ENVIRONMENTAL RISK MANAGEMENT AUTHORITY
ERMA New Zealand
NGĀ KAIWHAKATŪPATO WHAKARARU TAIAO

Evaluation & Review Report for the release of

Cotesia urabae

For the biological control of Gum Leaf Skeletoniser

PREPARED FOR THE ENVIRONMENTAL RISK MANAGEMENT AUTHORITY

ERMA200281

Photos credits (from top left to bottom right)

1. Adult *Uraba lugens* moth. John Barran, Scion

2. *Cotesia urabae* female attacking gregarious *Uraba lugens* larvae. Geoff Allen, University of Tasmania

3. Older *Uraba lugens* larvae feeding on the entire leaf blade. John Barran, Scion

4. Young gregarious *Uraba lugens* larvae skeletonising a leaf. John Barran, Scion.

Contents

Summary and Recommendations

Background

1. *Uraba lugens* more commonly known as the gum leaf skeletoniser (hereafter referred to as the skeletoniser) is a pest that established in Auckland in 2001. It is now found to be widespread throughout the Auckland region and has spread further south. This moth defoliates and causes damage to eucalypt trees.
2. The gum leaf skeletoniser stakeholder group, funded through the MAF sustainable farming fund, wish to introduce a parasitoid from Australia that attacks and kills skeletoniser larvae.

Recommendation

3. We recommend that the decision to release *Cotesia urabae* is approved. The organism poses a low risk to the New Zealand environment and our assessment shows the benefits of release outweigh any risks and that the minimum standards are not triggered. Furthermore, we do not consider approval of this application to be inconsistent with the principles of the Treaty of Waitangi.
4. There are two beneficial economic effects that we have assessed as significant. These effects are an increase in eucalypt forestry productivity (**medium**) and reduced cost from replacing amenity trees (**low**).
5. The risk of attack on non-target hosts was considered **negligible**. As *C. urabae* is not capable of successfully reproducing on any native or valued moth species, it will only form populations near eucalypt trees. *Cotesia urabae* only accounted for a small increase in mortality of two native moths. These increases in mortality rates were low, for example 8% in *Metacrias huttoni,* but this number is artificially high due to the host range testing forcing these interactions. Furthermore, as neither moth occurs within close proximity to eucalypt forests there is little risk from approving this application.

Monitoring

6. It is best practise to monitor any organism released. We believe a recommendation should be made to the applicant advising that monitoring is conducted.

1. Application process

Purpose of the application

1.1 Scion seeks approval to import for release *Cotesia urabae* (Hymenoptera: Braconidae) as a biological control agent for gum leaf skeletoniser, *Uraba lugens* (Lepidoptera: Noctuidae). This application is made under section 34(1)(a) of the HSNO Act, for approval to release without controls. Any approval of this application will fall within section 27(b) of the HSNO Act, being an approval to import for release or release from containment any new organism.

Decision path

1.2 This application was made under section 34(1)(a) of the HSNO Act, and is to be considered by the Authority in accordance with section 38 of the HSNO Act. A copy of the relevant decision path and associated explanatory notes can be found in Appendix One of this report.

Public notification

1.3 The application was formally received for processing on 12 April 2010.

1.4 Section 53(1)(b) provides that an application under section 34 to import for release any new organism shall be publicly notified by the Authority. In order to fulfil this requirement ERMA New Zealand gave public notice of the application on 15 April 2010, by publishing a notice on its website, and placing an alert notice in *The Dominion Post*, *The New Zealand Herald*, *The Otago Daily Times* and *The Press* on 17 April 2010.

1.5 ERMA New Zealand also sent letters or emails notifying the applicant, the Minister for the Environment, government departments (including the Department of Conservation (DOC), the Ministry of Agriculture and Forestry (MAF) and the Ministry for the Environment), local authorities, Maori organisations, and those organisations and individuals who had requested to be notified or new organism release applications.

Consultation with government departments

1.6 In accordance with section 58(1)(c) and clause 5, MAF and DOC were consulted about the application. Both made submissions in conjunction with the public submission process, and both were supportive of the application.

