Appendix 1. Consultation with the community prior to application

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1. The scope of consultation
The gum leaf skeletoniser (Uraba lugens) currently has limited distribution in the Auckland, Waikato and Bay of Plenty regions, but its range is expanding. Climate models indicate that it will eventually colonise as far south as Southland. Feeding by gum leaf skeletoniser (GLS) caterpillars on eucalyptus trees is a threat to the New Zealand market economy because damage to foliage can slow the rate of growth of plantation trees and increase the time required for trees to reach harvestable size. Eucalypts are grown widely as amenity trees. Foliage damage reduces the health and the utility of such trees in communities. Managing the pest to maintain the health of amenity trees is an economic cost to local authorities, institutions and householders. Caterpillars have long hairs that can cause rashes if they make contact with the skin. GLS is therefore a health risk, especially to children. This is the first exotic pest that could make backyards and playgrounds routinely unsafe for children. GLS is free of the natural enemies that may regulate populations in its home range, and the occasional outbreaks observed in Australia may be more frequent here. If this occurred, high densities of GLS larvae could result in ‘spillover’ environmental damage to native species such as pohutukawa.

The applicant is Scion (formerly Forest Research Institute). It is acting on behalf of the GLS Stakeholder Group, a consortium of interests co-funded by the MAF Sustainable Farming Fund to undertake this research. Many organisations and individuals were invited to consult on this proposal. Emails or letters were sent to stakeholders, including the GLS stakeholder group (44 individuals), Regional Councils (15 councils), relevant government departments, NGOs and societies (41 groups), and interested members of the public (29 individuals). There was consultation with the ERMA National Māori Network and other Māori stakeholders (162 organisations and individuals), and the project was presented at the ERMA National Maori Network at a hui in Auckland on 3-4 September. Stakeholders were from a wide variety of sectors and interest groups, including forestry, education, environment, conservation, health, farming, horticulture, bee keeping, land management organisations, the general public and tangata whenua.
2. Consultation with Māori

It is likely that the pest will eventually spread throughout Aotearoa. Releases of the proposed control agent (*Cotesia urabae*) may well be restricted to northern regions, but it is expected that it will eventually spread to attack GLS wherever it occurs. Consultation was therefore conducted nationally, but with emphasis on iwi, hapū, and Māori organisations and individuals in the North Island, and particularly in the Auckland region.

A letter or email requesting dialogue over this proposal was sent to over 162 organisations and individuals belonging to the ERMANZ Māori National Network. This letter is reproduced below. The proposal was also briefly presented at the National Network Hui at Te Puea Marae, Mangere in September 2009, and additional input was obtained there. As the first releases of the control agent are expected to be made in parks of Auckland City and Manukau City, Ngāti Whātua and Tainui were asked to suggest additional routes for consultation locally. On advice, the Tangata Whenua contacts listed on the Auckland Regional Council website that had not been contacted by other means were emailed. These 9 additional marae belonged to Ngāti Wai, Ngāti Whatua, Pare Waikato, and Pare Hauraki. The Mana whenua forum of Manukau City Council was contacted for advice on how to consult locally. Tainui distributed the information to further marae in the Auckland area. At each stage, at least six weeks were allowed for response.

All organisations and individuals consulted will be informed when the application has been submitted and opened for public submissions.

2.1 The ‘request for consultation’

Tēnā koe

BIOLOGICAL CONTROL OF GUM LEAF SKELETONISER

Proposal

Scion (was NZ Forest Research Institute Ltd) wishes to introduce a new biological control agent into Aotearoa from Australia to control caterpillars of gum leaf skeletoniser (GLS), a pest which poses a future threat to commercial eucalypt forests and to the health of amenity trees. The insect, which is a natural predator of GLS, does not bite or sting, and there would be no impacts on human health. The proposal does not involve genetic manipulation, and the insect cannot interbreed with native species.

Further information about GLS, the proposed biological control agent and this project can be found attached to this letter and/or at:


Consultation Process

I am writing to seek your opinions on this proposal, whether for or against, so that your views can be addressed when an ERMA application is written later this year. Consultation will be nationwide via several routes:

1. This request has been distributed to members of ERMA’s Māori National Network.
2. Additional hapū and marae in the Auckland Region, the rohe where the first releases of the control agent are planned have been contacted by this email, and there will be further input from the Manukau Regional Mana Whenua Forum
3. I will be available at the ERMA National Network hui to be held at Te Puea Marae, Auckland, this week to discuss any issues that arise from this proposal.
4. The issues that have been raised by Network members, iwi, and hapū during consultation on past applications to introduce control agents for weeds will automatically be considered.

Once the issues raised during consultation have been identified, the application will be completed, and then submitted in December 2009. The risks posed by the agent to native insect populations in Aotearoa will be the key issue evaluated. The application will then be available in January 2010 for you to make a submission if you wish, and I will let you know when the submission period begins.

It would be much appreciated if you could provide any feedback you may wish to make on this proposal by 16 October 2009 and I am very happy to discuss any issues you may raise in that feedback directly with you.

Please use the enclosed ERMA Consultation Response Form for providing your feedback me at Private Bag 4704, Christchurch, or feel free to contact me via email at richard.hill@plantandfood.co.nz, or by phoning me directly at 03 325 6400.

I also urge you to use the enclosed checklist as a guide for the types of issues I am particularly interested in hearing from you about.

Thank you for any contribution you might make to this process. I look forward to hearing from you.

Hei konā mai
Naku noa, nā

Richard Hill
For Scion

Phone 03 325 6400
hillr@crop.cri.nz

2.2 Responses from iwi, hapū and other Māori organisations and individuals

The full texts of responses and ensuing dialogue have been provided to ERMA NZ and to Ngā Kaihautū Tikanga Taiao. Responses were received from the following individuals and organisations:

Pauline and Hemi Te Rakau, Awatuna Homestead
Hokonui Rūnanga
Courtney Sealey, Ngāi Tahu
Victor Holloway, Te Rūnanga-a-iwi or Ngāti Kahua
Arthur Elkington, Ngāti Koata
Tipene Wilson, Ngāti Korokī Kahukura Trust
Dr Monty Souter, Te Rūnanga or Ngāti Porou

Cheri van Schravendijk, Tainui
Paul Horton, Tanenuiarangi Manawatu
Susan Wallace, Te Rūnanga o Makaawhio
Hinerau, Waikaremoana Trust Board, Tūhoe
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Wiki Walker and Lucy Tukua, Manukau City Council/Mana Whenua Forum focus group
(Correspondence)

The substantive issues raised in the course of this consultation were as follows:

1. Whilst it is a pity that we are looking at another introduction to our eco systems, I can appreciate the possible devastation that could occur if the skeletoniser reaches out to all of the Eucalyptus species in Aotearoa NZ.

