Vertebrate Predator Control in New Zealand and its application to the UK

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1 Acknowledgments

I would like to take this opportunity to thank the trustees and members of The Farmers Club whose generous bursary funded this study trip to New Zealand. I would also like to thank the many and varied people I met in New Zealand who shared their time, experience and knowledge with unequivocal passion.

2 Introduction

This report provides an overview of the range of vertebrate predator control techniques used in New Zealand (NZ). It is based on a 1 month study visit undertaken by the author in July 2013, which was funded by The Farmers Club of Great Britain. The overall aim of the visit was to investigate some of the novel techniques which are currently being trialled in NZ and to evaluate their suitability for incorporation into predator management strategies in the UK.

The report firstly provides a background to the role of predator control within NZ and therefore the rationale for the sites and people interrogated as a part of this study. It then goes onto look at current techniques as deployed for a range of predatory species.

The next section looks at some of the new techniques that are currently being developed and trialled as to their overall effectiveness and finally the potential application of all these methods to UK predator control situations.

3 New Zealand – fauna

The native fauna and flora of New Zealand is unique due to the millennia that it was isolated from other continents. This resulted in the evolution of a range of endemic species including flightless birds and insects. The mammal fauna of New Zealand was largely introduced by man, with only two species of bats being recognised as native land mammals (King, 1995). Of the 54 species of mammal that were introduced, 20 of these came from Europe, particularly Britain and all of these established successfully. This includes the following species of relevance to this report – hedgehog (*Erinaceus europaeus occidentalis*), rabbit (*Oryctolagus cuniculus)*, brown rat (*Rattus norvegicus)*, ship rat (*Rattus rattus)*, house mouse (*Mus musculus*), feral cat (*Felis domesticus*), feral ferret (*Mustela fero*), stoat (*Mustela erminea*) and weasel (*Mustela nivalis*). According to the New Zealand Department of Conservation (DOC) these introduced mammals pose one of the greatest threats to the survival of their native plants, birds, reptiles and invertebrates (DOC, 2013). It is also the DOC who are tasked with conserving the native fauna and flora of NZ therefore they play a major role in practical pest control on the ground and in researching & developing more efficient and humane techniques.

4 Overview of visit

The visit started at Christchurch on the South Island on the 1st July 2013 and went as far south as Te Anau in the Fjiordland National Park. I then travelled up the west coast of the South Island to Nelson. I then crossed onto the North Island and made my way as far North as Whangarei before departing from Auckland airport on 27th July 2013. In total 3,400 km were traversed and 17 different sites visited, an overview of the journey is shown in Figure 1. This included 6 Department of Conservation

(DOC) field stations, 5 University research centres, 3 private game preserves, 2 pest control supply companies and 1 commercial pest controller

Figure 1 Map of New Zealand showing approximate route and places visited

5 Current control techniques

The control techniques in NZ vary according to target species and situation but can be broadly separated between ground control and aerial control techniques. Aerial control techniques will be discussed briefly as there would appear to be minimal application to the UK situation.

5.1 Aerial control techniques

Aerial control techniques mainly target the Brush Tailed Possum (*Trichosurus vulpecula*) which is also a major pest in New Zealand and is a main vector for Bovine TB. Therefore this work is undertaken by DOC and the Animal Health Board (AHB) of NZ whose main aim is to eradicate TB from NZ. These techniques primarily involve the use of aircraft to drop toxic baits using 1080 poison (sodium monofluoracetate). This is primarily undertaken over terrain where ground control is impractical and inefficient. Global positioning systems (GPS) are used to ensure bait placement accuracy for effective possum control.

An initial pre-feed of the site with non-toxic bait is done to encourage consumption and overcome potential bait shyness. Toxic pellets, usually containing 0.15% 1080 are then ‘sown’ over the area. Cereal pellet baits are used in most operations, but cut carrot may be used in some cases. Research has resulted in reduced sowing rates; these are now sown at about 2kg per hectare. To protect non-target species, toxic baits are dyed green to discourage birds. They are often cinnamon-flavoured to encourage possums.

