DAMA WALLABIES: THEIR HISTORY OF COLONIZATION AND CONTROL AT OKATAINA/TARAWERA

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Dale began work for the New Zealand Forest Service in 1980 as a Science Technician with the Forest Research Institute in Rotorua. Following a restructuring of Crown research, he was transferred into Manaaki Whenua - Landcare Research. As a technician, he supported scientists studying indigenous forest ecology, threatened species such as kokako and pest animals such as rats, possums, and deer.

In 1993 Dale joined the Department of Conservation, as a Technical Support Officer, advising DOC staff on pest animal management within the Bay of Plenty Conservancy. While in that role he completed a Post Graduate Diploma in Wildlife Management through the University of Otago. As part of that course of study, in 1997, he completed a research report, "Evaluation of bait stations and management options for control of dama wallabies (Macropus eugenii) in the Bay of Plenty. University of Otago Wildlife Management Report Number 85". Between 2001 and 2010, he facilitated a national biodiversity training programme for DOC, taking a one year break to work as the Threatened Fauna Programme Manager for the Chatham Islands. Since 2010 he has worked as a Land Management Officer for the Bay of Plenty Regional Council (BOPRC), based out of Rotorua, and advises landowners about Biosecurity, Biodiversity and Sustainable Land Management. Part of this Biosecurity role with the council is to take regional responsibility for issues relating to wallabies and he is part of a multi-agency Wallaby Management Team, which has representatives from DOC, BOPRC and the Waikato Regional Council.

ABSTRACT
Dama wallabies (*Macropus eugenii*) were liberated near the southern end of Lake Okareka in 1912. By the 1970s their numbers had built to high levels in the forests surrounding Okareka, Okataina and Tarawera and the damage they were causing to the forest understorey was marked.

In 1984 the New Zealand Forest Service established a pair of 'exclosure plots' at Okataina designed to isolate the impacts of wallabies from those caused by deer. A decade later when the vegetation plots were remeasured, species diversity had increased by 142% where both deer and wallabies were excluded. Diversity had increased by 57% where wallabies were excluded and continued to decline by 7% where browsing was unrestricted.

Between 1988 and 1999 three aerial poisoning operations and some ground based pest control, targeting wallabies and possums, were carried out around Okataina and the Makatiti Dome.

Though these operations were highly successful at reducing wallaby numbers (93-95% reductions based on cleared-plot faecal pellet counts) remeasurement of permanent 20x20 metre vegetation plots showed no response in the forest understorey. To some extent this is not surprising as the control operations were effectively 'one-offs' in separate areas and only limited follow-up control took place.

Whether the depleted nature of the forest understorey has a significant impact on declining water quality in the Central North Island lakes is a question that will be extremely complex to answer, and to see marked recovery in these forest ecosystems, pest control would need to target a suite of pests and be sustained in perpetuity.

With regards to wallabies, a multi-agency Wallaby Management Team (including staff from the Department of Conservation, the Bay of Plenty and Waikato Regional Councils) are facing a number of issues. The wallaby feral range currently covers approximately 180,000 hectares and continues to expand. A tiny proportion of New Zealand's vertebrate pest research has concentrated on wallabies, so the Management Team faces significant knowledge gaps around wallaby behaviour and they have access to few robust monitoring tools and control methods. A low level of public awareness about the threat to biodiversity posed by wallabies and increasing public concern about some pest control methods exacerbates these issues.

Though monitoring and control methods for wallabies are limited, recent advances include the successful deployment of digital trail cameras, DNA analysis and a wallaby indicating dog to confirm the presence of low density populations in new areas. Bait development work with captive wallabies has identified a number of areas where traditional possum baits can be modified to improve their acceptance by wallabies.

As the Wallaby Management Team plans to proceed with control operations, targeting new incursions and populations outside of the feral range, an "Adaptive Management" approach will be followed. This will maximise the benefits from knowledge gained during the course of the work. To help limit further dispersal of wallabies, the Wallaby Management Team also requires some 'pure science' research on dispersal behaviour, so invasion pathways can be identified and managed.

