Appendix 1. Consultation with the community prior to application

1. The scope of consultation
2. Positive and adverse effects on the environment
3. Positive and adverse effects on human health
4. Positive and adverse effects on the relationship of Māori and their culture and traditions with the environment
    4.1 Responses from iwi, hapū and other Māori organisations and individuals
    4.2 Issues raised in consultation over previous similar proposals

5. Positive and adverse effects on society and communities
6. Positive and adverse effects on the market economy

1. The scope of consultation

The applicant is the Dung Beetle Release Strategy Group, comprising farmers and agribusinesses, supported by the MAF Sustainable Fund. Many organisations and individuals were invited to consult on this proposal. Emails or letters were sent to Regional Councils (15), relevant government departments, NGOs and societies, and interested members of the public (21). There was consultation with the ERMA National Māori Network and other Māori stakeholders (152 organisations and individuals), and the project was presented at the ERMA National Maori Network. Information about specific issues was sought from experts, and these personal communications are included below.

It is likely that various species of dung beetles will eventually spread or be spread throughout Aotearoa. Consultation was therefore conducted nationally. A letter or email requesting dialogue over this proposal was sent to over 152 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 Waiwhetu Marae, Petone in July 2010, and additional input was obtained there. As the first releases of the control agent are expected to be made in the Kaipara region, a hui was hosted by Ngāti Whātua Ngā Rima o Kaipara Trust to discuss any issues arising. All organisations and individuals consulted will be informed when the application has been submitted and opened for public submissions.

2. Positive and adverse effects on the environment

Dr Jacqueline Beggs, Auckland University, from notes of a meeting held in 2009.

Native dung beetles are present in high numbers in forests, but we know relatively little about them, or about the ecosystems into which these exotic dung beetles will be introduced. I don't believe there has been sufficient research to enable us to understand the risk that introduced dung beetles could disrupt the fundamental basis of those systems. A general principle of biological control is not to introduce generalist species such as these. Even if the beetles are specific to non-forested areas, what about other native habitats?

Phil Bell, Senior Technical Support Officer (Biosecurity), Department of Conservation

I did not get an overwhelming response from DOC's invertebrate staff, but I have come up with a few questions or areas of interest (many of which you could probably already answer!). There are:

- Likelihood of interaction with native dung beetles, particularly any competition, potential displacement, etc?
- Likelihood of movement away from pastoral land. Will the exotic beetles 'hunt out' dung from forest margins near pasture etc?
- Is there a chance of interbreeding with native beetles?
- Are the exotic beetles solely dung feeders? Am aware that some overseas dung beetles also eat plants (mainly rotting) and invertebrates.
- Where are they likely to be sourced from? Are those areas where the beetles are also used on pastoral land? Any indicators of success/failure?
- Will these exotic beetles use bird faeces (such as pukeko)? Could that lead to an adaptation in dung preference and potential move into other habitat?

Dr Steve Pawson, Scientist, Scion Research, Canterbury

RE: Pawson, S. M., Brockerhoff, E. G., Meenken, E. D., & Didham, R. K. (2008). Non-native plantation forests as alternative habitat for native forest beetles in a heavily modified landscape. *Biodiversity and Conservation*, 17, 1127-1148.

Q: *How many unidentified Saphobius sp. (Scarabaeidae) individuals you collected in the pasture pitfall trap sample at the 5m location? This is somewhat important given you found this genus in the 'transition' zone between forest and pasture.*

A: There were three specimens in total in the pasture at 5 m 1 in November 2002 and 2 in Feb 2004. Just to clarify this site was a little interesting in that the fence was about 5 m out from the edge of the forest as we defined forest edge, i.e., drip line of the canopy. Thus the 5m pasture pitfall was in long grass with some regenerating native occurring around it. Thus the fact that the species was not found further out in the 25 and 125 m samples would suggest that it is indeed not capable of surviving in true pasture.

Dr Ross Gray, Scientist, AgResearch

No native dung beetles in any of my recent samples (Waikato, Manawatu and West Coast Sth Island) only adults I've collected have been Black Beetle and Tasmanian Grass Grub…..Also, nothing in the way of native dung beetles recorded in any of my data running back up to three years.