Although targeting mainly possums, 1080 is also used for rat control and via secondary poisoning is effective at reducing stoat & ferret populations, however there is considerable impact on non-target species, specifically wild deer and pigs and it is extremely toxic to dogs that scavenge carcasses. Therefore it is not a popular control strategy with many New Zealanders, many of whom are hunters.

Aerial control strategies have been successfully deployed to eradicate pests from island reserves and these have become sanctuaries for much of New Zealand’s endangered fauna. Good examples of this are the Rangitoto and Motutapu Islands in the Hauraki Gulf just off Auckland. These islands were declared pest free in 2011 and used a major aerial deployment of pesticide along with other ground based techniques to remove all non-native mammals including mice (Griffiths, 2012).

The success of these off shore islands has encouraged the development of ecological islands that are either protected by a pest proof fence or can be isolated from reinvasion by other means such as a buffer zone. A good example of such an ecological island is the Maungatautari Reserve (http://www.maungatrust.org/) which is 3,400 hectares and is protected by 47km of fence. The fence is over 2m high and has mesh small enough to exclude a mouse. It has an electronic surveillance system that notifies of any breaches and is also inspected daily by staff.

5.2 Ground control techniques

The two main ground-based control techniques used against predatory mammals in NZ are either kill traps or toxins. Although the target species and site affect what techniques are used and how they are deployed most DOC sites follow Standard Operating Procedures (SOPs) for their pest control work (Gillies C. , DOC mustelid control best practice documents, 2013) therefore a single case study will be used to illustrate the main methods and any variations will be discussed as appropriate.

5.2.1 Threatened species protection in the Eglinton Valley

The Eglinton Valley is in Fiordland National Park at the southern end of the South Island. It is managed by DOC which undertakes continuous stoat and cat control along with periodic rat and possum control to protect a range of threatened species. These include the South Island long-tailed bat (*Chalinolobus tuberculatus)*, southern short-tailed bat (*Mystacina tuberculata tuberculata*), mohua/yellowhead (*Mohoua ochrocephala*), and South Island kaka (*Nestor meridionalis meridionalis)*. The valley is a typical glacial U shaped valley with a generally flat valley floor and steep sides. It is predominantly forested with southern beech species (*Nothafagus spp)*. As such it is fairly representative of the extremely steep terrain and thick impenetrable forest cover that is found in the South Island where much of this predator control work is undertaken.

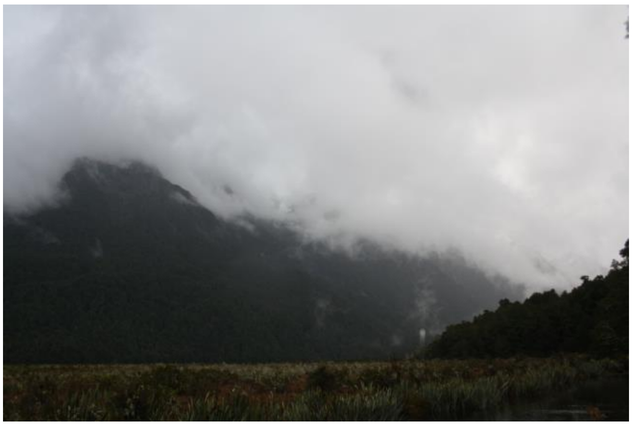

Figure 2 Eglinton Valley showing the steep forested slopes where ground control operations take place

Predictive monitoring of rodent population irruptions is achieved through annual measurement of the seed fall produced by the beech species as it has been found that rodent populations fluctuate in response to the food provided by the beech crop and heavy mast years can lead to damaging levels of rats and mice. This can lead to a knock on increase in the stoat population. Therefore monitoring the amount of beech seed fall is a useful way to predict probable trends in rodent and stoat populations for the following season (Hill, 2012).