TRANSCRIPT

My association with the forests of the central North Island goes back to the early 1980s when I began work for the Forest Research Institute as a technician. My dealings with Dama wallabies started in the early 1990s when I took up a role as Technical Support Officer with the Department of Conservation. My return to Rotorua in 2010 to join the team at the Regional Council gave me a chance to take on some unfinished business with wallabies.

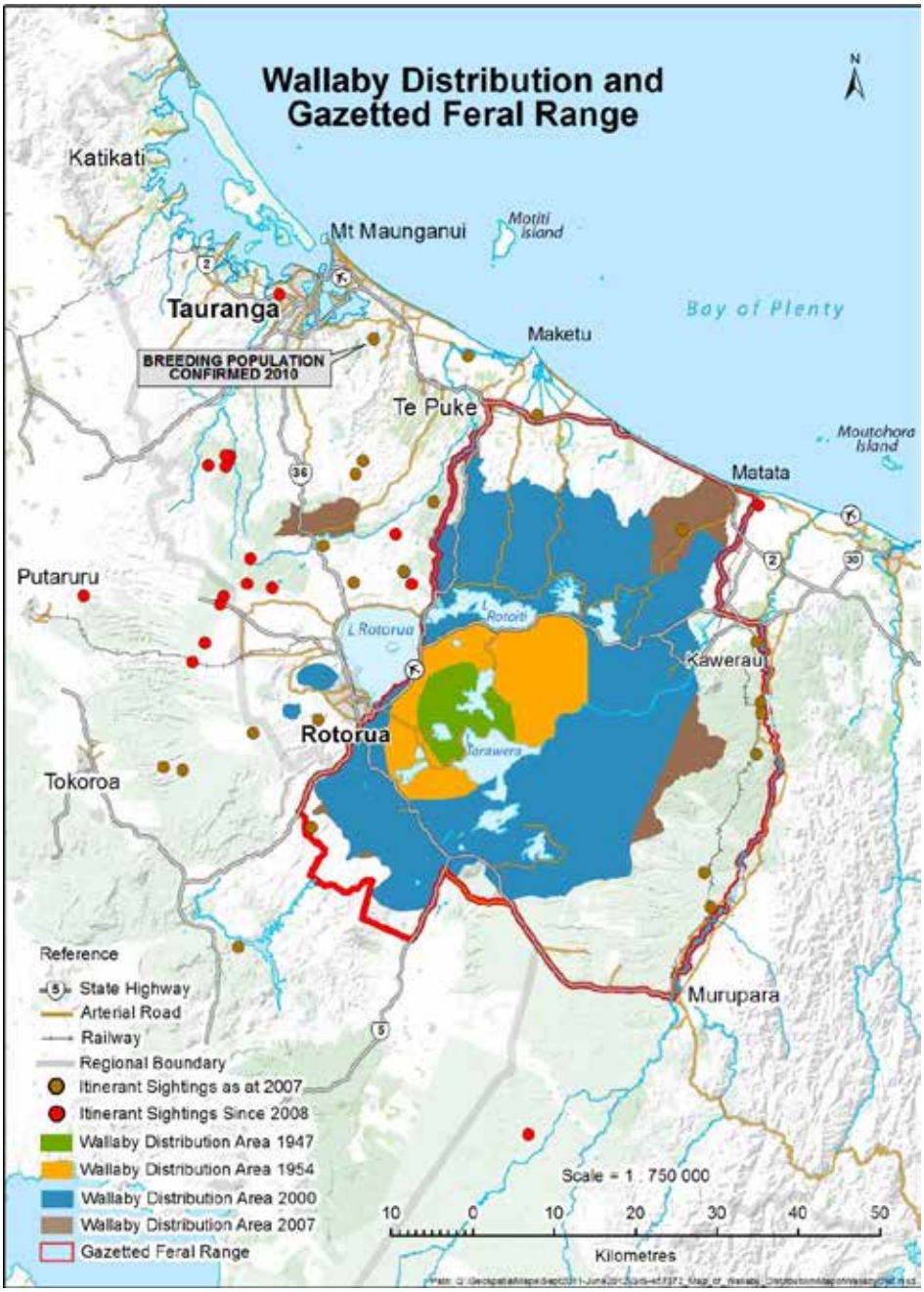
I will talk firstly about the critter and give you the history of their colonisation in the Bay of Plenty and the impact they cause on the forest understorey at Okataina. I will also give a history of the results of past control operations at Okataina, some of the issues inhibiting us from managing wallabies and recent advances, the 'good news' stories, and our future challenges going forward.