Consultation with Māori

1.7 The applicant conducted level 1 national consultation with Māori and undertook an extensive attempt to conduct more targeted local consultation with several iwi/Māori groups in the wider Auckland region given the proposal to focus any approved release in that area. We congratulate the applicant on their consultative effort and their follow up with all those who responded. We note also that the applicant intends to continue their consultation and relationship management efforts with Māori in the Auckland region should approval be granted.

Public submissions

1.8 Section 59(1)(c) requires an application to be open for the receipt of submissions for 30 working days from the date of public notification. As the application was notified on 15 April 2010, submissions were received up until 27 May 2010.

1.9 A total of 10 written submissions were received, and ERMA New Zealand forwarded copies of all the submissions to the applicant and to any submitters who requested them. The submissions received are summarised below:

Department of Conservation

1.10 The Department of Conservation have no concerns over risk to native fauna from the release of the skeletoniser. The Department supports the initiative and recommends the Authority approves the application.

Ministry of Agriculture and Forestry

1.11 The Ministry of Agriculture and Forestry supports the application and commends the applicant "for trying to solve a problem in what it considers to be a cost-effective and environmentally-reasonable manner". The Ministry believes the host specificity testing is "thorough and well designed" and this supports the conclusion that non-target attack will be rare. It should also be noted the Ministry has provided support to this application through the provision of a sustainable farming fund grant.

Regional Councils

1.12 Three submissions were received from regional councils, Environment Bay of Plenty, Northland Regional Council and Greater Wellington Regional Council. All councils support the application due to the potential benefit to human health and the eucalypt forestry industry.

New Zealand Farm Forestry Association

1.13 The New Zealand Farm Forestry Association acknowledges the importance of eucalyptus to New Zealand's forestry. The Association also points out the importance of sustainable production, and believes the incursion of pests must be balanced by introducing natural control agents. They believe *Cotesia urabae* is a specialist control agent and support its release.

The New Zealand Forest Owners Association

1.14 The New Zealand Forest Owners Association supported the submission of the New Zealand Farm Forestry Association.

The Eucalypt action group

1.15 The eucalypt action group supports the application. They see the release of a biological control agent benefiting the industry by maintaining confidence in the use of eucalypts.

Federated Farmers

1.16 Federated Farmers support this application due to economic and health concerns relating to the skeletoniser.

Dr Cliff Mason

1.17 Dr Mason opposes the application on the grounds that the need for a biological control agent is not evident, the success of the biological control is doubtful and the host specificity testing is not conclusive.

2. Risk Assessment

Context

2.1 This risk assessment looks at the potentially significant effects which could occur if *C. urabae* is released in New Zealand. This assessment is based on a wide range of information available to ERMA New Zealand, provided by the applicant, consultation with Māori, submissions from the public and the Agency's own information sources.

Risk assessment assumptions

2.2 If *C. urabae* fails to establish in New Zealand there is no risk. The risk actually increases if *C. urabae* forms larger populations, as effects like non-target attack could increase in frequency. At the same time the benefits will also increase with greater population sizes. Benefits and risks both increase with full establishment and any difference between the two become greater and greater. Therefore an assessment made based on full establishment makes it easier for us to determine if the benefits do truly outweigh the risks.

2.3 We have used a 20 year timeframe for our assessment. During this 20 years it is expected that the skeletoniser will have spread to much of the important eucalypt forests of New Zealand (Journeaux, 2003).