Figure 3 Double set DOC trap showing internal baffles and egg & rabbit meat bait

5.2.1.1 Mustelid Control

Stoat control in the Eglinton Valley used 356 wooden tunnels containing either two stainless DOC traps, two Mk IV Fenn traps or one stainless DOC trap (see Figure 3). Tunnels were spaced at 100-200m intervals along contour lines primarily in the base of the valley and concentrated around known bat roosts. Typically the traps are placed on a GPS grid rather than sited on a natural feature that a stoat may use. Hen's eggs and rabbit meat are used as bait to draw the animals into the tunnels. Traps are checked and re-baited, ten times per year, approximately 6 weeks apart, and monthly through the summer months. Servicing of the stoat traps was contracted out to a commercial pest controller. A total of 193 stoats and 265 rats were caught in the traps during the 2011/12 season (Hill, 2012).

There is a poison approved for use against stoats - PredaSTOP, containing 4-para aminopropiophenone (PAPP) which is encased in minced meat and put in a bait station (Dilks, et al., 2011). However, no poisoning of stoats has been undertaken in the Eglinton Valley or any other sites that I visited thus far. This is because this is a relatively new toxin and no best practice methodology has yet been developed by DOC.

As with most other DOC sites the Fenn traps have gradually been replaced by stainless DOC series traps this is because the Fenn trap failed the National Animal Welfare Advisory Committee (NAWAC) trap testing guidelines (Cowan, 2012). The DOC traps are considered more appropriate for the NZ situation as they are designed to kill instantly and with interior baffling in the tunnel reduce any chance of mis-catches so there should be no humanitarian issues with leaving the traps unchecked for long periods. This does however reduce their effectiveness as once they have been triggered they cannot catch again until reset. This has led to the introduction of two DOC traps within the same tunnel. A large trial of these double set DOCs compared with single sets was undertaken in Te Urewera National Park, unsurprisingly the double set caught more stoats but rather than twice as many they yielded a 7 fold increase in captures (Beaudoin, 2012). It is thought that an initial capture may work as fresh bait to draw another stoat to the second trap.

Finding suitable baits that would last 4-6 weeks between checks was quite a common problem and most trappers had their own variation on rabbit/possum/vension meat baits plus hens eggs. However, quite a few trappers were also using some form of salted/dried meat especially during the summer months. There are various commercially available baits and lures and one of the most popular appeared to be Erayz rabbit based bait which is available either as a paste or oven dried blocks produced by the pest control supply company Connovation (http://www.connovation.co.nz/).

One ingenious solution to ensuring that there was fresh bait at each trap box was described by Paul MacDonald at Whangarei Kiwi Sanctuary (MacDonald, 2013) His solution was to build a nest box suitable for mice at the back of his DOC traps such that wild mice would take up residence in the actual trap box and thus act as a draw to mustelids and rats all of whom predate on mice. Note DOC traps are specifically designed not to catch mice having a minimum trigger weight of 100g and also a spring loaded trigger plate that doesn't spring off with continual light passage.

The issue of long-lasting lures is one that will be discussed later in the report as it is of greater significance for the automatic traps that are currently being trialed.

5.2.1.2 Rodent control

Control of rats in the Eglinton Valley is initiated once indicators such as tracking tunnels and trap catch data show that they are increasing in response to seed fall. Cereal pellets containing the first generation anti-coagulant toxin pindone are put in mini bait stations spread across 4,800 ha within the valley. A total of 5,300 stations are laid out in an approximate 100 x 100 metre grid through forested areas either side of the valley. All stations receive an initial fill of 500g of Pindone Pellets plus 3 Feratox pellets (encapsulated cyanide to target possums simultaneously) in July/August. The bait stations were topped up once again in September and all bait removed at the end of the operation in the following February/March.

This is fairly typical example of the rodent control seen at many of the other sites as most relied on some form of poison based technique and traps were used primarily for mustelids and cats. The DOC best practice documents for rat control (Gillies C. , 2013) lists 8 different toxins that are approved for use in NZ, these are given in Table 1. All of these can be deployed in bait stations in the open countryside as described above.