The most common statement I hear about Dama wallabies is, 'I didn't know we had wallabies'. They are the smallest of the five species that were introduced to New Zealand. A large male reaches 7 kilos and most of the females are less than 5kg. Compare that with the Bennett's wallabies found in South Canterbury which can be up to 25 kgs. Coincidently, every photograph of a wallaby I have seen at this symposium so far, apart from the one on the front of your document, has been a Bennett's wallaby, so clearly

Google images are lacking a few photos. Because they are small and nocturnal they prefer a scrubby habitat and they are very cryptic. It is not uncommon for land owners who may spotlight their property for deer and possums to be unaware that they have wallabies on their property.

There is a low level of public awareness that we even have feral wallabies in the Bay of Plenty and what is even worse is that people that do know we have wallabies do not see them as a problem; they are often regarded as being cute and harmless.

We have had these animals for 100 years now. They were liberated near Lake Okareka in 1912 and since that time have expanded to cover nearly 180,000 hectares.



Probably of most concern is those little red dots on the western side of the big red line which are confirmed sightings of individual wallabies. I will come back to this map later on.

Wallabies were introduced into New Zealand by Sir George Gray in 1870 when he put four species of wallaby on Kawau Island. In 1912 dama wallabies were transferred from Kawau Island down to the Bay of Plenty where they were let go near Lake Okareka. The orange blob on the map is the distribution in 1954; by that stage they completely surrounded Okareka, Okataina, Makatiti and three sides of Lake Tarawera. By the 1970s the New Zealand Forest Service had already identified they were having a serious impact in the forest understorey.

The photos above show the comparison of the vegetation within an exclosure plot put in by the Forest Service in 1984 and when the plots were re-measured by the Department of Conservation a decade later. The fenced area that excluded both deer and wallabies showed 142% more species diversity (above right). There is also a plot with a lower fence where the wallabies are excluded but deer can hop over the fence and that showed a 57% increase in diversity. Where both deer and wallabies had access diversity continued to decline by 7% (above left). Rob Allen talked about the biased nature of the exclosure plots which are deliberately sited to get a response. Rob said this may not be typical of all Okataina. It would, however be typical of all the second growth kanuka forests, the dry habitat that Willie Shaw referred to.

There has been a history of animal control, in this area, going back to 1962-63 when eight aerial poisoning operations were carried out to ‘protect rateable land’ between Lakes Tarawera and Rotoma. In 1987 there was another aerial operation using 1080 Mapua cereal bait carried out over the east and south of Lake Okataina. The following year that work was extended to include the Makatiti Dome and part of the Tarawera Scenic Reserve. Following on from that in 1989 through to 1991 various ground based control operations were carried out using a variety of methods - 1080 gel, 1080 cereal bait, cereal containing brodifacoum and hand laid cyanide. This work covered areas missed by the previous aerial baiting operations. In 1999 the last operation was carried out at Okataina, it used 1080 carrot and covered the western side of the lake. Bait stations containing Pindone was used in sensitive areas.