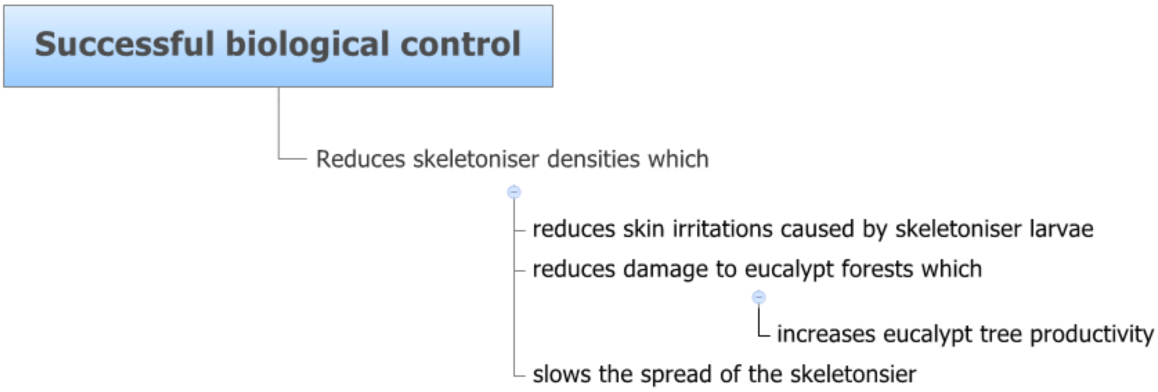
2.4 Our risk assessment is also based on the assumption that eucalypts do not provide any greater level of ecosystem services or are more aesthetically pleasing than other tree species. During the 20 year assessment period we assume that non-plantation eucalypts which die are removed and replaced by other species of tree. These replacement species will provide the same level of 'service' as the eucalypts. This means there are a number of effects identified by the applicant that no longer need to be assessed.

Organism Description

2.5 *Cotesia urabae* is a small parasitoid wasp that kills moth larvae. The adult wasps are extremely small at 2.5 – 3.2 mm and are not known to sting or irritate humans. They reproduce by laying eggs in the larvae of the skeletoniser. The wasp eggs hatch into larvae which, once mature, emerge from the dead or dying host. The emergent wasp larvae spin cocoons, before emerging as an adult.

2.6 As with many other wasp parasitoids a polydnavirus is transmitted along with the eggs to suppress the immune system of the host. This polydnavirus is fully integrated into the chromosomal DNA of the host parasitoid and is only capable of replicating in specific cells in the female wasp's reproductive system. When a host is infected the polydnavirus does not replicate, and there is no risk of the virus spreading.

3. Benefits of the Release



Effect one: Reduction in skeletoniser populations reduces the damage they do to trees and increases eucalypt productivity

3.1 There are almost 25,000 hectares of eucalypt forests in New Zealand (Forest Owners Association, 2009). The skeletoniser could have a large impact on many of the eucalypt species used in plantation forests (Potter and Stephens, 2005). Therefore the skeletoniser has potential to cause major economic damage by reducing the yields of wood from these plantations.

3.2 Although the skeletoniser can kill trees its major impact will be defoliation and a reduction in the productivity of eucalypt plantations. Trees which are severely affected have been a small minority in the past and most of these recover during late summer after the larvae pupated (Strelein, 1988).

3.3 In an economic assessment from the Ministry of Agriculture and Forestry (Journeaux, 2003) it was estimated that the reduction in growth rates would increase the rotation time of eucalypt plantations. Journeaux (2003) estimated this rotation period would increase in the North Island from 12 to 14 years and in the South Island from 15 to 18 years. Additional costs would occur through the requirement to increase monitoring and spraying of the forests. In total it was estimated these costs would amount to $69.4 million in 2003 dollars.

3.4 Our risk assessment is based on the full establishment of *C. urabae* (see 2.2-2.4 'Risk assessment assumptions'). We expect *C. urabae* will have two impacts; it will reduce dense skeletoniser populations; and will reduce the rate of spread of the skeletoniser.

3.5 As significant skeletoniser populations could form in monoculture eucalypt plantations any reduction in their populations will be beneficial. From an economic perspective a reduction in spread may be even more important. The skeletoniser is currently only in the Auckland region but is expected to eventually spread throughout New Zealand (Kriticos et al, 2007). The longer it takes to reach the significant eucalypt plantations in central North Island and Southland the lower the costs will remain.

3.6 We also note that Māori consultees identified this proposed benefit given the increase in significance of forestry assets to iwi/Māori groups in recent times. Although we don't have information on the value of eucalypt hardwood forestry to Māori we acknowledge their specific interest in ensuring a sustainable economic base from this industry.