Table 1 Rodenticides approved for use in NZ

First generation anticoagulants	Coumatetralyl
	Diphacinone
	Pindone
Second generation anticoagulants	Brodifacoum
	Bromadiolone
	Flocoumafen
Other	1080 Cereal baits
	Cholecalciferol

5.2.1.3 Cat control

Feral cats are of increasing concern in NZ and they have been present in the Eglinton Valley for several years. They are a serious predator so a concerted effort has been made to trap all wild cats. To this end 28 cat kill-trap sets were installed in 2010, however rather than being placed on a grid like the stoat traps they are placed in areas where cat sign has been reported. Three styles of trap are used – Conibear traps under Philproof covers; modified Timms traps set on the ground; and single Belisle Super X 220 traps set in 'chimney' tunnels. All designs are considered current Best Practice options and have passed NAWAC test for cats. Traps are baited with fresh rabbit meat, and are checked ten times per year.

Figure 4 'Chimney' cat trap using Belisle Super X 220 traps

A total 4 cats were caught in the cat traps in 2011/12, with 7 more caught in older style stoat tunnel traps with larger than normal entrance holes in the mesh, suggesting that the best practice kill-traps are possibly less attractive than a simple run through tunnel. Other cat control techniques are being considered for the future including leghold trapping, the use of cat detection dogs, and the use of the toxin PAPP, which is also approved for cats as well as stoats.

All other sites visited had variations on the above cat traps, but none were as yet using PAPP (Murphy, Eason, Hix, & MacMorran, 2007)

5.2.1.4 Monitoring

At Eglinton Valley monitoring of rodents and mustelids is carried out using a network of tracking tunnel lines following the standard protocol of lines of ten tunnels 50 metres apart as described by Gillies (2005). Outcome monitoring of bat survival rates and Mohua fledging rates are also used to assess the impact of the predator control work.

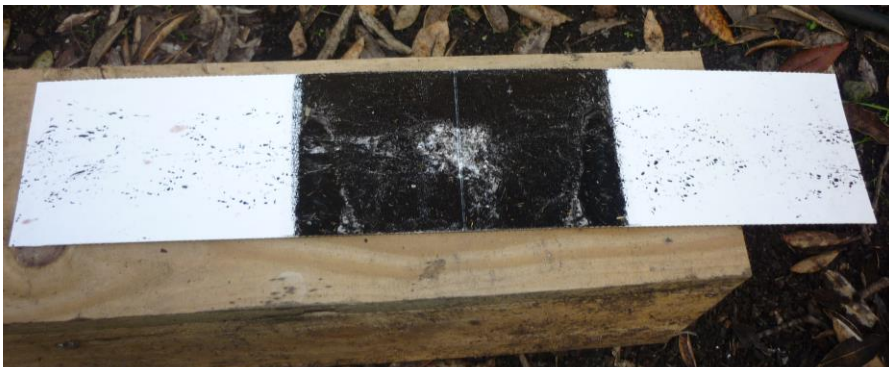

Figure 5 Ink tracking card

Figure 6 Wax block used to indicate rodent activity

Most sites visited used the standard protocol of tracking tunnels to assess mustelids and rodent population levels rather than just rely on catch rates as an indicator of this. Most sites had wax block feeders laid out in grids amongst their trapping lines again as an indication of rodent and possum activity levels.

On the islands where pests had been eradicated these measures were also used as an early indicator of any new invaders.

However where pest numbers were very low these techniques were not deemed sensitive enough so detection dogs were employed to actively seek individual animals. There was also some interesting research been done on con-specifics as lures to entice individual animals to traps – so called 'Delia rats' (Shapira, 2013)

Figure 7 'Pie' - DOC rodent detection dog

6 Advances in techniques

So far I have only discussed current practice in predator control as undertaken on many sites throughout NZ. However, the sheer scale of these operations and the time & effort required to continually check and reset traps has led several companies to develop some form of automatic device. The ideal situation is that these, once set in place, will continue to autonomously kill their target species without any need for checking or resetting for 6 – 12 months. Two such devices have been developed and are described below.

6.1 Goodnature automatic traps

Goodnature are a small team of design professionals based in Wellington who have developed a trap that is powered by a small CO_2 canister and will reset itself up to 24 times. They have two variants of this trap already on the market – the A12 is for possums and the A24 is for ship rats and stoats. Both traps have been approved by NAWAC and met their highest standards for humaneness. The target animals are attracted to the trap with the use of a bottled lure that encourages the animal to place its head inside the entrance of the trap where it nudges a trigger that releases a captive bolt that strikes the animal on the back of the head killing it instantly. The bolt then retracts back into the mechanism and the animal falls to the floor. The trap is ready for its next victim!