We have no idea of the results of the operations in the sixties as they were not monitored, but the other aerial baiting operations achieved high percentage kills ranging from 93% through to 95%:

- 1987 - aerial 1080 **95% reduction in wallabies**
- 1988 - aerial 1080 **93.7% reduction**
- 1989 - 1080 gel foliage baiting trial **87.2% reduction**
- 1999 – aerial 1080 carrot **93% reduction**

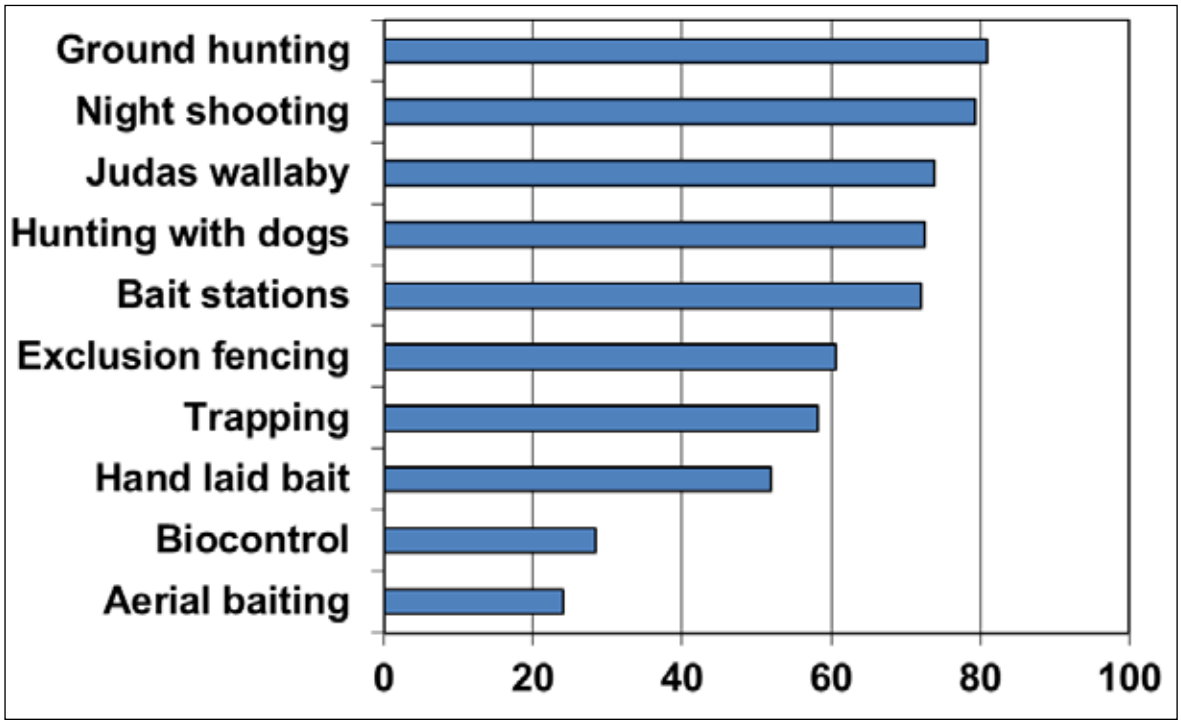
The only ground operation where results were monitored was Bruce Walberton's trial with 1080 foliage bait. That achieved 87.2% kill. These percentages are worked out using cleared plot faecal pellet counts and if any of you had the misfortune of doing faecal pellet counts they are the worst case scenario. You have to remove the pellets from the plot, go back a month later, search for pellets, count the ones that are recruited then do your control operation and repeat it all again. It is my understanding that in the 1999 operation the monitoring cost more than the aerial baiting operation. Despite the cost it is a good tool for moderate to high density wallaby populations but it is not suitable for picking up wallabies in low numbers.

All of these operations had a good result in terms of animal kills but, and that is a very large but, looking at the outcome in terms of forest regeneration, despite the dramatic reduction in wallaby numbers, the re-measurement of a whole series of 20 by 20 plots throughout Okataina showed no significant response in the forest understorey. To some extent that is not surprising because all of those operations were in different areas and there was little or no follow up control. They were essentially 'one offs'. Expecting to see change after doing just one control operation and walking away…it will simply not happen.

Another thing that I believe is going on out there, and Graham Newton saw this with fallow deer in the Blue Mountains, prior to those baiting operations a diet study carried out on wallabies showed they ate a large amount of 'leaf fall mahoe'. If you assume that leaf fall mahoe is less palatable than the small seedlings growing in the understorey, it is likely that the few surviving animals will reject the leaf fall and continue to eat every palatable seedling.