2. I will propose that Richard contact me directly and will propose or discuss that we look to take matters such as this through the Regional Mana Whenua Forum, most of whom I’m assuming will be on their Network.

3. First, thank you for beginning this process before the actual application is lodged. This is a best practice approach. Having visited the labs in Christchurch at the last Māori National Network Hui there is some comfort that at least the science behind the proposed release is robust. I note a couple of points.

   A. Without fully understanding the nature of the research and not having the time or inclination to scroll through the research information, results and conclusion, to some degree we rely on the researchers to ensure that the factors raised in your attached questionnaire are not impacted by the release of this parasite. It would be good to demonstrate a credible peer review of the research measured against the questionnaire and other issues that have been raised by tāngata whenua in the past. By credible we mean someone with an appropriate science qualification but versed in mātauranga Māori as well.

   B. In future, it would be good to have a summary of such a peer review available as part of the initial communication to tāngata whenua. Like yourself, practitioners are busy on a variety of issues so any ‘easy’ information that can be provided would be helpful.

   C. One question perhaps for answering at the Māori National Network hui – has the parasite been tested against introduced caterpillars? Concern here about an inadvertent effect on the ecosystem if the parasites effect an introduced species which is, in itself, providing some sort of biological control on our current, already altered ecosystem. A quick reading of the information provided looks like it is silent on this matter.

   D. We also note a hope that the vector/pathway by which the moth was introduced has now been mitigated by the appropriate authorities’.

4. ……are ethically opposed to the introduction of new biological control agents into the NZ environment as a method of controlling other introduced species. While we acknowledge that the proposal does not involve genetic manipulation and there is an assurance that the insect will not interbreed with native species, we are concerned about what impact this insect may have in the future if its food source is decimated, whether it will die out or seek alternative food sources, whether there is a future threat of interbreeding which may not be apparent in the short term or under current circumstances’.

5. We would also like an indication about whether there is a way to eradicate this insect (if required) that does not involve bringing in a different insect’.

6. …..urges caution when introducing exotic flora and fauna into New Zealand; remembering past introductions that are still wreaking havoc throughout the nation.
Also, taking into consideration MAF’s own words from one of its (undated) websites:
‘Data from the experiments are still to be analysed, but the parasitoid has unfortunately shown some interest in attacking some species…….

7. The first question that comes to mind is: ‘What happens to the parasite, should it ever complete its work and eradicate the entire population of GLS?’ Does it die into extinction or does it find another (native) host to breed in and ultimately kill?

8. Environmental:
   Tui dependence on eucalyptus for winter food supply (Start of second point?) effects include non-establishment of biocontrol agent and or GLS in the much altered natural environment of the Manawatu ecosystem.

   Cultural: tangata
   From the material supplied it is indicated that there are health risks from contact with GLS caterpillars so some benefit to people from limiting its spread/population numbers.

   Cultural: Nga taonga tuku iho:
   No 100% guarantee that biocontrol agent will not affect native species to be balanced with negative effects to native eucalyptus species by gls.

   Introduction necessary because of past introduction of exotic plant/animal spp. Not understood at time of release.

   Cultural: matauranga
   There will be some impact on Maori ability to care for iwi beneficiaries if forestry interests are affected.

   Health: taha wairua: Māori through their respective iwi authorities are able to access better care services derived from commercial interests in forestry, thus any adverse effects from GLS to Eucalyptus plantations will impact on flow on from services derived from this revenue.

   TeTiriti:
   No mention of iwi/maori involvement in release decision making group or representation on this matter other than this token consultation process.

   ……wish to express our rights as tiaki tangata to be involved in any releases in our rohe’.

9. Te Rūnanga generally supports the use of bio-control agents where there is a good chance of success at eradicating the target species and such measures can be demonstrated to avoid risk to non-target species through thorough host specificity testing.

10. ….We oppose the introduction of any alien species to New Zealand whether it is plant or animal. It is proven that alien species over time have a negative impact.

11. Environmental – Adverse - There is real concern….unknown impact of the introduction ….on the cycle of living organisms within our ngahere. Many of our beneficiaries still gather traditional kai and source their water from the blocks of land we administer…..not enough information available to convince us that there will be no change….There have been a number of species that were not meant to have had any impact… but there has been. The introduction of trout… had a significant impact on the kai gathered… We are warned by out elders to always be cautious. The fact that the organism is being introduced from Australia raises further concern. The information available from the implementation of the CU into Australia forest does little to address our concerns due to the numerous differences not only in the living organisms found in our forest in contrast to Australia, but so too the differences in climate. Although we appreciate the strain that time imposes upon this project we feel that there must be controlled research where evidence
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shows that there will be no change to our ngahere as the regeneration of our native ngahere will take centuries as opposed to the 20 year cycle of eucalypt forests.

Beneficial – …close relative of the rata, and research already shows that GLS has been found to infest pohutukawa. We are concerned for all living things within our ngahere, if it can be scientifically demonstrated that the rata or any other CU affected organisms native to NZ can be saved by the release of CU, without any change to life cycles in our forest, then we support it’s implementation.

Cultural – Adverse – As Kaitiaki it is our job to secure the future of our lands, water and air for the next generations to come but it is much more than this to us as māori. We have a holistic view of the world where everything has a whakapapa. We can all whakapapa back to the Atua whose domain is our forests, waters, lands and skies, namely Tanemahuta, Tawhirimatea, Tangaroa, Ranginui and Papatuanuku. Any negative or long-lasting impact is not just to these domains but to ourselves as we live in and amongst these domains. This is why we are cautious about the introduction of new organisms into our environments. With this inter-relatedness comes a balance between all living things and even the slightest change unbalances the equilibrium that keeps everything in harmony. The effects are potentially devastating and irreversible.