3.7 We are unable to estimate the exact monetary benefit that will amount from the introduction of *C. urabae.* In terms of magnitude of effect we expect there will be some regional beneficial economic effects with some national implications in the medium term (**moderate**). We expect there will be a good chance that this effect may occur under normal operating conditions (**likely**). Based on the ERMA New Zealand risk assessment framework (Appendix One) this gives a level of effect which is **medium** (level C).

Effect two: Reduction in skeletoniser populations reduces costs for authorities managing amenity trees

3.8 Currently Auckland city spends is $60-65,000 per annum to manage eucalypts damaged by the skeletoniser (Application, page 49). Around 3% of the country's amenity trees (Journeaux, 2003) are eucalypts that could be attacked and damaged by the skeletoniser. An assessment of the cost to amenity trees was made by Journeaux (2003). He analysed two scenarios. In the first instance he assumed total replacement of all eucalypt amenity trees throughout New Zealand. In the second he calculated the impact on tree amenity value, relative to the percent of trees attacked and the degree of damage. Given the low levels of trees expected to die we believe the second scenario is the more realistic. Journeaux (2003) predicts a $31.5 million loss of amenity values in 2003 dollars which we have used as the basis of our analysis.

3.9 We are unable to estimate the exact monetary benefit that will amount from the introduction of *C. urabae.* In terms of magnitude of effect we expect there will be some regional economic benefits which will accrue to small organisations (**minor**) and this effect is expected to occur under normal operating conditions (**likely**). Based on the ERMA New Zealand risk assessment framework (Appendix one) this effect would be categorised as **low** (level B).

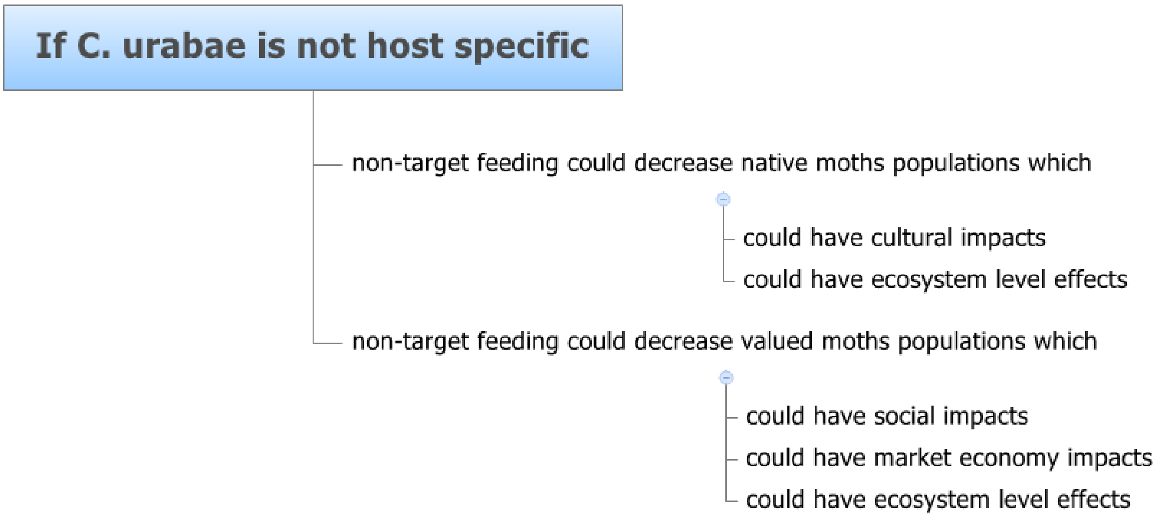
Effect three: Reduction in skeletoniser populations reduces the incidence of serious skin irritations

3.10 The larvae of the skeletoniser can cause skin irritations characterised by a stinging sensation, followed by itching and the formation of welts (Derraik, 2006). This means forestry workers and members of the public near infested trees could be affected.

