Kararehe Kino
Vertebrate Pest Research

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CONTENTS

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Manaaki Whenua
Landcare Research

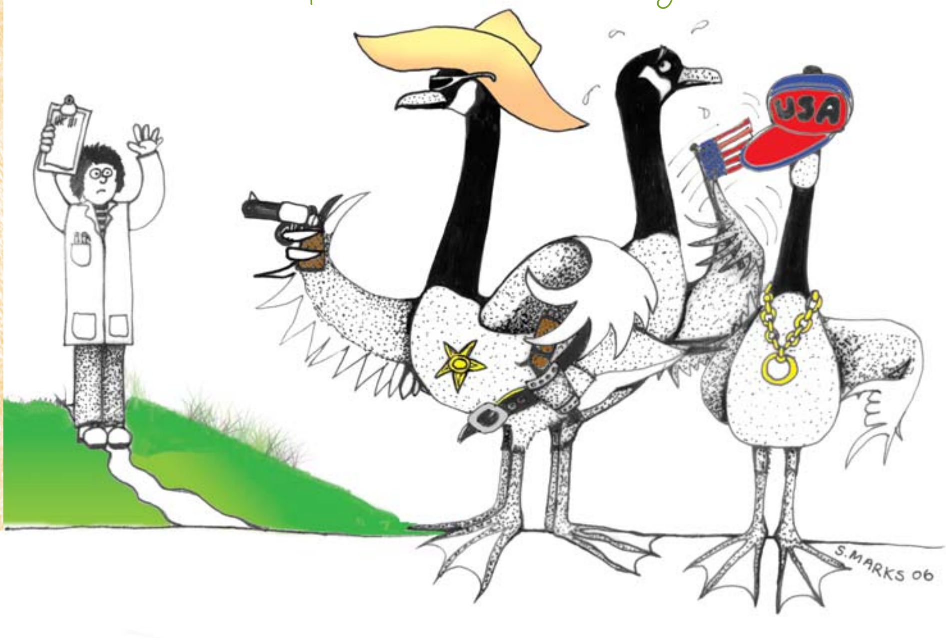
Problems with Canada Geese!

Canada geese have become an agricultural and urban pest in New Zealand. They were originally introduced from North America in 1905 as a recreational hunting resource, and while they are still hunted, they can also be a source of conflict between hunters and farmers, airport authorities, and other resource managers.

Recently, Eric Spurr and Jim Coleman reviewed Canada goose population trends, damage, and control in New Zealand. They found that the species expanded rapidly in number and range after establishment, and continue to do so to this day (Fig. 1). Recent range expansion has possibly been a consequence of habitat enhancement (e.g. improved high-country pasture through fertilisation and irrigation; creation of new lakes such as Opuha and Ruataniwha, with adjacent agricultural development), and hunting and culling pressure dispersing birds from traditional areas. Most geese are found in eastern districts of both main islands. The total population is currently about 50,000.

Goose population trends have been monitored in the South Island since 1975. Geese are counted from a light aircraft that follows a standard set of flight paths over the major high-country valleys traditionally frequented by geese. These counts indicate no significant change in the last 20 years (Fig. 2). However, the flight paths are not distributed randomly and do not cover all of the goose's current range. Although additional flight paths have now

"No Canadians here partner. We are American geese eh!!"



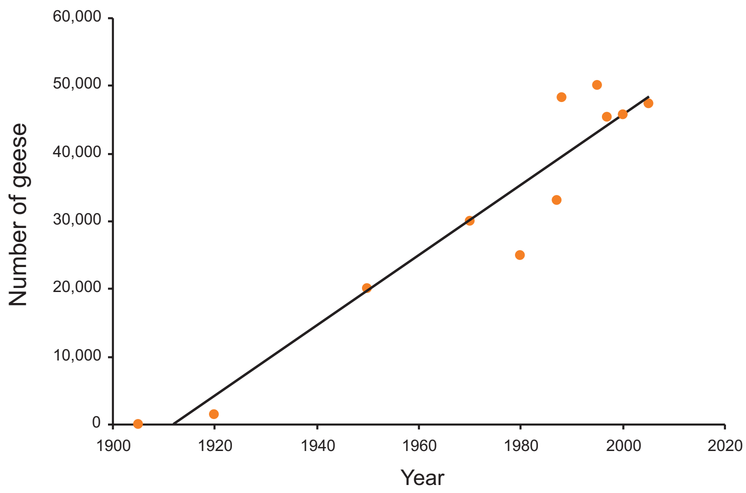


Fig. 1. *Canada goose population trend in New Zealand since establishment, based on anecdotal historical data.*

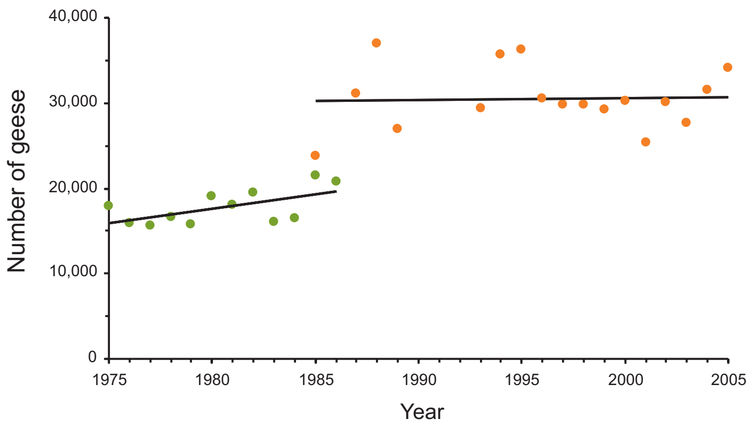


Fig. 2. *South Island Canada goose population trend from counts in selected high country valleys in April 1975–1986 (●) and June 1985–2005 (●). Note: Geese were more visible in June than in April.*