Benefit – We do however also acknowledge that inactivity to the eradication of the GLS could lead to the same disastrous effects.

Te Tiriti – Continual consultation and release of information of information is a key to enabling our kaitiakitanga. At this stage we must be opposed to the implementation of this organism. Lack of understanding as to the impact and the effects of the CU will have upon our ngahere and the living organisms therein, the warnings of our elders and the decades of time it will take to reverse any damage to our natural resources consolidates our stance at this time of opposition to the introduction and release of the CU.

Maori development – adverse - …Maori businesses operating within our rohe that rely on the uniqueness of our ngahere. Kai…from the ngahere…supplement the weekly grocery shopping. Kai….provides for tangihanga and hui as many …no financial position to provide food for hundreds… There is concern around these businesses and these kai gatherers…if there is any change to the ngahere…or negative effects of the release…

Benefit – The release…could save a ngahere that provides significant economic benefits to our people.

12. ‘What are the potential overlaps between the parasitoid and native parasitoids in habit and/or ecological niche?
What do the researchers understand about the effects that impacts such as climate change could have on the maintenance of the parasitoid?
Whom or what will control the ‘control’….?
Can mixed species mosaics provide some relief to the impacts of GLS?
Are there native plant species with …toxins that can be interplanted …to provide temporary protection for young plants…?
Are there generalist parasitoids existing within the ngaahere which may also be effective?
Have concerns that 1. The research into the parasitoid is not complete and 2. The increasing reliance upon the introduction of exotic biocontrols…
Most of the issues listed here are discussed in Section 7.3.

2.3 Issues raised in consultation over previous similar proposals

Apart from the issues noted in this consultation, Māori have raised the following points in relation to similar applications to introduce biological control agents (for weeds) in the past three years:

‘...is a bit late for hapu/iwi to begin assessing cultural concerns as the statutory clock would have started ticking. I.e., we will only know what plants have been tested, the methodology and the results at a rather late stage in the process.’

‘It does help to ease my concerns if it does not involve genetic manipulation and neither species can interbreed with native species.’

‘...once let loose the biological control agent cannot be recalled.’

‘... many years ahead the biological control agents are found to have caused damage to our native species that the agencies refuse to accept responsibility or acknowledgment and leave the costs of eradication to the ratepayers.

‘To date several biological control agents have been successful yet not well spread.(perhaps when making the application a clear pathway be identified on how distribution will take place accompanied with the required funding).’

the question would have to be asked, ”What happens when all of the tobacco weed are gone?”

‘On-going monitoring of the environment where the lace bug is released, assessing the potential impacts for other native invertebrate and plant species. This is monitoring the impacts of competition or predation by the lace bug. It is intended that this also be an application condition.

‘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”

‘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) on the proposal to introduce biological control agents for broom in 2006. Many 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 are dealt with generically in information that has been lodged on the Landcare Research website. Other issues are addressed explicitly in Sections 7.1 and 7.3 of the application.

3. Responses from local government, forestry companies and Department of Conservation staff
A range of organisations were contacted and asked to comment on the proposal to introduce the lace bug. All regional councils within the distribution of woolly nightshade were contacted. Forestry companies were contacted via industry and research groupings. DOC staff were asked to comment via internal networks

3.1 Sample request for information

Biological control of gum leaf skeletoniser (GLS)

I am writing to ask for your help to determine what successful management of this moth pest would mean for your region, and what issues the introduction of a new biological control agent would raise for you. If you or any of your staff are members of the GLS Stakeholder Group, you may already have received this request for information. If so, I apologise for redundancy.

Further information about GLS and this project can be found at

The gum leaf skeletoniser (GLS) is a moth from Australia that first arrived in New Zealand in 1992. Numbers have begun to rise in the last few years, and it is spreading in Auckland, Waikato and the Bay of Plenty. Its distribution is limited at present, but the fact that it thrives in Tasmania tells us that it will eventually colonise all the way to Southland. As its name suggests, the larvae of this moth eat the leaves of many species of gum trees, but it can also feed on related ornamentals, and to a limited extent on pohutukawa. It has occasional outbreaks in Australia that defoliate forests, and in the absence of its natural enemies such outbreaks are likely to be more common here.

The pest poses a future threat to commercial eucalypt forests and to the health of amenity trees. A recent economic assessment places the net present value of the costs of this pest in New Zealand over the next 20 years at $100-142 million. GLS larvae have long protective hairs, and if caterpillars fall from trees and come into contact with the skin, especially of children, these hairs can cause stinging and a rash that can last several days. As GLS spreads this is likely to become a problem for schools and pre-schools, many of which have planted eucalypts as shade trees in playgrounds.
The MAF Sustainable Farming Fund, co-funded by a wide range of stakeholders, supports the Gum Leaf Skeletoniser Stakeholder Group to conduct research to manage this pest. The primary focus of this research is the planned introduction of natural enemies from Australia that help to regulate GLS populations there. Scion (NZ Forest Research Institute Ltd) has been subcontracted by the GLS Stakeholder Group to conduct the research at Rotorua (in secure containment) to find safe biological control agents. They now wish to apply to ERMA for permission to import and release a minute (3mm) insect that kills small GLS larvae. The insect is called Cotesia urabae, and belongs to the family Braconidae. The purpose of this introduction is to suppress populations of the pest slowing its spread, and reducing or even eliminating the risk of future outbreaks. The insect does not bite or sting, and there would be no impacts on human health. The proposal does not involve genetic manipulation, and the insect cannot interbreed with native species.

The primary focus of research to date has been to determine whether this agent is safe to introduce to New Zealand ecosystems and the results of this research will form the core of the application. As required by the HSNO Act, all significant adverse and beneficial effects that are likely to arise as a consequence of this proposal will be evaluated.

I am writing to seek your help to identify particular issues that this proposal raises for you, and to hear your opinions, whether they be for or against. These can then be recorded and addressed when the application is written. We would like to hear your views before October 16. Once the issues raised during consultation have been identified, the application will be completed and then submitted in December. The application will be available in January for you to make a submission if you wish, and I will let you know when the submission period begins.