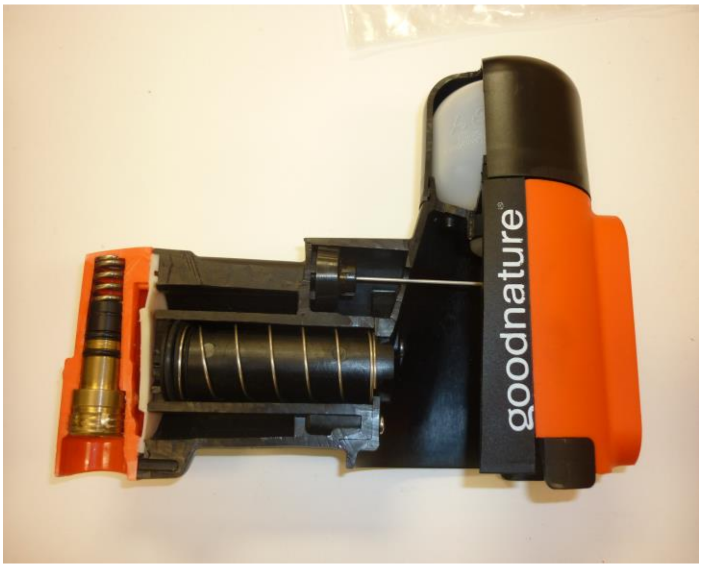

Figure 8 Goodnature A24 trap cutaway to reveal internal mechanisms

These traps have undergone a lot of detailed design work and development and are now at a stage where they are been produced and sold on the open market in NZ and other countries. DOC is currently undertaking a large scale trial of these traps to ascertain their effectiveness (Gillies, et al., 2013). In the first phase of this trial there was a high rate of mechanical failure with gas leaks rendering the traps useless. However incremental design improvements and tighter manufacturing specifications has resulted in far fewer mechanical failures. There are still however issues with finding an appropriate lure that will remain attractive to the target species for long periods of time.

Figure 9 Goodnature A24 trap set on a tree

6.2 Spitfire toxin delivery system

Another automatic device that is being developed by Connovation Ltd (Auckland NZ) but is still only at the prototype stage is the Spitfire toxin delivery system. This consists of a tunnel through which the target animal passes and if the animal is long enough to reach between two electro potentiometers within the tunnel this will trigger a squirt of a toxin onto the chest/belly of the animal. The animal runs off and the mechanism resets ready for its next victim. When the animal grooms this sticky paste from its fur it ingests the toxin and dies. By varying the distance between the potentiometers and also the active toxin within the paste then the Spitfire can be adjusted to a range of target species. The prototype model is designed to last for up to 100 triggers. It is currently being tested on stoats using PAPP as the toxin (Blackie, MacMorran, Murphy, Smith, & Eason, 2012) and a larger version is proposed to deal with feral cats.

