instead, this application will contain a summary of the dialogue undertaken for the first two applications, based on the information provided below

Application 1, *Neolema ogloblini* (formerly Lema obscura) (2007)

Input from Iwi Māori recorded in an appendix to the application

An information pack was prepared, and is attached in this appendix. The document described how the applicant intended to assess the risks, costs and benefits surrounding the proposed introduction of *Lema obscura* in the application, and asked each organisation to identify any issues that were inadequately, or not covered in those plans. Responses to the questions most frequently asked about biological control were provided. Recipients were given the option of responding by form letter (a SAE was included), by email, by phone, and were invited to seek more interaction with the applicants. Individuals who had responded to previous applications were contacted. The offer to meet kanohi ki te kanohi was not explicit, but such meetings would have been undertaken willingly had respondents requested it. The information pack was circulated to 81 iwi, hapū, and Māori organisations (18 of which were papatipu rūnanga of Ngāi Tahu). This list was supplied by ERMA New Zealand. The packs were distributed in early September 2005, and responses were requested by the end of October (6 weeks). One week later, packs were distributed to an additional 13 iwi and hapū in the

Auckland Region. A further letter was sent on 29 August to selected people who had provided input to the preparation of two previous applications in the past year.
Toitū te Whenua (Ngāi Tahu) was contacted to facilitate discussion of the proposal and the methodology for consultation with NT.
All organisations consulted will be informed when the application has been submitted and is open for public submissions.

Responses from Iwi, Hapū and other Māori organisations
Email or written responses were received from 8 sources including one representing the 18 rūnanga of Ngāi Tahu. The originals of these responses have been supplied to ERMANZ. Four respondents indicated that they were happy that the process in place would adequately address their views. The remaining respondents made detailed responses or requested further information. In these cases there was further dialogue with respondents by email or phone, and more information was supplied on request. Respondents were reassured that their issues would be addressed in the application.

Responses were received from:
Ngāi Tahu, plus
- Wairewa Runanga
- Onuku Runanga
- Hokonui Runanga

Ngāti Wai Trust Board
Ngāti Rehua-Ngāti Wai ki Aotea Trust
Ngāti Rarua Iwi Trust
Te Rūnanganui o Taranaki Whānui ki to Upoko o te Ika a Maui Inc

The issues extracted from those submissions are provided below, and are addressed in Section 7.3 of the application. The original responses have been copied to ERMANZ.
"As you stated in your letter, we are not 100% happy with the introduction of non-native species to Aotearoa. We will consult our kaumatua who have knowledge of rongoa area and will submit our findings…"
'We are looking for further information on what tests have been accomplished to confirm that the biological control will in no manner impact on our native species…"
"Will this insect actually eradicate the weed.. ..are we just inviting it for a feed?
Does the insect have flying capabilities (to take it) to restricted areas…with rare indigenous plant life?
What plans to reverse this….?
Can control in this way be justified?
When it changes to a beetle, what will it eat?
Everything…has a tapu… What then do we do about the tapu of the insect world…?
What protocols… to relocate the mauri of this insect?"
"At this stage we would like to discuss the proposal…At this stage we are taking a precautionary approach until we are satisfied that all checks and balances are in place"

In addition to these responses, the following issues have been identified from responses to previous applications to introduce biological control agents for weeds:

- What are the flow-on effects for the environment?
- What is the contingency should the population if the agent looks for other prey?
- How will Māori be able to peer review this work?
- Have other forms of intervention been investigated?
- What is the impact of not intervening?
- I would rather nothing like this was brought into the country
- What is the history and success rate of biocontrols?
- Are there human health concerns involved?
- Will there be employment opportunities in the introduction?
- All introduced species have impact on the native flora and fauna
- Request reports on monitoring and analysis of this biocontrol

The following comments were made in a "Cultural Impact Assessment" prepared by Toitū to Whenua (Ngāi Tahu) in 2005 on the proposal to introduce biological control agents for broom, and are also relevant to this application:

- What happens to the introduced bug if and when it successfully eats all the (weed) in an area?
- Everything has a whakapapa and mauri. Even the insect that we might bring into the country. What happens to the new organism's whakapapa when it is taken from its home, where it is a native species?
- If a particular native plant is going to be tested, then that sample should come from the area where it is proposed to release the insects, and not from another location (e.g. the North Island)
- If an introduced insect is intended to specifically attack the leaves, twigs, flowers or seeds of a weed, what then is the risk that they will attack other plants that have similar leaves, twigs, flowers or seeds, as opposed to a close relation, particular in a no choice situation?
- We have no idea what they will do to our native insects here.
- What happens if at some point in the future we have to bring something else in to control the insects we are introducing…?
- Herbicide use may impact non-target native species (considered "scrub") in some areas. It also impacts on the mauri of Papatuānuku, through building up in the soil over time. Often herbicides enter our awa (waterways), and can have adverse effects on mahinga kai
- While we did not bring (the weed) here, it is here now. So we have to address it. We have to think about what is best
- The way we see it…if you don't have the money to monitor post release, then you don't have the money for the project.
- We are interested in who carries the risk should things get out of hand. What level of responsibility goes back to the applicant?
- If biocontrol is successful, what responsibility is the (applicant) taking for succession – that is, what plants take over the space broom occupies, given that there are many other potential weeds waiting for space?"
- We take our role as kaitiaki very seriously, and thus know we need all the information in order to make an informed decision.

- Host testing must be effective and appropriate.
- The benefits of (the target weed) on the landscape must be taken into account.
- The applicant must fully assess the potential impact of the proposal on taonga species.
- Adverse effects on (valued non-target species) are undesirable.

Consider the environmental benefits, the environmental effects of increasing the use of herbicides, and other environmental costs associated with doing nothing.

Many of these issues were dealt with generically in the "FAQs" that was sent to respondents (see 1.6 below). Others have been addressed in Sections 7.1 and 7.3 of the application.

1.2 Response from the applicant as recorded in the application form

A letter seeking consultation was circulated to a list of 81 iwi, hapū, rūnanga, and Māori organisations supplied by ERMA New Zealand (18 of which were papatipu rūnanga of Ngāi Tahu), and an additional 13 organisations requested by the Māori Relations Unit of the Auckland Regional Council (see Appendix 1.2). The letter was accompanied by an „information pack". The consultation document was distributed in mid-July. Responses were requested by the end of August (6 weeks) but were accepted until mid-October. A further letter was sent on 29 August to selected people who had provided input to the preparation of two previous applications in the past year. The distributed material is reproduced in Appendix 1.6. It describes how the applicant intended to assess the risks, costs and benefits surrounding the proposed introduction of *L. obscura* in the application, and asked each organisation to identify any issues that were inadequately, or not covered in those plans. A sheet of answers to „frequently asked questions" about biological control of weeds was provided. Recipients were given the option of responding by form letter (a self-addressed envelope was included), by email, or by phone, and were invited to seek more interaction with the applicants. The offer to meet kanohi ki te kanohi was not explicit, but such meetings would have been undertaken had respondents requested it. Email or written responses were received from eight sources including one representing the 18 rūnanga of Ngāi Tahu. The applicant entered into dialogue on all specific issues raised by respondents as and when requested. In none of the written responses, nor in the follow-up phone calls were specific requests made for a face-to-face meeting. The responses and subsequent correspondence have been supplied to ERMA New Zealand in full, and are summarised in Appendix 1.3. Four respondents indicated that they were happy that the suggested process for preparing the application would adequately address their views. The remaining respondents made detailed responses or requested further information. Where requested there was further dialogue with respondents by mail, email or phone, and more information was supplied on request. Once the application is lodged the applicant intends to inform all organisations how to access the application and prepare public submissions.

The specific issues raised during pre-application consultation on this proposal and in correspondence over previous applications are listed in Appendix 1.3. Many of these issues were dealt with generically in the "FAQs" that was sent to respondents (see Appendix 1.6). Larger generic concerns include a general disquiet about introduction of exotic organisms, the irreversible nature of control agent introductions, and their consequences. Respondents have raised the issue of how whakapapa, mauri and tapu of the introduced species will be transferred. Initial releases in the Auckland Region will be made in consultation with the Māori Relations Team of Auckland Regional Council. Landcare Research will monitor for any non-target damage to native plants

following release (Section 5). Many other issues of importance to Māori are noted in this Section but are addressed in more detail elsewhere in Section 7.