Dr Trevor Jackson, Scientist, AgResearch, Lincoln

Q1: *What is the likely frequency of pathogens passing between scarabaeid species? Are there generalist pathogens or are they relatively host specific?*

A: Scarab pathogens are usually moderately to highly host specific. This could be due to the evolution of their hosts in microbial rich environments. It is (highly) unlikely that they would act as incubators and pass on diseases to native species.

Q2: *Can you think of any resident pathogens that are likely to do well in exotic dung beetles, especially given the specialist habit of DB?*
A: Possibly some of the more unusual nematodes that are associated with Scarabaeinae (Thelostomatids for example). These are not common in native scarabs (mostly Melolonthinae) and unlikely to pose any threat to native species.

Q3: *Dung beetle populations are likely to get quite high. Do you think there are significant new risks for native scarabaeid populations here mediated through pathogens?*
A: No, because there will be considerable space separation except with the outbreak pest species like grass grub and manuka beetle in improved pastures. But in this situation they would be multiplying native pathogens and exerting some control in modified habitats susceptible to native pests.

Stephen Thorpe, School of Biological Sciences, University of Auckland

… I have been involved in a number of different projects (including Olly's) involving native dung beetles (Saphobius spp., and the rare Saphobiamorpha spp.) Never once have I seen any evidence that they venture outside native bush…..

Jenny Dymock, private consultant, Northland. Author of first application to import an exotic dung beetle (<u>Onthophagus</u> <u>binodis)</u> into New Zealand.

27 July 2010: The latest correspondence I have found on the application from MAF is dated 20 Nov 1996 from Dr Kevin Corrin, National Manager, Animal Quarantine, MAF Agricultural Authority.

The Agricultural Security Consultative Committee, Technical subcommittee (Invertebrates) met on 12 Nov 1996 to discuss the proposal ..... "The main concern of the committee was the possible impact of the beetle on earthworm pops"..... They recommended delaying the decision until after a conference to be held by AgR..... I attended that conference on 27 Feb 1997..... Dr Jo Springett spoke on earthworms and concluded "the effect of dung beetles removing dung as a food source for earthworms is to reduce the potential earthworm food by less than 10%. It is unlikely that this would significantly decrease positive effects of EW on soil structure and root distribution. If dung beetles were active mainly in summer their effect on earth worms would be even less and dung removal from the soil surface during summer would be assured".

27 July 2010: I have .... letters from MAF. One is dated 20 Nov 1996 from Dr Kevin Corrin, National Manager, Animal Quarantine, MAF Agricultural Authority.

The Agricultural Security Consultative Committee, Technical subcommittee (Invertebrates) met on 12 Nov 1996 to discuss the proposal. "The main concern of the committee was the possible impact of the beetle on earthworm pops". They recommended delaying the decision until after a conference to be held by AgResearch.

The last correspondence I have is a letter from Kevin Corrin on 9 Jan 1997... where they again state the concern was about earthworms. The conference was held on 27 Feb 1997.

Unfortunately I don't have any other records of correspondence from MAF. I can't remember receiving an outright refusal. Maybe I just gave up at that stage.

Dr Adrian Davis, Scarab Research Group, University of Pretoria, South Africa; John Feehan, Director, SOILCAM, Hackett, ACT, Australia; Dr Bernard Doube, Principal, Dung Beetle Solutions Australia, Bridgewater, South Australia; Dr Jean-Pierre Lumaret, Professor, Department of Ecological Systems Dynamics, Paul Valéry University, Montpellier, France; Dr James Ridsdall-Smith, Senior Scientist, CSIRO, Western Australia.