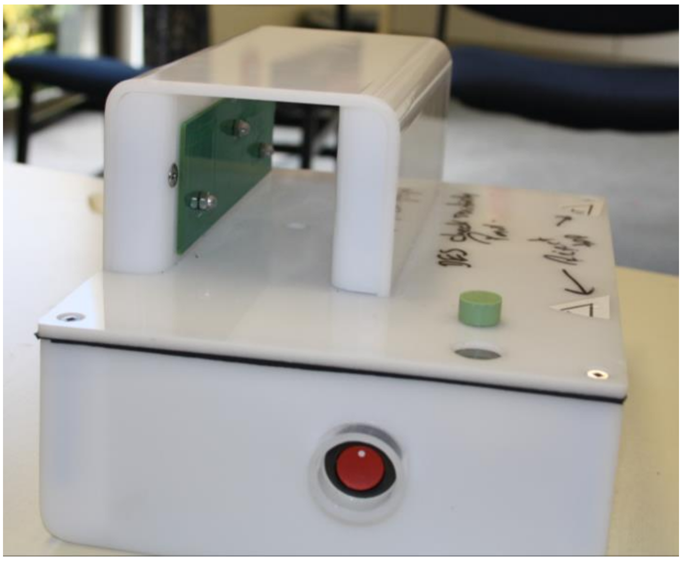

Figure 10 Prototype of the Spitfire toxin delivery system

6.3 Longlife lures

As discussed in the section on current trapping practice long life lures are already an issue for many pest controllers in NZ. What is apparent with the above two new automatic devices is that without a suitable attractant that will continue to draw target species to these devices then it doesn't matter how many times they can reset themselves before requiring a refill they will just be expensive boxes in the forest. Therefore what is exacting the minds of the researchers within the Universities that I visited is the development of an attractant that can be deployed over 6-12 months within these automatic traps.

The Centre for Wildlife Management and Conservation at Lincoln University are working on identifying which chemicals within certain compounds attract stoats so that a synthetic lure can be mass produced. So far they have had some success using aldehyde which is a volatile compound found in chicken eggs. They are currently trialling this and other products on wild caught stoats held in large cages.

Figure 11 Wild caught stoat used in trials of attractants

Figure 12 Commercially available spray lure

Similarly researchers at the Victoria University of Wellington are trying to isolate specific pheromones from rats and possums to see which can be used as an attractant for each species.

Many of the pest supply companies offer their own brand of lure but as yet none have proved to have the longevity required. Goodnature are working on a dispenser bottle that will deliver a small drop of scent each day much like many home air fresheners.

7 Lessons learned and application to UK

7.1 Use of DOC traps in the UK

The use of spring traps in the UK is regulated by various pieces of legislation, but the main ones are the Wildlife and Countryside Act 1981 and the Spring Traps Approval Orders (STAO). The STAO 2012 lists a total of 28 kill traps that are currently legal to use for mammalian pests in the UK. This list includes historical traps that were first approved when the Gin trap was banned in the 1954 Pest Act, such as the Juby, Lloyd, Imbra and Sawyer, none of which are available for sale today. It also includes the ever-popular Fenn traps and their clones, which are by far the most favoured by gamekeepers across the country. Incidentally the Fenn trap was approved at the same time as the aforementioned traps, so is 60-year-old technology.

More recently we have seen a range of new traps added to the STAO that have been developed in other countries for example the Kania from Canada, and the Magnum bodygrips and WCS Tube trap from the USA. It has been relatively easy to make these additions as the EU has signed up to The International Humane Trapping Standards – this basically means that if a trap meets these international standards then it can be used in the EU for the specific species that it has been tested on. Therefore the STAO not only lists approved traps but what target species each trap is approved for.

There are also two recent additions to the STAO that have been developed in NZ – they are the Nooski rat & mouse traps (http://www.nooski.com/) and the DOC series of spring traps (http://www.predatortraps.com/traps.htm) that are used widely across NZ by DOC themselves and others. The Nooski is an ingenious trap that is designed to place an elasticated rubber ring over the neck of the rat and thus choke the rat to death, however it is not very effective in the field and was not evident in use throughout my travels in NZ!

The DOC traps were developed by the Department of Conservation in New Zealand to replace the Fenn traps that they discerned were not humane enough for the situation where they would be left for weeks without checking, and they certainly are effective in the field and could be used more in the UK than they currently are. The main problem with uptake of the DOC trap has been its cost £31.95 (http://www.perdixwildlifesupplies.co.uk) compared with traditional Fenn traps at £8.50 (http://www.uktraps.co.uk/). There is also a requirement that the DOC trap is used in a wooden tunnel to an exact specification including internal baffling to guide the target onto the trigger plate. This is not a requirement of the Fenn trap and any tunnel of any material can be used so long as it restricts access by non-target species. This makes it much easier to blend a Fenn tunnel into its natural surroundings. This appeals to the field craft of the trapper and makes them less obvious to the public but probably makes little difference to stoats or rats!