We are very happy to enter into dialogue on any issue relating to this proposal. Please contact me at Richard.hill@plantandfood.co.nz, or by phoning me directly at 03 325 6400. I look forward to hearing from you.

Thank you for your contribution to this process.

3.2 Responses from Regional and City Councils

Simon Cook, Auckland City Council (Phone call, 12/2009)

Australian species have been planted widely as ornamentals in Auckland, and many streets are lined with Queensland box and other species that are apparently susceptible to GLS attack. Eucalypts are also planted widely for their landscape value, sometimes in iconic places such as gum tree hill in the Auckland Domain. These trees also provide shade and shelter in public places, and have other important values in the urban ecosystem such as food for Tui and waxeye.

Eucalypts (especially E. cinerea and filicifolia, flowering gum) have been planted in many schools and pre-schools where they provide important UV protection. Although the frequency of cases of allergic response to GLS is not great in Auckland, these institutions have ‘Health and Safety’ responsibilities to minimise risk to their pupils. Options are to remove susceptible trees (but this reduces shade), or to spray or stem inject. The City Council owns much of the land on which educational institutions lie, and although there is no explicit liability for risks, council staff have assisted in managing the GLS problem in some schools.

GLS has defoliated trees in recent years, and browning of half of the canopy of *Lophostemon* is not unusual. These plants do not come back well from the stress caused by this defoliation, and there is significant loss of landscape value. GLS attack causes dieback and the production of much dead wood in civic plantings, which is in itself a ‘health and safety’ issue for the council. Stress from defoliation undoubtedly contributes to premature death in some trees, but it is difficult to isolate GLS effects from other tree health issues.
Auckland CC appears to have a greater problem than neighbouring cities. Manukau City definitely has outbreaks of GLS, but appear to be investing relatively little in GLS management. It has not caused much problem in North Shore, possibly because old street plantings are less common in this newer city. Waitakere City has had little problem in recent years, possibly because of spraying for painted apple moth eradication.

Aerial or ground-spraying is politically difficult to justify. Development of stem injection has provided a very effective alternative that minimises environmental exposure to pesticides. A low pressure method has been selected, and this takes half an hour per tree. 8 mm holes are drilled in the tree, and systemic insecticide is slowly injected by syringe by hand. In tree-lined streets several trees can be treated simultaneously. Treatment is limited to fine days in summer when high transpiration rates increase uptake in the stem. Treatment provides protection against all foliage feeding pests for up to 3 months, although this varies with time of year and with tree.

The cost of dealing with dead wood generated by GLS attack in Auckland City is currently $5-10,000 per annum. The council currently spends $40,000 per annum on stem treating approximately 10% of its own estate annually. More treatment could be undertaken if more money was allocated for that purpose. Community groups also fund GLS management as do schools etc, but the quantum of this is unknown.

GLS is an important pest because it feeds on old foliage, whereas another keystone defoliator, paropsis, feeds exclusively on young foliage. Adverse effects are therefore cumulative. GLS has been less abundant in Auckland in the last two years compared with 3 years ago.

Biological control would be considered a success if it kept populations sufficiently low to make canopy losses undetectable, stopped the need to replace dead trees, slowed the spread, and lowered the risk of GLS to schools sufficiently to eliminate the need for management.

Kevin Collins, Programme manager – Natural Heritage, Environment Waikato

….The following are comments from EW staff; they have not been approved by the full Council.

You asked for information on costs or impacts of GLS to EW, and comments on the potential risks, costs or benefits of the proposal.

Environment Waikato supports the development of an application to ERMA. The risks from GLS to the present regional economy are not great. However, the potential contribution of *Eucalyptus* species is currently under-appreciated. The wide-spread presence of GLS could seriously limit that potential, which would affect regional economic opportunity.

The Waikato Region has large areas of plantation forestry. No exact figures are available; however the forestry industry suggests that eucalypts make up about 80 percent of all hardwood plantings. Over time, the industry may wish to plant more eucalypts because they are a naturally durable hardwood timber with good carbon sequestration characteristics. Eucalypts could be a better species than softwood conifers in many parts of the region. That land use option should not be removed by a collective failure to respond to GLS.

At this stage, it appears that GLS does not have a major impact on our native flora. However, ecological relationships can change over time (e.g., from climate change) and the future risks are unknown.

Similarly, Environment Waikato has some older soil conservation plantings of eucalypts in the catchment schemes in the Taupo and Rotorua districts. However, we have not planted them extensively in recent years due to the disease risks. Environment Waikato would like to minimise the disease risks and keep open the option of using eucalypts for soil conservation.

Of course, any release of a biocontrol agent involves potential risks. Nevertheless, EW lends its support to the application, in the knowledge that ERMA approval processes are rigorous and thorough.
**Jack Craw, Group Manager Biosecurity, Auckland Regional Council**

I was part of the MAFBNZ TAG several years ago that determined that commercial plantations of eucalypts were not a significant primary production contributor – as evidenced by the 2 commercial forestry owner associations declining to commit resources to research, or (as I remember it) commit resources to even GLS delimitation or sizing the threat. The thrust was that commercial plantings of eucalypts were out of fashion, due to diminishing returns compared to pines (due in part to parasitism of eucalypts by a range of insects etc that affected plant growth and quality [yep that’s definitely ironic]), cheap imported eucalypt timber etc. So primary production values didn’t play a part in ARC’s subsequent decision.

I was initially concerned at the apparent predation of native Metrosideros and lack of research into host range. Later work left me somewhat mollified, however I have never been convinced that GLS has been demonstrated as a negligible threat to native spp or other valued Myrtaceae. So biocontrol of GLS has another allure.

GLS predates brush box and other related spp that have been commonly planted for shade planting in schools, kohanga, kindergartens, play centres etc. GLS has urticating hairs, so can be considered to be a slightly increased risk to children, due to children being likely to touch caterpillars and likelihood of GLS to be present near kids. ARC agreed to be a small player in assisting research into both biocontrol and pesticide tree injection (considered to pose a much lower risk of human exposure than spraying), mainly on the human health issue but also because of fears of wider predation onto native and other valued Myrtacaeae.