A series of questions regarding habitat specificity of exotic beetles introduced into Australian pastures were presented to dung beetle experts (Adrian Davis, Bernard Doube, John Feehan, Jean-Pierre Lumaret, James Ridsdall-Smith) who have in the past or continue to work with species that were introduced into Australian pastures. Their responses to the following questions are presented below:

Q1: ***Do you know of any cases where any of the introduced dung beetles listed above have been found in habitats other than pasture? For instance, deeply shaded forest, broken canopy scrub/forest, dense scrub/bush/rain-forest flanking pasture, etc? If so, where?***

Q2: ***Is there any evidence that the habitat preferences of any of the introduced dung beetles has changed since introduction?***

Q3: ***Alternatively, have any been found in habitats that were not predicted?***

Q4: ***Do you know of anyone stating that dung beetles are not beneficial, and if so why do they hold that view?***

Dr Adrian Davis: **Adrian was a member of the CSIRO Dung Beetle project team in South Africa. He was involved in extensive dung beetle survey trips throughout Africa, and was curator of the CSIRO dung beetle collection in Pretoria. Adrian is still actively involved in dung beetle research with the Scarab Research Group, and his main interests are the historical origins of spatial patterns in dung beetles from biogeographical down to community scales of organization.**

A1: Edge effects are known in disturbed areas but it is doubtful that deep penetration in numbers would occur.

A 2: Doubtful but best answered by the Australian experience : Not to my knowledge

A 3: Not to my Knowledge.

A 4: Native forest beetles in South Africa clearly survive despite the presence of these species typical of relatively unshaded habitats. Disturbance of forest would be a much greater threat to endemic NZ dung beetles.

Additional comments:

None of the African species are characteristic of forest habitats with a humus layer. Some would be found in open woodland, particularly *Onitis alexis*, but none are truly shade associated. The shade records from Boekenhoutskloof and Roodeplaat Davis 1996 - Pedobiologia) are for thickets within the open woodland matrix from which open woodland records were taken. Records of *O. caffer* in thickets at Boekenhoutskloof (sandveld near Pretoria) were in winter when the leaves had been dropped from the trees. Unpublished forest sampling in South Africa has largely failed to record these species.

John Feehan: **John worked in the CSIRO Dung Beetle Project from 1965 to 1991. He was based in Canberra, and played a pivotal role in mass rearing, release and redistribution of the introduced species. Since 1993 he has operated his own very successful dung beetle redistribution company SoilCam.**

A 1: The only species I have observed colonizing dung in areas other that open pastures are the dusk and night flying species such as *O. gazella, O. alexis*, *O. caffer* and *B. bison*.

I have observed all four species entering areas (in much lower numbers than in open pasture) which I would describe as lightly wooded or light scrub where trees are around 6 meters in height and around 20 meters apart.

I have not noticed *O. gazella, O. caffer* or *B. bison* colonizing dung under the canopy of trees. I recall that on one occasion I picked up over 20 *O. caffer* at about 8pm from a single cow pad near a large tree at Highfields, which is 20 kms north of Toowoomba Queensland. I recall that it was unusual finding so many beetles in dung so close to a tree. I looked up and recall that the dung was outside the perimeter of the canopy of the tall gum tree, which was approximately 20 meters tall.

The only species I have found in dung under the canopy of trees is *O. alexis* at Araluen, which is 80 kms SW of Canberra, and at Coonabarabran in northern NSW. In both cases I would describe the tree density as less than lightly wooded. ie approximately 20 trees in a 100 acre paddock.

Both *O. gazella* and *B. bison* appear to fly away from or along the edge of densely treed wind brakes and wooded areas. In fact harvesting beetles at night is often quite productive in these areas. *O. gazella, O. alexis* and *B. bison* appear to be able to detect a wire fence and will often colonize dung along a fence line to a greater degree than dung out in an open pasture.

A 2: No

A 3: Crepuscular flying species have invaded dairies at the end of their 22 minute flight period when fluorescent light are on and I have also received reports of *B. bison* flying to light at homesteads. Their flights to dairies and homestead lights are brief and the beetles disperse in 10 minutes or so.

A 4: No

A 5: No

Additional Comments:

I have been harvesting dung beetles for forty years and during that time I have relocated more than 5,000 colonies consisting of 18 species.

While traveling through Queensland I have had numerous beef producers comment that when beetles are active buffalo fly numbers are reduced to levels where little or no control measures are required. However buffalo fly numbers are never reduced to zero due to the fact that introduced beetles don't enter the lightly wooded areas and light scrub areas in sufficient numbers to bury dung quickly to suppress all buffalo fly breeding.