There are still a lot of questions to answer. How do we deal with the impacts of browsing mammals? How low do we need to push wallaby numbers at Okataina to see regeneration of palatable species in the understorey? What other critters do we also need to deal with? And the million dollar question, will sustained multi-species pest control actually improve water quality? More will be said about this in the next presentation and other speakers have already pointed out that even if improved water quality is not one of the outcomes, from multi-species pest control, there are other reasons for doing animal control.

There are some issues inhibiting wallaby management. We only have a handful of baits registered for wallabies and two pesticides (1080 and Cyanide) and clearly 1080 has a high level of public concern. In 2006 APR Consultants carried out a survey of public awareness about wallabies and they asked people about their support for a range of potential wallaby control options. As to be expected, aerial baiting was at the bottom with a low level of public support. Unfortunately it shows an inverse correlation between public support and the method's effectiveness.



Night shooting which had a high level of public support is not effective for broad scale control of wallabies in a forest situation. It is however effective on farm country with small patches of forest. We are reasonably confident that we have eradicated a small population of wallabies on Okere Farm using night shooting.

It is quite reassuring to see that bait stations, which I am a fan of, get around 75% public support, but there are a few issues with wallabies and bait stations which I will come to later.

Another issue inhibiting wallaby management is the low level of public awareness about wallabies. For any control programme to be sustainable the public have to be on side or it is a waste of time.

Wallabies are seen as a regional rather than a national issue so the amount of money spent on funding control operations, developing control techniques, and any sort of research and development, is just a drop in the bucket compared to the millions that have been spent on other pests such as possums and other predators. Unfortunately we are on our own here.

As a result we have very limited control methods available to us. We have a limited understanding of what drives dispersal and that could be helpful in the future. One thing we do know is that wallabies are very timid and neophobic. Neophobic means they are afraid of new things in their environment which also has implications for methods such as bait stations.

I have had some mileage out of this photo over the years. It shows competitive exclusion between possums and wallabies. In 1996 when I took this photo it was part of a pilot study I did to see which bait stations might be best for wallabies. Physically there is no reason they cannot feed from any of these three bait stations, their skull is about the same size as a possums so there is nothing stopping them. But I found that they completely emptied the Marley downpipe bait station, before taking a single bait out of the other two stations including the Philproof feeder.

The Philproof feeder is the best possum bait station on the market for a number of reasons. There is a big veranda on the front which effectively keeps the bait dry. It appears that wallabies do not like putting their head into the bait station because the veranda covers their ears and eyes. Unlike a possum which can climb the nearest tree when danger comes along, a wallaby has to pick up any source of danger with enough advanced warning to run away. Wallabies are very wary and they are constantly listening and watching out for danger. Enlarging the entrance hole on the bait station helps but it is still not ideal. The other issue seen in this photo is that possums will actively exclude wallabies from the bait station. Possums are half the size but twice as stroppy.

The photograph above was taken on Mt Tarawera and a wallaby is feeding quite close to some possums and it is probably a wee bit nervous. In most other video sequences you see the wallabies will depart when possums arrive.

These photos show some good news stories relating to recent advances in wallaby surveillance and monitoring. Firstly an ancient technique (left), a dog. Dogs have been around a long time but we are just starting to make good use of them. This specialised wallaby indicating dog and it handlers have been very successful in locating new wallaby populations on the margin of the range.

The other device shown is a trail camera (right) that is mainly used by deer hunters to get pictures of stags on their favourite wallow. We use these as a surveillance tool to record the presence of wallabies and determine if it is more than one animal. Also as a monitoring tool, by placing them systematically at 500 metre intervals to monitor the success of our control operations. This was how we located the wallabies on Okere farm, an unexpected spin off also recorded the first kiwi in the Rotorua district in the last decade. We also used the cameras to monitor the success of our night shooting operation (i.e. no wallabies have been recorded since).