So ARC agrees that GLS is a useful research target. We would be willing to contribute $2K- $4k pa for 3-4 years, plus offer in-kind assistance (Dr Nick Waipara) if needed. Although this is a small contribution, GLS was assessed as a very low priority species, in the Auckland RPMS process, and no submissions were received (via the RPMS discussion document and draft RPMS document processes) nominating this sp for inclusion in the RPMS. We made this offer (and make it again now) on the basis of it being seeding finance, to encourage other players to similarly contribute (based on their trust of our assessment), and/or to allow other funding sources to grant funding (sometimes co-funding is a requirement).

**Don McKenzie, Northland Regional Council, donm@nrc.govt.nz**

We have recently engaged Dr Jenny Dymock to provide advice on our biological programme in Northland and I have attached her advice in support of developing an appropriate biocontrol agent.

………A number of eucalyptus pests have already found their way Northland and are now successfully established. Many of these have spread much faster than what would have been expected from their own powers of dispersal.

New eucalypt pests in Northland include:

- *Brown lace lerp, Cardiaspina fiscella.*
- *Gall wasp, Ophelimus eucalypti.*
- *Eucalyptus tortoise beetle, Paropsis charybdis.*
- *Black butt leaf miner, Acrocercops laciniella.*
- *Leaf blister sawfly, Phylacteophaga frogatti.*
- *Eucalyptus psyllids - Eucalyptolympma maidenii, Cryptoneossa triangulata, Creiis lituratus and Aneoeconeossa communis.*
- *Eucalyptus shoot psyllids - Blastopsylla occidentalis and Ctenarytaina spatulata.*

Two successful biocontrol agents in the same genus (*Cotesia*) as the agent proposed for introduction against GLS have established throughout Northland for the control of maize pests. These are *Cotesia kuzak* for control of tomato fruitworm, *Helicoverpa armigera*, and *Cotesia ruficrus* for control of armyworm and greasy cutworm, *Agrotis ipsilon*. It is expected that *Cotesia urabae* will be able to successfully establish in Northland.
Appendix 1

Implications for Northland

Forestry production

Northland’s climate is suitable for growing of eucalyptus, especially the more valuable, durable species such as *Eucalyptus saligna* and *E. botryoides*. Commercial eucalyptus production in Northland according to the National Exotic Forest Description (NEFD) report was 430 ha in 2007. This is much lower than the Central North Island (14093 ha) and Southland (12159 ha) but in terms of eucalypt production Northland ranks fifth after Tasman/Marlborough and the West Coast (total plantings in NZ in 2007 – 28575 ha). Projections of increased plantings in Northland are high (see “A report on an economic assessment on of the impact of the Gum Leaf Skeletoniser, *Uraba lugens* in New Zealand” by Phil Journeaux (MAF Policy) in 2003.

Amenity values

Eucalyptus species are significant amenity and shelter trees in Northland, notably in the Kerikeri area.

Health problems

The gum leaf skeletoniser poses significant health risks. The caterpillar is covered with protective spines, in particular, the stiff, brown-tipped dorsal bristles, that sting and may cause irritation. The stiff spines are hollow and contain venom, which can be injected into the human skin upon contact. This often results in local pain (sometimes severe) and welts (swollen patches on the skin) that tend to become itchy. The reaction to gum leaf skeletoniser may last for many days. The spines of dead caterpillars or on shed skin also retain their ability to sting.

Summary

In summary, the Northland Regional Council supports the introduction of the parasitoid, *Cotesia urabae*, for biological control of the gum leaf skeletoniser, *Uraba lugens*, as a sustainable, longterm control option for this pest which can cause health problems and which could have a detrimental effect on eucalypts for commercial production, shelter and as amenity trees in Northland.

Response: 24 Sep 2009, acknowledgement and thanks to Jenny Dymock

Mary Trayes, Environmental Information Officer’ West Coast Regional Council’ 03 768 0466 Ext 269
mt@wrc.govt.nz

The West Coast Regional Council supports your doing this in principle but would be unable to offer financial support…….

As far as we know, and have checked with local forestry operators, there are no large commercial ventures growing eucalypts here on the West Coast and only a few small private stands, many of which were really hammered in the big winds of July 30th 2008…….

Response: email, 24 Sept 2009 - Thanks for your encouragement. We will let you know when the application is submitted in December and becomes available for public submission.

3.3 Responses from Department of Conservation Staff

Phil Bell, Senior Technical Support Officer (Biosecurity), Threats Management, Research and Development Group, Department of Conservation

Thanks for this further information on the GLS biological control programme. I am sure you will be able to put together a comprehensive application to ERMA for the release of the parasitoid, *Cotesia urabae*.

From DOC’s perspective, we would be interested in info relating to:
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- The make up of the final host testing list – the species chosen, how/why they were chosen instead of others, etc
- The results from the host testing (particularly any feeding on native species, etc) and the regime of the host testing (choice, no choice, etc)
- The behaviour of the parasitoid in Australia – results from the study in Tasmania, whether it attacks any other species in the ‘field’ and if any of those species have relatives in the NZ fauna, etc.

I hope that helps shape your application.

Response: Thanks Phil. These points have been the subject of considerable research and will be covered in depth in the application. I will ask Lisa to send you some relevant papers.

Paul Craddock, Technical support Officer – Biosecurity, Auckland Conservancy (2004?)

… Essentially, everyone is fairly comfortable with the proposed list of species for the first cut. …Talking with John Dugdale, Robert Hoare and other lepidopterists as she noted would be a good idea to highlight if they know of any particular species of concern. Really it is a good thing we have no Nolinae here. The advice on looking into other Australian hosts of the parasitoid is worthwhile to identify at risk groups, although you may have already done this.

I guess the best way forward is to keep following the centrifugal phylogenetic system as you are doing for testing and follow up any anomalies or weird results that may crop up during testing. …

A couple of people commented that the initial test list is short and that some more common indicative species could be added to the second list, particularly from the families Noctuidae, Geometridae and Hepialidae. Maybe worth tossing in a butterfly species as well….It’d be good to have a good total of around 20-30 species to have been tested in total by the end of it all.

The only thing we noted was that *H. armigera* is related to a native rare moth endemic to Central Otago, *Australothis volatilis*, which feeds on *Vittadini* spp. Our conclusion was that *H. armigera* would be indicative of parasitism on *A. volatilis* and so it would be best to wait for the results from that species before taking it further.