Dr Bernard Doube: **Bernard was part of the CSIRO Dung Beetle Project team. He was based in Rockhampton from 1977, and in South Africa from 1980 to 1987. Bernard's research centred on selecting and testing dung beetle species for the biological control of buffalo fly.**

A 1: *Bubas bison, Onthophagus binodis , Onthophagus taurus* and *Euoniticellus fulvus* are relatively rare at cattle dung baits set in moderately dense scrub a metre or so from the open pasture.

It is important to appreciate that there are a number of aspects to habitat specificity. One relates to the beetle's preference for light/dark (grass / bush) and it appears from Doube (1983 Hluhluwe study) that light intensity is an important factor in determining the distribution of beetles. BUT of GREAT IMPORTANCE is the distribution of a suitable breeding medium. Cattle cannot get into dense scrub and so there is NO cattle dung there. These species are quite specific for cattle/horse/wet sheep dung. They do not bury sheep pellets for example. It is most unlikely that these species will feed on kiwi dung and other form of dung found in dense forest, even if they could get there, which is most unlikely.

These species are absent from or extremely rare in regions that are climatically suitable but have no domestic stock, e.g., in cropping districts.

A 2: None whatsoever. Nor have they changed in Africa where there is a continuum of suitable cattle country from the Cape to the tropics. The tropical species remain in the tropics and the temperate species remain in the temperate regions. Boundaries are determined by climate, and so may change with climate change. Species geographic distributions will change with climatic change, species staying within their preferred habitat as it shifts across the continent.

A 3: None to my knowledge.

A 4: No.

A 5: It is most unlikely that these species will enter such forest for at least two reasons. Firstly they prefer light to dark places and so avoid forests. Secondly, the absence of cattle and horses (domestic stock) from such places means that there is no food for them there. They find dung using the odour of dung. If there is no appropriate odour, there is nothing to lure them into the forest, even if they liked it there, which they don't.

If these species do not enter the forests, they cannot pose a threat to the native species of the forest.

Dr Jean-Pierre Lumaret: **Jean-Pierre has extensive knowledge and publication in the ecology of Mediterranean dung beetles and maintains a long term association with CSIRO and CABI based research initiatives in the Mediterranean region. Jean-Pierre heads graduate based research in the Ecology of Arthropods in Mediterranean Agroecosystems team and the Zoogeography laboratory.**

The European species of your shortlist I can give information are: E*. fulvus, G. spiniger, O. taurus, O. vacca, C. hispanus, B. bison, B. bubalus*.

For each of these species I give you below their main ecological characteristics:

E. fulvus**:** mainly at low altitude (60% of sites < 250 m of altitude), but 5% of the sites above 1000 m (up to 1600 m in Corsica). Values for 377 observations. March to November, especially between May and September. Oviposition from May to August. Especially in very open pastures, more rare when the habitat becomes close. Absent in forest.

G. spiniger**:** lowland and medium altitude: 75% of sites <500m; 18% between 500 and 1000m; reaches about 1700m. Values for 459 observations. Mainly in wet soils, clay (56%), or silty (16%). Mostly in very open habitats (81%), very rarely in the forest, and in this case only in the edge if dung is present. Cow dung (60%), horse (22%), human (12%). Rarely in the dung of sheep, fox. Attracted by the light. Oviposition in autumn.

***O. taurus*:** especially at low altitude (70% of sites <250 m); up to 1100 m (values for 650 observations). March to November, especially between May and September. Oviposition in April, emergence of the first generation of adults in June; at least two generations pr year. Cattle dung (50%), horse (20%), human (17%), sheep (10%), pork, rabbit. Mostly in very open grasslands (80%). Absent in forests. Clay, loam, sandy loam sites.

***O. vacca*:** between sea level and 1700 m in altitude. 54% of the sites were <250 m; 22% between 500 and 1000 m (values for 798 observations). March to November, especially between April and July (83% of observations), peaking in May. Especially in the pastures; absent in forests. Heavy clay soils (64%), but also silt and sandy soils. Cow (38%), sheep (38%), horse (17%), human (7%); also in pig, fox, badger.