We have also recently carried out a bait development trial, under contract with Ray Henderson from Pest-Tech Ltd in Lincoln. We have a captive holding facility here in Rotorua. Ray tested and developed various baits, lures and bait delivery systems for control of wallabies. He found that wallabies are strongly neophobic and upset by new things in their environment. He identified the ingredients that wallabies preferred, which were; wheat germ, bran, linseed meal, maize, brown sugar, salt and rolled oats, and combined them to make a palatable paste bait. When doing bait trials we used Connovations' 213 paste, as the comparison or "Control bait". Anything that is as good as that product scores a 50, if it is better it scores higher than 50. Ray's paste bait was a significant improvement on that commercial bait. His cereal bait was only slighter better than 213 paste. By comparison RS5 (the best commercially manufactured cereal bait) only scored 19.8% for wallabies. Ray confirmed that carrot appears to be a good bait for wallabies.

Ray tested 98 different lures. He found that the best wallaby lures were mixed herbs - tarragon, oregano, cloves or eucalyptus and wheat germ oil. Their interest in eucalyptus oil clearly indicates, even after 100 years, they are still pining for home.

One interesting outcome from that work was that cinnamon, which is in the majority of possum baits, is a repellent to wallabies. The only thing worse than cinnamon, that Ray trialled, was persimmon.

The results on delivery systems showed that placing the bait directly on the ground had the highest consumption. Strikers are a little potato starch container with a paste bait inside which are stapled to trees (left) and were also an effective way of distributing bait to wallabies.

At the end of the bait development we offered the wallabies bait with a feratox cyanide capsule inserted in it. Unfortunately the results were really poor. I believe we need to pre-feed with baits containing placebos that closely replicate the cyanide capsules to reduce the chance of the wallabies rejecting the cyanide capsules when the toxic baits are presented to them.

Looking forward, we still need some good wallaby specific control tools. We need to calibrate our monitoring methods. We have two good methods but we do not know their detection probability. We need better understanding of wallaby behaviour and dispersal which is important to improve the efficiency in our surveillance and control.

We need to improve public awareness, but this can be a double edged sword. It is all very well for us to generate motivation from the community but if they then say, 'What are you doing about it?' And we say, 'Mmm not much, we haven't got the tools'. It can come back to bite us, so it is really important to use the current control tools to get some runs on the board.

So what is our end goal? At the moment we are trying to stop further spread of wallabies. The red line on map (see map of distribution) was the gazetted feral range under the old Wild Animal Control Act. We now call that our containment area. The Kaituna River (the north western boundary) and Lake Rotorua itself, has formed an effective barrier to stop wallabies going west. Both the Tarawera River and the Rangitaiki River are good physical barriers and they form our line in the sand as defendable boundary in the east. In the south there is not much stopping them. Unfortunately where wallabies have dispersed west of Rotorua, all the streams are pointing towards the Waikato and are not a physical barrier.

Following our goal of 'stopping the spread', we are trying to eradicate isolated populations such as the Okere population (which we are reasonably confident is gone now) and a isolated population behind Te Puke (which was the result of someone keeping wallabies illegally for export). Once outlying populations are eradicated we can push back towards the middle of their range.

While this is happening the land management team need to decide whether wallabies are having a negative impact on resources within the containment area. If that is the case, it is sustained control, which involves pushing wallaby numbers to low enough levels that they do not impact on those resources.

Finally once making that kind of progress, then it is possible to step back and review whether eradication is achievable over the whole range.

There have been lots of cute photos of wallabies and I will leave you with this one because protecting bio-diversity is about killing things, it is not pretty. But we do need to get some serious runs on the board in pushing back the tide otherwise we run the risk of losing the support of our stakeholders.

I would like to finish up by thanking Guus Knopers and Lynell Barnett, our dog handlers, Lotte the dog and Phil Commons who is my 'go to' man for all wallaby issues. Ray Henderson did the bait trial, Cam Speedy and Nick Singers wrote an awesome report on animal control options for Okataina, which I have plagiarised for this presentation. Thanks also to the Department of Conservation and the Waikato Regional Councils are co-signatories to our wallaby management plan.