Risks:

Adverse effects to Māori cultural and spiritual values could theoretically arise from two sources: 1. reducing the amount of tradescantia in native forest ecosystems by biological control 2. introducing the insect to the forest ecosystems of Aotearoa 1. Tradescantia does not appear to be used as either kai or rongoa. It was originally introduced as a house plant and as a garden ornamental, but it is no longer used for this purpose as it is not legal to propagate or distribute this species. With the possible exception of its role in sheltering native snails, worms and geckos (Standish et al., 2002; Brown & Rees, 1995; Section 7.1.1.5), tradescantia has no known economic, environmental or cultural values in Aotearoa (Sections 7.1 and 7.4). The reduction in the biomass or cover of tradescantia in forest ecosystems through biological control would (in itself) therefore, have no significant adverse effect on those values, and the removal of tradescantia would not adversely affect the mauri of forest ecosystems or the role of tangata whenua as kaitiaki over that mauri. 2. The introduction of *L. obscura* to Aotearoa could theoretically adversely affect that mauri by damaging native or other valued plants, or by interfering in the relationships between elements of the native flora and fauna (whakapapa). Host-range testing indicates that *L. obscura* feeds only on a very narrow range of closely related plants, all of which have been introduced to Aotearoa as ornamentals (Appendix 2.2, Section 7.1.1.4). Tradescantia has no relatives amongst the native flora. The closest (though very distant) relative is nīkau, (*R. sapida*) which is listed as a tāonga under the Ngāi Tahu Deed of Settlement (Attachment 12.148). Tests show that this plant is not at risk from the control agent and the narrow host-range estimated in tests indicates that no other native plants would be at risk either (Appendix 2.2.4, Section 7.1.1.4).

Even though this weed grows intimately and aggressively with native plants in forest margins, with some exceptions it is not a favoured home for native invertebrate species (Winks et al., 2003; Section 7.1). The introduction of *L. obscura* might attract additional predators, but the paucity of native species found on this weed suggests that any impact on native food webs is likely to be simple and low (Section 7.1.1.3). Any adverse effects will be local as *L. obscura* can only reproduce on tradescantia, and larval populations will build only in the immediate vicinity of infestations of this weed. As heavy tradescantia infestations are restricted to forest margins and gaps, effects will not extend into intact forest. As detailed in Section 7.1.2.5, any effects are as likely to be beneficial to native invertebrates as adverse.

Adult beetles are highly mobile so will migrate into all nearby habitats, but unless the weed is present there, beetles will be rare, and will not feed on non-target plants there (Appendix 2.2.4). The effect of introducing *L. obscura* to forest ecosystems would alter the mauri of those systems. However, the applicant contends that these changes would be small, local, and (if control succeeds) reversible as the weed population declines. Any adverse effects of introducing the insect will be small compared to the massive ongoing, and expanding effects of the weed on the composition and sustainability of forest ecosystems (Section 7.1). A species is defined as a reproductively isolated entity, not capable of forming fertile hybrids with others. L*. obscura* is regarded as a stable species (F. Vencl, pers. comm.) that belongs to the subfamily Criocerinae. This sub-family is not represented in the native fauna, and so there are no related native species. Hybridisation with native insects is therefore not possible. *Lema cyanella* has been introduced to New Zealand from Europe for the biological

control of Californian thistle. There are no records of hybridisation between *L. cyanella* and other European *Lema* species. It is highly improbable or impossible that these two species could hybridise to produce viable offspring. This risk is considered to be negligible to nil. This beetle does not sting or bite, and the insect is not genetically modified.

Benefits:

Consultation did not identify any benefits specific to Māori. The environmental and economic benefits that would accrue to Māori as a result of successful biological control of tradescantia are those that accrue to all New Zealanders, and are assessed in section 7.2. However, the potential beneficial environmental effects have particular cultural significance for Māori. Tradescantia occupies space on the forest floor and displaces other plants and their associated fauna. This weed is already causing massive and spreading disruption to relationships in the forest. The introduction of *L. obscura* will also change relationships, but the extent of these changes, and whether the changes in themselves will be adverse or beneficial, is uncertain and variable (see Section 7.1). However, biological control offers the possibility of limiting the spread and impact of tradescantia, helping to restore forest relationships to the state that existed before tradescantia invaded. It may also save rare and vulnerable low-stature plants growing in swamps and stream margins. The only other tool available for managing tradescantia infestations is herbicide. While effective, herbicides can kill nearby plants, especially seedlings, and may accumulate in soil and water.

Standish (2001) estimated that if the cover of tradescantia in forest margins and gaps could be reduced then regeneration of native plant species would resume (Section 7.1.2.1). Such a reduction in the vigour and cover of tradescantia would have massive consequences for the health and long-term survival of forest remnants and forest margins, characteristics that are currently in decline in infested forests (Appendix 1.5). It is considered likely that this moderate level of control could be achieved by this *L. obscura*. This would lead to better retention of New Zealand‟s diverse range of indigenous flora and fauna including rongoa plants such as kawakawa, *Macropiper excelsa* (Standish et al. 2001), and the

kai of native birds, such as karamu (*Coprosma* spp.). It would also lead to the regeneration and restoration of valued natural habitats, halt the decline in the quantity and quality of traditional Māori food resources resulting from continued spread of this weed, and help restore the integrity of these values in infested forests. As a result, successful biological control of tradescantia could significantly improve the mauri of the forests, the ability of Māori to exercise kaitiakitanga over that mauri, and the health of mahinga kai.