***C. hispanus*:** found in very open environments (grasslands, low scrublands (<2 m high), plain and low-altitude (but 900 m in Corsica), clay substrate (50% of sites), but also loam and sandy loam sites (30% of sites). Values for 125 observations. In France, February to November, but especially in spring (April and May) (nesting period). No activity at the time of maximum summer drought. Cow dung (55% of observations), sheep (30%), horse and human.

***B. bison*:** Especially at low altitude (90% of sites <250 m), but reaches 900 m in Corsica (values for 89 observations). Activity from September to July; adult emergence in autumn. Cow (70%), horse, human, sheep. Mostly in open sites, but sometimes in clear undergrowth (rare). *B. bubalus*: values for 150 observations. Compact soils, clay or loam. Open or very open pastures. Breeding period: between May and July.

I hope this information can help you. In my opinion, I consider that these species cannot pose a threat to native forest dwelling dung beetles in New Zealand.

Dr James Ridsdall-Smith: **James was a member of the CSIRO Dung Beetle Project team from 1977 to 1989. He was based in Perth WA, but travelled extensively to South Africa, Spain, Portugal and France to study dung beetles in the field. His main research centred on controlling bush fly in WA, and in studying the effects of dung beetle density on beetle reproduction and its impact on bush fly numbers.**

A 1: One issue that we have had in Australia is that the large introduced species do become abundant at some sites but not usually if small species are already abundant. We dont know what conditions are needed for all the small and large species to become abundant and coexist at the same sites. Possibly it is the presence of fragments of woodland/shrubland, but we really don't know yet. My guess is that you will not have a problem with introduced beetles in thick bush forest.

A 2: No evidence of change in habitat preferences. However we do know know that evolution and selection for niches is very active in dung beetles. As I have said above we don't really know what niches they occupy in their native environments anyway.

A 3: Not that I know of.

A 4: There are concerns that there could be non-target effects from introduced dung beetles. For example Fred Legner thinks that introduced dung beetles have interfered with the effectiveness of parasitoids and predators already in the dung. Legner EF 1995 Biological control of Diptera of medical

and vetinerary importance Journal of Vector Ecology 20, 59-120. There is no evidence for or against this hypothesis. Similarly beetles might bury dung that contains eggs/larvae of sheep internal parasites. I did make some measurements on this and although there were parasites in buried dung, there was no evidence that the whole threat was worse as a result of dung beetle activity.

A 5: No.

Additional comments:

The argument about natural vegetation is harder to clearly argue. In all countries a few native species will move partly to breed in pastures in cattle dung. Usually open habitat species, and in Australia adapted to arid environments. It seems to me irrelevant to an introduction program.

In Australia the introduced species that thrive in pastures are mainly smaller species that have very long distance dispersal behaviour. *Intermedius, taurus* and *gazella* are all known to travel several hundred kilometres in a year. It is inevitable that they will fly over some native vegetation and may be attracted to fresh dung there. The question I think is do they stop in these natural areas and breed there or just feed and pass on. This is a problem for determining host specificity for herbivorous insects also.

I have checked our data for National Parks in more detail. Trapping was carried out by GP Hall in three National Parks in the northern sandplains (Badgingarra, Watheroo and Moore River NPs). Ten traps were set per month in each park (30 traps) .....over 28 months (840 traps). A total of 4175 native scarabaeine beetles were trapped and 25 introduced beetles (0.6%); these were 17 O. binodis and 8 E. intermedius. 23 of the introduced beetles were collected from Moore River N. Park. In the pasture adjacent to the Badjingarra National Park beetles were caught in traps..... left open for seven days. Over 28 months 56 traps were set. We collected 398 beetles of which 70 were the native *Onthophagus ferox*, 145 the introduced *Onitis alexis* and 183 the introduced *Euoniticellus intermedius*. In these more northern regions *O. binodis* does not thrive; Moore River is the most southern of the three parks sampled. I think this number of introduced beetles does not represent a threat; widely dispersing pests like fruit flies often fly over and through native forests without breeding up their populations in the native vegetation. The parks incidentally are largely heath with areas of banksia woodland and some eucalypts in the gullies.