Alison Evans, Canterbury Conservancy (2004)

…Most of those species are likely to occur in Australia…so there should be reasonable information …over there…whether they are likely to be hit.

The parasitoid are probably more likely to attack native moth species that have a similar gregarious larval stage to *Uraba lugens*. So I think it is probably important to find out host-host-specific the suite of parasitoids being targeted are in Australia before deciding on the NZ moth species.

There are several moths in Canterbury and Otago that are listed as acutely threatened and I can send them …But I guess the impact on more common moths that perform larger roles in the ecosystem are equally important…

There are several species that are unlikely to be affected because they have such different lifestyles or are in such small numbers that they are unlikely to be detected by a parasitoid. Sad but true.

Some of the moths are only known from one specimen…. (other points captured elsewhere)

Dr Rod Hay, Department of Conservation, Christchurch

Hmm - big questions and no simple answer I am afraid. The native birds associating with Eucalypt plantations depend very much on where they are in relation to source populations. They also depend to some extent on the Eucalypt species, though I suspect that you are not really talking about flowering gums. Tuis in Hawkes Bay will move tens of k across open country to feed on Eucalypt flowers in season. Bellbirds of course gravitate to Eucalypts in Cashmere (and other) gardens. Native birds like kaka would use some of the eucalypts in and around the native forest in Pureora and probably the eucalypt "enriched" beech forests in Westland and Western Southland. Residency on Eucalypt plantations I am less sure about, though I suspect that "normal" populations of insectivores like fantails and grey warblers are just as likely to hang out there as any forest. The importance of holes and dead branches I am even more vague about. Our hole nesting species (kaka, parakeet, rifleman, mohua and, to some extent, tomtit and whitehead) are mainly native
forest species, though rifleman, tomtit and especially whitehead can occur in exotic plantations. I'm just not sure about Eucalypts though.

Colin O'Donnell may be aware of some information. As an aside, long-tailed bats can roost in (depend on) gnarly old exotic trees (particularly willows around Kakanui), but again, I don't know about Eucalypts there. They have been known to roost under the bark of big old gums near your Turangawaewae on the Hauraki Plains.

3.4 Responses from Forestry Companies
Comment on the proposal to introduce woolly nightshade was requested from the NZ Farm Forestry Association, the Forest Health Research Collaborative, and five forestry companies. From there the request was distributed to forest managers for comment. Responses were as follows.

Don Hammond, HRML Forestry
I was involved early on with GLS when MAF were considering trying to eradicate it and subsequent work following its spread.

It is certainly a problem in urban areas and public places like schools where the caterpillars are a problem to the health of kids. As a result I believe in Auckland many schools and Councils are removing susceptible trees from parks and playgrounds to limit the problem. Alternatively they are having to resort to other means of control which in public places is not entirely desirable.

From an industry perspective, we do not like any pest that threatens commercial trees and this is very likely to as it spreads south. The area planted in Eucs is not great and is currently shrinking, but as a result of pests like this our options are also being reduced. We also need to consider the phytosanitary risk of exporting this pest to another country, even though it may not feed on the exported product, it is one more thing we need to be alert for.

With many of these pests some form or Biocontrol would be a good outcome as it reduces the need for chemicals etc. I understand that there is some biocontrol work going on but am not sure of its progress.

I am not sure if this helps but as I say, any new pest is a concern to the forest industry and each new one reduces our potential options.

Kevin Moloney, Hardwood Management
Eucalypts have great potential in carbon forestry and we (Hardwood Management) are actively developing carbon forests. The threat of uraba is a potential risk to this environmentally important component of climate change arrest.
Barry Poole has had a long track record in the eucalypt industry and I'm sure could add some support in this regard for the ERMA application if requested.

Barry Poole, Hardwood Management Ltd, barry.poole@hdwd.co.nz
Tasman Forest Industries (TFI) had approximately 11,000ha of eucalypts under management when the GLS was discovered in Mt. Maunganui, and the majority of this resource was E.nitens. (palatable to GLS). Even though the insect was deemed a poor flyer at the time, TFI personnel and its parent company, Fletcher Challenge, were deeply concerned as to the risk to their eucalypt estate. We assisted where possible with investigations and support around understanding the insect and its potential for damage to New Zealand eucalypt plantations.

Fletcher Challenge sold the estate to GSL, an English company and Hardwood Management, made up of former TFI employees was the company tasked with continued management of the estate. Though the GLS population close to Mt. Maunganui was eventually eliminated, the outbreak and subsequent spread from Auckland populations maintains the potential risk from this insect. Other
Appendix 1

insects and fungi have reduced the attractiveness of *E. nitens* as a species of choice in parts of the North Island, but the species is still grown extensively in the South Island.

GLS also attacks a number of other eucalypt species and for this reason remains a potentially serious pest of NZ eucalypts.

Hardwood Management anticipates being involved in the planting of some 10,000 hectares of eucalypts over the next 5 years and though the species being planted are not favoured by *Uraba lugens*, any efforts to control this insect in our landscape are to be commended.

**Dean Satchell, biosecurity and forest health spokesperson, NZ Farm Forestry Association**

The N.Z. Farm Forestry association fully support the introduction of *Cotesia urabae* as a biological control agent of Gum Leaf Skeletoniser *Uraba lugens*.

Farm Forestry believe eucalyptus is New Zealand’s only viable plantation hardwood forestry crop and thus emphasise the importance of biological control of introduced pests to preserve the economic viability of the species.

GLS is a serious pest in parts of Australia but biological control may keep it in check in N.Z. We fear unchecked outbreaks of the pest would cause serious defoliation of eucalyptus stands in New Zealand and also cause health problems for workers undertaking silvicultural operations.

Eucalyptus is used for high value short fibre pulp in N.Z. This is both an export crop and consumed domestically... Eucalyptus is also used for high value solid timber end uses. These include flooring, furniture and other decorative uses, along with decking, naturally durable posts and crossarms, retaining walls and landscape timbers... These end uses can all be supplied locally and on a sustainable basis only if pest introductions can be controlled to a level where growth rates remain commercially viable. Wastewater treatment and bioenergy are emerging uses for eucalyptus and are opportunities which contribute towards an environmentally sustainable economy. Such opportunities should not be lost. Farm Forestry fear that GLS and other pest introductions, if not checked with their natural biocontrols, could erode the viability of these opportunities. Without alternatives this could involve serious economic consequences for New Zealand.