Application 2, *Lema basicostata* and *Neolema abbreviata* (2011)

Input from Iwi Māori recorded in appendix to the application

Scope of pre-application consultation with Māori

Iwi, hapū, and Māori organisations comprising the ERMA Māori National Network were contacted on 20 July 2010 and invited to enter dialogue on the proposal to introduce these two species. A total of 140 were contacted, 18 of which were papatipu rūnanga of Ngāi Tahu. The message described how the applicant

intended to assess the risks, costs and benefits surrounding the proposed introductions in the application, and respondents were asked to identify any issues that were inadequately, or not covered in those plans. Recipients were given the option of responding by form letter (a SAE was included), by email, by phone before 27 September.
The responses obtained recently are provided below. The substantive responses to application NOR07001 obtained in 2007 are also provided. Subjects raised in previous consultation regarding biological control of weeds are also reproduced below. The main beneficial and adverse effects raised during consultation are listed in the application form.
Attempts continue to meet the Tai Tokerau Iwi Technical Committee to further discuss this programme. All organisations consulted will be informed when the application has been submitted and is open for public submissions.

Responses from Iwi, Hapū and other Māori organisations
Email or written responses were received from 6 sources including one representing the 18 rūnanga of Ngāi Tahu. The originals of these responses have been supplied to ERMANZ. Two respondents made detailed responses or requested further information. In these cases there was further dialogue with respondents by email or phone, and more information was supplied on request. Respondents were reassured that their issues would be addressed in the application. The issues abstracted from those submissions are provided below, and the applicant's comments are in parentheses.
Responses were received from:
Ngāi Tahu, and Hokonui Runanga
Cheri van Schravendijk
Tanenuiārangi o Manawatu Inc.
Raukawa Charitable Trust
Tūwharetoa Māori Trust Board

"We would like to be included in any development for the control of tradescantia we have some major infestations here in the Manawatu which TLA's spend considerable resources on in terms of trying to control it across our region, and we see considerable benefits in developing and distributing any measure available to holt its spread." (Further discussions are in hand)

"The main impacts of these infestations is on forest regeneration, waterway veg, spawning area in lower river/stream reaches and toxin loading of forest animals, mud fish, kakahi mussels, and soil and waterways associated control area." (Noted, see Section 4a(iii)

"Any comments we have would be similar to those we expressed for the dung beetle application" (Noted, some relevant issues summarised below)

"A concern that pops up straight away then, is whether these beetles could switch to our softer-leaved native understorey plants like parataniwha …. Or, even our more light-loving Astelias, Collospermums etc etc. Some of these plants don't necessarily have the same nasty toxins that can be found in WJ, and so, could they

potentially become a more palatable food source for the beetle? ". (Neither beetle can feed on plants outside the family Commelinaceae. There are no native plants remotely related to tradescantia; see Appendix 4).

".. what level of confidence is there re: little/no overlaps between weetaa, native beetles, and Tradescantia leaf beetle ecology - in particular, habitat and rodent predation… I'm thinking density-dependant relationships here and prey-switching …". (See sections 4b(i), 4b(iii), 5 and Appendix 3).

"…making assumptions here that the beetle can accumulate the toxins found in wandering jew and use them as a insectivore defense system, similar to what GLS and monarch butterflies can do?

…How will the potential toxic effects in the food chain be monitored and/or mitigated by the researchers? Or, is this system not relevant to the beetle?" (insectivorous birds..Bats?). (There are tradescantia toxins in the faecal shields with which these larvae cover themselves. This suggests that the larvae are excreting rather than sequestering the toxins. Theory would suggest that toxins accumulated in herbivorous larvae would deter generalist predators. If the larvae were a rare food item, then predators would accumulate little toxin. Specialist predators and parasitoids might home in on such toxins, but as the herbivore will be novel to New Zealand, no such specialist natural enemies will exist here. The applicant could find no examples where a predatory insect has sequestered toxins from a herbivore with consequent adverse effects on a higher level predator; see Section 4b(iii)).