3. Positive and adverse effects on human health

No specific submissions received

4. Positive and adverse effects on the relationship of Māori and their culture and traditions with the environment

4.1 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

Paul Horton, Tanenuiarangi Manawatu, Rangitaane

Netta MacKintosh, Hokonui Rūnanga, Ngāi Tahu

The substantive issues raised in the course of this consultation (and addressed in Section 7.3) were as follows:

'What will be the interactions between the two individual taonga on a "daily" basis as they go about their respective industrious works?'

'What is to prevent the introduced specie becoming an aggressor and "invading" the habitat of our own representatives?'

'Are there any traits in the introduced specie lifecycles, lifestyles which show any traits for dominance and aggression towards others of their own kind or other species in Australia?'

'Are the proposed introduced species susceptible to climate and elemental affects on their health that could foster a "disease" regime that is currently not present in our islands?'

'The eco-servicing of these beetles could speed up nutrient cycling in the natural systems (Mahinga kai)'

'If history is any indicator there may be effects on Indigenous flora and fauna'

'Farming by Maori may benefit from this ecoservice'

' Some benefits (for waterways) from nutrient removal but this is balanced by by changes in farming practices following the increased productivity effects'

'Some benefits for (Land) but issues of increased stocking rates as production on marginal land improves'

'We see both positive and potentially adverse effects to air, the potential for increased green house gas emission from rotting dung may be a problem'

Natural habitats and ecosystems - Significant adverse and beneficial effects – Too many issues to cover in this document

'Some cultural issues surrounding faeces contamination to human food crops/ production maybe a problem'

' There may be some food web benefits for native animals. As the beetles are pasture spp. little benefit would be gained if forested systems on hill country from this release.

As above, lowland pasture/soil may improve but over all hill country may see little benefit

'All the world biota and natural interactions are the result of the activities of the atua Maori'.

'Overall positive cultural outcomes from this introduction and establishment'

'By the expected water quality improvement all 4 aspects of Maori health and wellbeing should improve'

'Unknown (benefits to ongoing management of resources) at present as the TOW is only just beginning to be upheld in the spirit in which it was intended'.

'Potentially mitigates some of the environmental degradations imposed by western agri-practices and environmental use.'

' For those maori with farming interests there will be benefits but overall this may be negated by widening socio-economic barriers. Little or no benefit for non-landholding Maori.'

'This proposal does not mention Maori participation at future levels'.

'Overall significant beneficial effects – As an iwi with a large geographic base, ..would like to be included in the scientific research and release for dung beetle colonies in our region. This would go some way to addressing the above points and in particular TOW partnership and participation in our regions resources'.

4.2 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. 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.

'..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 acknowledgement 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. Some 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 comefrom 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.

'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'.

5 Positive and adverse effects on society and communities

No specific submissions received

6 Positive and adverse effects on the market economy

Humphrey DeLatour, Dung Beetle Release Strategy Group

Great to see you pushing for the presence of more dung beetles in NZ. You may recall that Jenny Dymock here in Auckland applied to introduce a single species about ten years ago, and that the committee finding was "they have no proven benefit". Amazing!!!... but the whole process did not seem to be a serious one, and about half of those able to give a 2 minute presentation did not seem to have a clue just what a dung beetle was. Several seemed to have fears that burying dung would be a danger to their parasitic wasps intended to control blow flies.

Perhaps the biggest flaw in that previous attempt to import beetles lay in the monospecies approach, being only for Onthophagus binodis... a species introduced to Australia from Africa. While the above is probably great for cow dung, here in NZ we also need species to handle sheep dung. Possibly Australian varieties that work on wallaby dung and South American varieties that work on the dung of cameloids may well adapt to sheep, goat and deer dung.

Any importation of dung beetles should probably aim at at least six different varieties to give some diversity and to provide ecological balance. Onthophagus binodis and O. gazella may well provide the backbone of cattle dung workers. There are people that have worked with dung beetles for years that will know far better than I. Australian John Feehan is one...I think he is in Walawala NSW these days. You are no doubt also aware that here in NZ, John Pearce has also had some small Australian beetles, in the area where you would like to release more.