**4. Responses to other consultation, personal communications and submissions, and additional information**

**Request sent to 22 further members of the public who had previously corresponded with Lisa Berndt on GLS problems**

Hello

I am writing to you as you have been in touch with me some time in the past few years in relation to the pest caterpillar gum leaf skeletoniser.

With the help of Richard Hill, I am currently preparing to apply to ERMA to introduce a biological control agent to help sustainably manage this pest, and am seeking your input on any issues, benefits or concerns you may have regarding GLS or the proposal to introduce a biocontrol agent, so we can include these issues in the application. Further information on how you can contribute is below. Even a quick email with your thoughts is welcome, or information on problems you have experienced with GLS.

Richard is coordinating feedback on this issue, so please reply to him on richard.hill@plantandfood.co.nz, or reply to this email and I will forward the message on.

Thanks very much for your interest.
Responses:

‘We are happy to help you in any way we can. We have no further problems with the skeletoniser caterpillar’. (Kathy Moy-Low, Principal, Holy Cross School)

‘We had so much trouble we made the decision to remove the tree. However there are more in the area which from a distance look like they too have this trouble. After each application they would go for a short time before coming back. We also had a large population of moths inside’. Debby Evans

‘I have no idea if this is of relevance or interest to you, but we have a large Eucalypt on or property, which 3 years ago had an infestation of Gum Leaf Skeletoniser caterpillars - they were all over the tree, our deck and house, the wind blew them inside, they dropped on anyone passing below the branches, they were a serious problem for a while. We thought the next year though that some bird species had discovered them (blackbirds perhaps) because in subsequent seasons they have not been anywhere near as bad, in fact there don't seem to be any. This year we have had a lot of Shining Cuckoos visiting, and I am wondering if they have been cleaning the caterpillars up - I read that they eat the Magpie Moth caterpillar which is similarly hairy, and poisonous to other birds. If they are, it could be that the infestation may be controlled in areas which Shining Cuckoos occupy’. (David Wood, Mt Eden)

Dr. Geoff Allen, University of Tasmania

Good question. I’ve considered this question before. I have a comment about this in my paper in J. Aust Ent. Soc 1990 p310 in the discussion. The main thing is there are no records and only cuckoos seem to eat hairy caterpillars. I did some bird exclusion trials at Risdon on populations of your Uraba and the loss inside the bird excluded cages, excluded by netting size, was similar to that where birds had access. This suggested to me that the major loss of caterpillars from trees was due to invertebrate predators, I suspect ants to be the major one. I do have a vial of my desk somewhere with an ant species I’m yet to identify that was found eating Uraba. My guess is a lot of this predation loss goes on between dusk and dawn with night active ants. However yet to test this.

Prof. Andy Austin, Australian Centre for Evolutionary Biology & Biodiversity, The University of Adelaide

…in summary I think the chance of a *Cotesia urabae* hybridising with any local NZ species is extremely remote, given

1. members of this genus are often highly host specific

2. They utilise specific polydnaviruses to overcome host immune defences

3. *C. urabae* is associated with a eucalypt feeding host and probably utilise eucalypt associated chemicals in host finding

4. We have not recorded it from any other leidopteran larvae feeding on eucalypts

5. It is probably very distantly related to any native *Cotesia* species.

6. Although there are host specific strains in some *Cotesia* species, hybridisation as far as I know, is very rare and restricted to very closely related species – ie. it is known in the *C. flavipes* complex.

Hope this helps

Dr Lisa Berndt, Scion, Rotorua

there is no Australian export permit - the requirement for Aus was a letter stating what is being shipped and that they are not listed by CITES etc, which we had signed for each shipment by Cathy Young at DPI in Tasmania, and a statement confirming species from Geoff A.

Or do you want the MAF import permits numbers? there are a number over the years as we got a new permit for each shipment.

the latest being 2008035682

approval code NOC04004
Dr Ecki Brockerhoff, Scion, Christchurch
……..haven't had a chance to reply to your question about native insects in eucalypt deadwood and what indirect effects Cotesia could have if it is introduced. I don't think there is much information on how the availability of eucalypt deadwood affects population dynamics of native insects. There are a few native beetles that colonise eucalypt deadwood, but to my knowledge none of them are dependent on this. Their 'natural association' would be with deadwood of native species, and while there could be a shortage of this in some regions as a result of past forest clearance, supplementary deadwood of eucalypts is provided anyway due to dieback caused by other insects (e.g., Paropsis) and because of harvesting / tree felling. So I can't see that Cotesia could have any negative effect there. On the contrary, if Uraba can't be managed through biocontrol or other 'tools' then the future planting of eucs will probably be much less than today, and this would result in a more substantial reduction in deadwood availability, eventually.

John, could you take a look at the forest health database what native species are associated with eucalypt deadwood? Can you imagine that any of them would greatly benefit from damage caused by Uraba, and that this could be negatively affected by Cotesia?

Steve Pawson currently has a good poke around the literature on saproxylic insects in NZ, and while his focus is on pine forests, I'm copying this to him in case he has seen anything that could be noteworthy in this context.

Ian Nicholas, Scion, Rotorua
As discussed some more information for you.
I enclose a recent draft exec summary of my bioenergy report (the latest draft of the main report (Bioenergy Options) is on Scion web.
A couple of specific comments.

Invasion of eucalypts. I see no issue on invasiveness of eucalypts like California. Dryer areas of NZ, Canterbury, Hawkes Bay, Marlborough do not have this issue, unless there is combination of fire and ground disturbance. I consider it is an ecological response not a climate one. Usually pasture is intact enough to preclude spread.
The issue of fire is a non-event to me, New Zealand eucalypts generally have shade tolerant understorey of NZ natives which does not get dry enough to make for high fire risk. I don’t think they are worse than pines, although they can carry a fire in very very hot conditions. I do not consider it a species risk, just a climatic one.

The potential for eucs is to replace imported hardwoods (around 20 million dollars/year), current pulp resource in Southland and for carbon sequestration, where E. fastigata is the preferred option. Graph below is from MAF web published data.