It is quite plausible that the Fenn trap will eventually be removed from the STAO as it barely meets the International Humane Trapping Standards and therefore if these were made more rigorous then the Fenn trap and most of the other traditional traps would be lost. Pest controllers would then be faced with using some of the newer traps such as DOC spring traps and would have to re-think some of their traditional sets. For example many Fenns are placed in run-through tunnels where target species naturally run, however DOC traps are designed to be used with an attractant to lure the animal into the tunnel. Therefore, if we are to move to using DOC traps in the UK then we will have to develop sets that make use of baits rather than natural runs.

7.2 Use of Goodnature A24s in the UK

As yet the Goodnature traps are not approved in the UK, however as they have passed the NAWAC trapping standards in NZ it should be relatively easy to get them added to the STAO for the species that they have been tested on. They are currently approved for stoats and ship rats in NZ, to be of any value in the UK they will also need to be approved for brown rats and grey squirrels. Goodnature are in discussion with the Food and Environment Research Agency (FERA) who are the UK body responsible for testing new spring traps and are hoping to get their A24s tested on brown rats and grey squirrels. This would enable the use of the A24 in the UK and it will be a particularly good trap for controlling brown rats and grey squirrels.

There will be similar issues to the DOC trap in terms of uptake by pest controllers and gamekeepers in that the A24 will be considerably more expensive than Fenn traps as they retail in NZ for $169 NZD (£86.50 GBP at current exchange rates) and this doesn't include shipping half way around the world! However, there will be considerable savings in time as the A24 should not require daily checks which is a current requirement for all other spring traps on the STAO.

Again the A24 is based on attracting the target animal into the trap rather than placing the trap on a natural run so there will need to be a changed mind set in trappers when using the A24 with much more emphasis on using appropriate lures.

A further complication with the A24 in the UK is the number of non-target species that we would need to exclude from the trap and somehow only allow access to specific species. Some of this could be achieved in terms of where the trap is set but will also probably need some additional tunnel to prevent access by birds for example. In NZ they have developed an attachment (see Figure 13) that is used to exclude Weka (*Gallirallus australis)* which are a large flightless rail.

Figure 13 Goodnature A24 with Weka excluder attached

It is also possible to fit an A24 to an existing wooden tunnel so that non-targets are excluded as normal (see Figure 14).

Figure 14 A24 retro-fitted to a DOC trap wooden box

7.3 Use of long-life lures in the UK

The use of lures and attractants to draw predators to traps is not that advanced in the UK. If any lure is used at all it is usually food based with rabbit meat or eggs used for stoats and grain or peanut based products used for grey squirrels and rats.

Some trappers will use the urine of a caught bitch stoat to mark their traps and make them attractive to dog stoats in the area so the development of pheromone based lures in NZ is definitely worth watching. This may open up a whole new avenue for pest controllers especially when using newer traps like the DOC and A24. However, this science is in its infancy and there is much that we need to learn about pheromones and the chemical signals that are transmitted through mammalian scent.

8 Conclusions

Overall the trip was an excellent opportunity to meet a wide range of wildlife management professionals who are dealing with similar issues albeit in harsher terrain. I have learnt some important lessons that I hope I will be able to pass on to my game & wildlife management students at Sparsholt College and other pest control professionals. Hopefully this will result in the increased uptake of the DOC trap as a humane and efficient alternative to the Fenn and in the longer term the introduction of the Goodnature A24 as a valuable addition to our trapping armoury. The A24 will certainly be an excellent tool in the campaign against the brown rat especially as the use of second generation anticoagulants in the UK countryside is getting harder. It could even help in the eventual eradication of the grey squirrel as they are designed for use by non-professionals so could be fitted to every bird table in the land!

What was most heartening was the overall perception of the NZ people to predator control in that it was widely accepted as an important component of conserving their unique native species. The fact that intensive predator control was occurring on most of the sites I visited was widely publicised within the visitor centres and the traps themselves were clearly marked and easily seen from the public paths that traversed the sites. It is a pity that here in the UK predator control is not acknowledged as an essential element of managing our wildlife and that much of it is done secretively so as not to upset the general public.

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