A great many of the problems that we hear of from farmers, and AgResearch staff, could be improved by farming with both earthworms and dung beetles. Problems like intestinal parasites, drought, erosion and water pollution to name a few. I have often been asked by farmers, what can I do to get earthworms back on my farm? When I suggest that they will have to find an alternative to their current drenches and pour-ons, they usually lose interest. Healthy animals may well not have parasite problems....but I get told "we drench our animals to make them healthy, and still we have to dose them for worms," Those same practices that make dung poisonous to earthworms for up to six months also make it poisonous to dung beetles for the same time. Obviously sometime, somewhere a great deal of education of farmers, teachers and the public in general, is required. Our vets and drench salesmen are unlikely to take a lead, and generally our news media do not wish to hear about dung beetles.

I wish you luck with your project, which I consider to be very important for the future of farming in NZ. It was a stupid idea for our ancestors to bring sheep, and cattle here without their essential ecological partners, over 160 years ago, but is never too late to correct that problem.

Dr Rowan Emberson, Entomologist, notes of a phonecall 30 June 2010

Dr Emberson supports the introduction of exotic dung beetles. Utilisation of dung can be variable. For example, dairy cattle deposit most of the cattle dung produced in New Zealand. Because of their diet, this dung is usually much wetter than that produced by 'range' cattle that is more similar to that produced by the natural hosts of most dung beetles, and this wetter dung may be less acceptable to introduced beetles. Because of such uncertainty he warned of the need to be realistic about the overall benefits claimed for the proposal.

Q. Have you ever come across any of the following species in grasslands in your tenure review work?
A. No we never came across them.

Penny Fairbrother, Research co-ordinator, Animal Health Board

Thank you for your letter seeking our (AHB's) views on the proposed introduction of dung beetles to New Zealand pastures. I have discussed this with a few other people within AHB and we consider that dung beetles are very unlikely to contribute to the transmission/spread of bovine TB. If anything, I believe that dung beetles (through the burying of dung and other material that may harbour TB bacilli) may even reduce the risk of grazing animals picking up the disease. Overall, we have very little concern regarding this proposal. However, we would appreciate the Release Strategy Group investigating this potential risk, i.e. dung beetles as a spreader of bovine TB, during the development of the application and would be pleased to discuss this further with you or the Group at any stage.

Dr David Leathwick, AgResearch, summary of phone conversation 2 Jun 2010

Nematode parasites are estimated to cost the sheep, beef and deer industries in New Zealand about $700 million annually in lost production and control costs. Parasite eggs are voided from infected stock and develop on pasture to an infective 3rd larval stage which is then the source of new infection in grazing livestock. Increased rates of infection would be a serious matter to the pastoral industry if dung beetle activity increased the development and survival of nematodes on pasture as this could dramatically increase the losses and costs of parasite control. Plot trials indicate that the eclosion

success of eggs to larvae can be doubled by dung burial, potentially increasing the abundance of infectious stages on forage, and increasing the probability of re-infection of stock through ingestion. Larvae can migrate onto forage from a burial depth of at least 5 cm. The consequences of deeper burial are uncertain. Unless the application can show that dung burial damages parasite eggs and does not result in increased disease translation then there is need for great caution. Dr Leathwick also cautioned against relying uncritically on Australian or other overseas information as the dynamics of parasites varies greatly between climate zones, soils, and particularly with soil moisture. Dr Leathwick has unpublished information that he is willing to share.

Dr Alec McKay, AgResearch, response to summary of phone conversation 3 Jun 2010

If you were going to build a case for Dung beetles introductions it would be their contribution as structural engineers in the soil, rather than in dung removal. Dung removal is not a problem in most of our pastoral soils. There are good data on dung disappearance rates.

We have a programme looking at the role of earthworms in litter incorporation and in sustaining the structural integrity of pastoral soils under intensive livestock farming. We are particularly interested in the role of the deep burrowing species, which have a very patchy distribution throughout New Zealand.

Earthworm species beneficial to pastures are not indigenous to New Zealand. Because there has been no systematic release of earthworms their distribution is patchy. The findings from an on-farm survey in the Central North Island in spring 2009, reinforces this fact, with only 14% of paddocks sampled contained all three earthworm functional groups. European grassland soils often have between four to nine Lumbricid species.