Peter Cameron, consultant entomologist, Auckland
…..2. I would agree that our observations on hypers are biased because most of our collections are from heliothis larvae rather than Cotesia cocoons.
3. The strain issue is possibly a real problem for future introductions. If I remember correctly for Microctonus/clover weevil the introduction of other strains is now banned by regulation? Surely there are strains in all species, including C plutellae as Graham mentions - does this mean that testing for infertility etc etc etc is now a requirement?.....

Erika Commers, Greenscene, Auckland
I do not believe that there is anyone else in the Auckland region doing any similar work on a private or public basis.

The type of work we do is predominantly stem injections of an organophosphate (Tamarind) to control the insect feeding damage in high view areas. Currently there is nothing else that is done by us for control.
Appendix 1

There are very strict safety measures for chemical handling and it is an imminent concern to handlers with organophosphate usage. The level of risk to the public is minimal during application because it is always being under close monitor. The nature of the application minimizes any further exposure to the public after the treatment is completed. Therefore the bulk of the risk is to the handler/applicant. Exposure is a serious issue and must be minimized with appropriate PPE.

**Dr Robert Hoare, Lepidopterist, Landcare Research, Auckland**

According to my notes from Denmark, Michael now includes nolines amongst the trifine noctuids and they are therefore not closely related to Hypeninae, which are quadrifines. I do not know the details of why, and I think this is unpublished. I am not sure if this is good news or bad news. Unfortunately it is just about impossible to keep up with the changes in noctuid classification these days.

Certainly, British lepidopterists are in the habit of rearing Schrankia spp. from the egg on withered flowers rather than fresh foliage, so I would say they are essentially detritivores. I think we possibly have only 2 hypenines, both named; the purplish Trigonistis from Matuku looks to me like a colour variant of anticlina. But John may have looked at other characters I have missed…

**Gordon Hosking, Trustee, Project Crimson, gordon.hosking@xtra.co.nz**

Thank you for advice on the proposed biological control agent for gum leaf skeletoniser. While Project Crimson does not expect to have any concerns we would appreciate receiving a copy of the application when it becomes available. As chair of Project Crimson's Science Advisory Committee I am the contact on this issue…..

**Response:** acknowledged with thanks 24 Sep 09, with promise to contact on submission

**Dr Peter Lo, Plant and Food Research, Havelock North**

I and the team here have collected and reared 1000s of leafroller larvae over many years from orchards, vineyards, shelter and weeds. We have reared probably several 1000 Dolichogenidea spp. and I'm not aware of any hyper parasitoids. Very occasionally we do come across something unusual that was not identified, but this may have been a parasitoid. The data are unpublished…. We have reared a few cocoons but did not record numbers (perhaps 100-200) and I don't remember any hypers. Almost all our collections are from Hawke's Bay plus a few from Gisborne

**Pauline Syrett, Entomological Society of NZ**

….I think the Society's main concerns would be which species were selected for testing to determine the host range of the proposed control agent, and the methods used for host range evaluation. It is likely that some of our members have already been consulted on these issues (some are involved in the work!), and we would be reassured that the work carried out to measure host range was adequate if appropriate experts have been involved in the selection of potential hosts to be tested.

The full host test list does not seem to be on the websites provided, so if you wanted anything more specific from us at this stage, we would need a bit more information.

As you suggest, the main concerns to us are likely to be susceptibility of native and beneficial insects to the parasitoids. I don't think we would be happy to accept more than a minimal risk to such non-targets, especially to what I believe to be our single species of Nolidae.

These comments are mine only, but I can formalise them by circulating a response to our committee for approval. However, I thought that I'd just check first to see that there wasn't more information available that would allow us to be more specific.
Paraphrased email

My comments are restricted to vegetable and field crops. I don’t know about fruit of forest crops, and I have limited experience in ‘native’ habitats. Hyperparasitoids are quite common in late season. _Baryscapus galactopus_ attacks _C. glomerata_ in late summer and autumn, and has moved onto the new _C. rubecula_.

Hyperparasitism is not ‘bad’; enough to have a big impact on ‘success’ of _C. rubecula_, but there is up to 30% parasitism of _Cotesia_ cocoons in late season. See Cameron PJ, and GP Walker. 2002. Field evaluation of _Cotesia rubecula_ (Hymenoptera: Braconidae) an introduced parasitoid of _Pieris rapae_ (Lepidoptera: Pieridae) in New Zealand. Environmental Entomology. 31 (2): 367-374.

There was not a lot of parasitism on _C. ruficrus_ on a variety of noctuid hosts, and I can provide you with the name of the hyper. Parasitism of _C. kazak_ cocoons was quite rare and late in the season. Uncertain of parasitism of _A. subandinus_.

I need to add that we nearly always only collected lep. larvae from the field, and on the rarer occasions that we collected cocoons there was a lot more hyperparasitism. We don’t have good data on this….

I have seen chewed _Cotesia_ cocoons in the field, but predation is very uncommon I think.

Do you know of any evidence of hybridisation of Cotesia species (or lack of same) either from NZ or from overseas? - _C. plutellae_ seems to have different strains, and in fact they have changed its name in some regions. You would know that _C. ruficrus_ is reported here before the introduced species and the introduced entity was/is considered a superior strain. We have never reared _C. kazak_ or _rubecula_ from any other hosts (in crops)

Do you know any refs that could lead me to info on 'associated organisms' (Obligate species) on Cotesia species, particularly such things as polydnaviruses? – No references off hand. In autumn we get mortality of Cotesia cocoons from a small NPV infecting _T. orichalcea_ larvae, identified by Louise Malone’s group, but I believe this is a non-target effect from the virus infecting the host. I have seen this a lot in larvae kept in GPD tubes (under stress) where we are rearing larvae out to fate. Most commonly have seen mortality of emerging parasitoid larvae from sick hosts, mainly _T. orichalcea_ and _Pieris rapae_, so the non-target effect is on _C. ruficrus_ and _glomerata_ respectively. So the ‘virus’ is affecting the large caterpillars, such as those required by _ruficrus_ and _glomerata_. I don’t see that effect in _kazak_ and _rubecula_ that emerge from small larvae.