Relevant responses obtained in previous new organism applications
The following responses were obtained in 2007, during consultation over the application to import *Neolema ogloblini* (NOR07001). Responses are in parentheses.

"As you stated in your letter, we are not 100% happy with the introduction of non-native species to Aotearoa. We will consult our kaumatua who have knowledge of rongoa area and will submit our findings…" (Noted)

'We are looking for further information on what tests have been accomplished to confirm that the biological control will in no manner impact on our native species…" (see 4b(iii), Appendix 4)

"Will this insect actually eradicate the weed.. ..are we just inviting it for a feed?" "Can control in this way be justified?" (History shows that biological control of weeds can succeed in New Zealand. The level of control that will be achieved will depend on the population levels that these beetles will achieve once released in New Zealand. Although it is known that they will be introduced to Aotearoa-New Zealand without the natural enemies that limit their numbers in Brazil, we cannot be certain what mortality factors will apply in New Zealand until the insects are released).

"Does the insect have flying capabilities (to take it) to restricted areas…with rare indigenous plant life?" (Yes, but will be host specific wherever it occurs; see Appendix 4)

When it changes to a beetle, what will it eat?" (see Appendix 4)

“Everything…has a tapu… What then do we do about the tapu of the insect world…? / What protocols… to relocate the mauri of this insect?” (Release of agents will be conducted in collaboration with tangata whenua).

“At this stage we would like to discuss the proposal…At this stage we are taking a precautionary approach until we are satisfied that all checks and balances are in place” (noted)
“What plans to reverse this….?” (see section 5).
Many submissions on previous applications to introduce new insects to Aotearoa-New Zealand are also relevant. Some recognised benefits for ecological webs, native animals and nutrient cycling (mahinga kai), and employment. The benefit for land and waterways of potential reduction in herbicide applications (and other human health issues) is a frequent comment.

Many past submissions stress the role of Māori as kaitiaki, both of taonga, and of tapu, mauri and whakapapa. As a result, these submissions seek reassurance that control agents are, and will remain safe for taonga species following release. Similarly, indirect adverse effects on non-target species, ecological relationships and landscapes are a common area of concern. The need for meaningful post-release monitoring of non-target effects and impact on the target weed is also a consistent theme.

Response from the applicant as recorded in the application form

Source of potential benefit	*Comments*
Successful control of tradescantia improves forest regeneration, waterway vegetation, and the quality of spawning grounds	See comments in Appendix 2. An increasing benefit as tradescantia spreads
Successful biological control reduces herbicide use, reducing the toxin load on forest animals, mud fish, kakahi mussels and soil and waterways	See comments in Appendix 2. Benefit limited because current herbicide use is low
Otherwise, consultation conducted in 2007 and 2010 did not identify any benefits that are unique to Māori.	

Source of potential adverse effect	*Comments*
Introduced beetles directly adversely affect the ecology of native species	See Section 4b(i) and Appendix 4. No adverse effect is expected.
High rate of nutrient turnover resulting from insects feeding on tradescantia adversely affects ecosystems.	Ecosystems under tradescantia are already heavily modified. Foliar damage that is insufficient to achieve control is unlikely to significantly worsen existing state. Heavy

	damage leading to successful control is temporary, restoring the ecosystem in the medium to long-term. Affected area is relatively small compared to total forest estate, see Section 4b(i).
Beetles bring new diseases to New Zealand	Introduction of new diseases not expected, see Section 4c.
Large beetle populations on tradescantia increase the available food biomass in forests, increase the destructive potential of predators such as rats, causing adverse knock-on effects for native fauna.	Foliar damage that is insufficient to achieve control is unlikely to significantly increase biomass. Dense populations leading to successful control will be temporary, restoring the ecosystem in the medium to long-term. Affected area is relatively small compared to total forest estate, see Section 4b(i).
Larvae sequester toxins from tradescantia that are passed through the food chain, adversely affecting population of predators, especially birds and bats.	Sequestration of plant poisons by related beetle larvae is common worldwide, but there are no records of direct bird poisoning as a result. Toxins are usually sequestered for the purpose of 'teaching' predators to avoid particular prey species (deterrency) rather than to directly poison (Appendix 2).
Introduction of new species to New Zealand and without adequate protocol proves detrimental to mauri and tapu	First releases into the New Zealand environment will be made in close consultation with local Iwi.
Introduction is made without adequate Māori peer review, and without Māori participation at all levels.	Consultation and collaboration is ongoing, see Appendix 2.
Inadequate post-release monitoring.	See Section 5.