Recent findings by one of my PhD students (Schon et al., 2010) highlights the importance of earthworm diversity, with anecic earthworms potentially offering support and acting as a substitute for the actions of epigeic earthworms under high stock treading pressures. This is of considerable interest to the pastoral industry because Sparling and Schipper (2004) found low macroporosity arising from moderate compaction on a large proportion of pasture soils, with half the dairy sites, predominantly on the more resilient soils, having a macroporosity of <10%. We have the evidence to make the case for introducing anecic earthworms to many of our pastoral soils. Happy to share what we have found to date and what we are proposing to do next. I do not believe the case is there yet for Dung Beetles. Again happy to discuss further

Don McKenzie, Biosecurity Manager, Northland Regional Council (response written by Dr J. Dymock)

The introduction of beetles which bury dung will contribute to sustainable land management practices in Northland. Faecal contamination of pasture reduces productivity, wastes nutrients, pollutes waterways and is the source of parasitic worms in pasture.

Pasture productivity

Pastoral farming is a significant contributor to the Northland economy. Over half of Northland's land area is used for agriculture which also provides employment both on-farm and in rural support services. In 2008 the Northland livestock population consisted of 392,200 dairy cattle (11.4% of NZ total) and 507,500 beef cattle (11% NZ total) (Source: Statistics NZ). The amount of fresh dung produced by cattle in Northland each day covers an area of 75 ha (0.84m2/cow/day) and can remain on pasture for up to 4 – 6

months in summer. Other sources of dung which dung beetles will bury include sheep (504,300 in Northland), deer and horses. A reduction in area of pasture affected by dung, especially in drier summer months when dung beetles are active, will greatly benefit the Northland economy.

Faecal contamination of waterways

In addition to important wetland habitats and river systems, Northland has an extensive coastline (3000km in length) with several large indented harbours and bays, and large estuarine areas. Many of its waterways have relatively small catchment areas. Therefore faecal contamination of waterways has widespread implications for both freshwater and marine ecosystems. Many inland and coastal communities depend on local water sources and recreational and cultural connections with marine and freshwater environments are strong. Fishing and gathering of kai moana are integral to the lifestyle of all Northlanders.

Dung beetle fauna

Northland is one of the few areas in New Zealand where a deliberately introduced exotic dung beetle has established. The Mexican dung beetle, *Copris incertus*, was released at a number of sites in New Zealand in late 1950s from a population in Samoa without sufficient consideration of the suitability of climate for establishment. In Northland, it is restricted to the Whangarei district and is also found in the Kaikohe area, where it has established following human-assisted redistribution. This species and two native Australian dung beetles, *Onthophagus granulatus* and *Onthophagus posticus*, are inefficient at burying the large quantities of dung produced in Northland by introduced mammalian herbivores. Northland would benefit by the introduction of dung beetles species from areas which are more closely matched to Northland's climate.

Northland's native dung beetles are restricted to its larger tracts of native forest.

Conclusion

Given the numerous economic and social benefits to the region, the Northland Regional Council supports the introduction of dung beetles into the pastoral environment.

Permaculture in New Zealand

If your email requires a response we will respond as soon as possible

Jane Sherrard, Chief Executive, Ngāti Whātu Ngā Rima o Kaipara Trust

This email confirms the support of our Te Wahanga Manakitangi o Te Tai Ao (Environmental Protection Unit) that Chris Pairama works as a member of the team for him to be involved in this project during his paid hours as our contribution to the project. He has been requested to list his hours accordingly in an invoice template so there is due accountability for all parties. He should also be given full access to reports / information / research findings etc to update his reports to the unit and Trust.

The EPU Convenor Glenn Wilcox has also given his tautoko for the above-mentioned and we are happy to provide you a formal letter for any further funding requirements on letterhead. Also for promotional material, reporting, we have full arrangements for shared tohu and acknowledgements.

The Trust is extremely innovative in many of its co-partnering interests and various technologies and mechanisms to combat issues of environmental concern. We are involved with current discussions

about the derivatives of wastewater treatment that can possibly be complementary to wetland tier dispersals to papatuanuku rather than landfill. To that effect, we have developed an approach to be involved in trials of various nature to help inform our whanau kaimahi and also help organisations to research new methodology. At a later date, I will approach Landcare Research to place this project possibly on our website (Environmental as well as Emerging partnering interests).