3.11 There is no known data available on the incidence of exposure to the skeletoniser in New Zealand (Derraik, 2006). There have however been a small number of possible incidents reported. For example, (Derraik, 2008) reported a case of three school age children, who after climbing a eucalypt tree began to feel a stinging sensation, with welts developing on their bodies. The following day all the children had no lingering itchiness or any form of discomfort. One child had slight but visible welts on her wrists after five days. There are no reports that we are aware of from Australia of similar problems.

3.12 If *C. urabae* successfully reduces skeletoniser populations, this will decrease the chance people are exposed to the skeletoniser and develop serious skin irritations. The exact reduction of skeletoniser populations is hard to accurately predict. We expect there may be short term positive effects for individuals in specific areas. This gives a magnitude designation of **minimal**. This effect could occur, but is not expected to occur under normal operating conditions, a likelihood of **unlikely/occasional**. This effect is therefore assessed as **negligible** (level A).

4. Risks of the Release



Effect four: *C. urabae* is not host specific causing a significant decline in the population of native or valued moths

Host range testing overview

4.1 In the design of their host range testing experiments the applicant has relied upon best practice as described in literature such as Van Driesche and Murray (2004). We note this adherence to best practice and are of the view that the results from the host range testing are robust.

4.2 It is important to note the data provided by host range tests is best interpreted as an overall pattern of results, revealed through the use of a range of designs and observations. Statistically significant results are useful but not necessary for interpreting the risk of non-target impacts.

4.3 Given the limit to available resources, the first step when conducting host range testing is to identify which species to test. The applicant has selected eight species based on their relatedness and ecological similarity to *C. urabae*, and their economic or social importance to New Zealanders.

Table 1. Species used for host range testing.

Species	Status	Reason for inclusion
Uraba lugens	Exotic pest	Target pest
Celama parvitis	Endemic	Same subfamily
Metacrias strategica	Endemic	Close subfamily
Nyctemera annulata	Endemic	Close subfamily
Metacrias huttoni	Endemic	Close subfamily
Metacrias erichrysa	Endemic	Close subfamily
Tyria jacobaeae	Introduced biocontrol agent	Close subfamily
Spodoptera litura	Exotic pest	Distant subfamily
Helicoverpa armigera conferta	Exotic pest	Distant subfamily

4.4 The applicant has used both no-choice and choice host testing. In no-choice testing *C. urabae* was presented with only the test species to attack. However in choice testing *C. urabae* was presented with the test host species and the target host, the skeletoniser. By having both the test host and the skeletoniser in the cage they were able to measure the relative likelihood of attack (choice test).

4.5 The key questions to be addressed by these experiments are whether or not:

- *Cotesia urabae* can successfully complete its lifecycle on the non-target host,
- *Cotesia urabae* will attack a non-target host in the presence of the skeletoniser, and;
- *Cotesia urabae* will attack non-target hosts and cause mortality.

Question 1: Can* C. urabae *successfully complete its lifecycle on the non-target host?

4.6 Results indicate that *C. urabae* is not capable of successfully completing its lifecycle on any of the non-target species and therefore is only capable of reproduction in areas where the skeletoniser is present. Although the skeletoniser is capable of feeding on a wide range of trees, it is generally found on non-native, eucalyptus trees from Australian (Berndt and Withers, 2009). This means populations of the skeletoniser and therefore *C. urabae* will be mainly limited to locations where eucalypt trees occur.

Ultimately this means the only interactions between native and valued moths and *C. urabae* will be from small numbers on the edges of areas planted with eucalypts.

Question 2: Will C. urabae *attack a non-target host in the presence of the skeletoniser?*

4.7 The choice testing for these species indicate the attack on non-target species will be infrequent. *C. urabae* had a lower successful attack rate on the non-target species compared to the target, the skeletoniser (Application, Appendix two). On three non-target species used in choice tests this attack rate was less than half that of the target host.

4.8 Furthermore, by artificially forcing an interaction between two species in such tests, the rate of attack can often be overestimated (Van Driesche et al, 2003). In the real world we can expect *C. urabae* to have even lower rates of attack on non-targets.

Question 3: Will C. urabae *attack non-target hosts and cause mortality?*

4.9 *Cotesia urabae* did not have any effect on mortality for the majority of native moths tested. Of the eight species tested only two were affected (*Metacrias huttoni* and *Metacrias erichrysa*) and in these species the levels of mortality were much lower than for the target host. For example, for *Metacrias huttoni* 7.5% of mortality could be attributed to *C. urabae*, whereas for the skeletoniser this figure was 39%, a difference that was highly statistically significant. There appeared to be no effect from *C. urabae* on *Celama parvitis* however the number of replicates was insufficient to determine this statistically.

Evaluation

4.10 Based on the information provided by the applicant there are three species which could be affected should they interact in the environment: *Metacrias huttoni*, *Metacrias erichrysa* and *Celama parvitis*. The likelihood of interaction in the field is much reduced because of three reasons.

4.11 First, testing shows *C. urabae* has a higher successful attack rate on the skeletoniser.

4.12 Second, all three species have limited geographical overlap with the skeletoniser and therefore with *C. urabae*. *Metacrias huttoni* and *Metacrias erichrysa* are often found in open herb and tussock fields at high altitudes of 550 to 1200 m (Gibbs, 1962) areas considered unsuitable for the skeletoniser. *Celama parvitis* on the other hand feeds on *Helichrysum lanceolatum* a widespread shrub found from the northern tip of the North Island to at least Dunedin in the south. It is commonly found along river banks, road cutting, forest margins and coastal cliffs (Smissen et al, 2006). Therefore while *Celama parvitis* and *Helichrysum lanceolatum* may occur in the same region as eucalypt plantations and *C. urabae* they will generally not have overlapping habitats.

4.13 Finally, there is limited overlap of larvae in time. The skeletoniser has two generations in Auckland with larvae present from January to March (summer generation) and May to October (winter generation) (Withers et al (2003) cited in Mansfield et al, 2005). In *Celama parvitis* larvae are present from around April to November (Berndt et al', 2009). This means there is a very limited overlap where both species have larvae present at the same time, again reducing the chance of incidental attack on the non-target host *Celama parvitis.*

4.14 We consider that should any non-target feeding occur it will not be significant at a population or species level because of the following reasons:

- *C. urabae* is unable to establish populations on non-target hosts;
- *C. urabae* is more likely to successfully attack the skeletoniser over non-target hosts;
- *C. urabae* caused only very low levels of mortality on non-target hosts;
- There are few instances where *C. urabae* will be in direct contact with larvae of non-target hosts.

4.15 The impact will be localised to areas close to eucalypt plantings, and there is no indication of population level impacts. This adverse effect of mortality on non-target hosts is assessed as **minor** in magnitude. As this adverse effect is considered to only occur in very unusual circumstances it is rated as **very unlikely**. The gives a assessment of **negligible** (level A) under ERMA New Zealand's risk assessment framework (Appendix one).

Effect five: Introduction of *C.urabae* will inhibit the kaitiakitanga responsibility of Māori

4.16 In performing a kaitiakitanga role, iwi/Māori are concerned with ensuring and maintaining the sustained and enhanced health and well-being of the environment, particularly in relation to native flora and fauna. A number of consultees expressed concern about the potential for non-target impacts to native species and the overall long term impact of introducing a new exotic species to control an already present exotic species. This concern goes beyond the immediate biophysical risks of *C. urabae* attack or hybridisation with native species, to recognising a potential degradation of mauri[1]– vital to sustaining health and well-being.

4.17 We recognise that assessing the potential for adverse effect to mauri is difficult. However given the information provided by consultees, the applicant and the assessments earlier relating to non-target effects and hybridisation, we consider the resulting effect to the mauri of native species and ecosystems to be limited.

4.18 We also note that the applicant has committed to undertaking post-release monitoring in relation to emergence and non-target impacts. We consider this will contribute positively to the ability of Māori to perform their kaitiakitanga functions and several consultees requested they be kept informed of these monitoring results

[1]Active life-giving principle or form of energy present in all animate and inanimate things. (ER-PR-01-1 11/04)

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