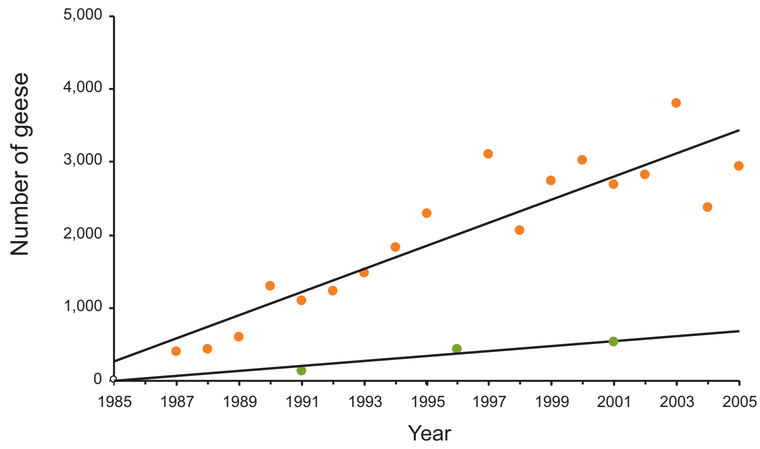


Fig. 3. *North Island Canada goose population trends, from counts of moulting birds in January–February, on Lake Wairarapa (●) and the Rotorua Lakes (●)*

been added to cover newly occupied areas, the historical counts may not accurately represent trends in the South Island goose population.

There is no island-wide aerial survey of goose numbers in the North Island, but ground counts at some lakes indicate an increasing population (Fig. 3).

Geese compete with livestock for crops and pasture; foul farm paddocks, city parks and sports fields with their droppings; and increase the risk of bird-strike around airports. They can carry diseases including avian influenza, campylobacter, salmonella, and E. coli that may infect people and animals, including native birds. Goose numbers are considered too high by both farming interests and urban authorities.

Eric and Jim found surprisingly little research has been done in New Zealand on the economic impacts of geese. However, anecdotal accounts of goose damage to pasture and crops abound. Geese in areas of dryland grazing appear to favour fields adjacent to lakes, irrigated pasture, and emergent re-sown pasture, and are most damaging on annual compared with perennial pasture. These feeding preferences result in a small percentage of farmers 'hosting' most geese and incurring most damage, while many farmers rarely, if ever, see geese on their property.

The Canada goose is classified as a game bird in the First Schedule of the Wildlife Act 1953, administered by the Department of Conservation, but this classification is currently


Kev Drew

Canada geese 'resting up'.


Grant Morriss

Research staff turned hunters in their spare time.

being reviewed by the Minister of Conservation. At present, geese can be hunted only under license from Fish and Game New Zealand. Regional councils currently have no legal jurisdiction over Canada geese because the provisions of the Wildlife Act are retained in the Biosecurity Act 1993. If the Canada goose ceases to be listed as a game bird, regional councils may have to take over management of the species wherever it is deemed a pest. This may require the development of improved and publicly acceptable methods of controlling them.

Recreational hunting is the management option preferred by local Fish & Game councils. However, because recreational hunting alone is usually insufficient to control goose numbers, official culling operations are often necessary to supplement hunting. During these culling operations ('flapper drives'), moulting (flightless) geese are rounded up, stunned, and then beheaded, a method approved by the Ministry of Agriculture and Forestry (MAF) and Society for Prevention of Cruelty to Animals (SPCA). Egg destruction was undertaken on a large-scale in the 1970s and 1980s, but is no longer widely practised because it is laborious and nests are difficult to find. Various physical scaring devices appear to have generally had little long-term benefit, and toxic baits and chemical repellents have limited local application.

Eric and Jim concluded that further research is needed to quantify the true costs of goose damage, develop more cost-effective methods of goose control, and improve the monitoring of goose population trends — all are particularly important given the patchy nature of goose populations and the birds' variable behaviour.

This work was funded by the Foundation for Research, Science and Technology, Greater Wellington Regional Council, and Fish and Game New Zealand.

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***Jim Coleman** (not shown)*

Habitat Composition Influences Introduced Bird Distribution on Arable Farms

Some introduced birds are considered significant crop pests by arable farmers. Greenfinches and house sparrows, for example, can cause substantial damage to high-value speciality seed crops such as radish. The level of damage varies, but may result in significant losses. To try and minimise such damage, farmers often use bird control techniques such as scarers, shooting, chemical repellents or poisons. Yet, these techniques are often economically or environmentally unsustainable or simply ineffective. An alternative may be habitat manipulation, to limit bird pest populations and their access to key resources, i.e. arable crops.

However, to develop an effective habitat manipulation strategy, we need to know more about the ecology of bird pests. So in 2003/04 and 2004/05, Catriona MacLeod and Keven Drew, with support from the Foundation for Arable Research, undertook bird and habitat surveys on 19 randomly selected 1-km squares containing at least one arable crop to determine whether the habitat composition on arable farms in mid-Canterbury was a significant predictor of bird abundance during breeding.

C. MacLeod

Crop field with gorse hedge. Boundary habitat such as shelterbelts and gorse seem to be key predictors of bird distribution in the breeding season.

In each square, two 1-km-long transects, split into 200-m sections, were established, and the bird–habitat associations present investigated at two different scales (1-km-square and 200-m-section). The main boundary features along each 200-m section were recorded (i.e. shelterbelt, gorse hedge, or fence) and the types of crop grown. These data were used to calculate the proportion of the 200-m sections covered by each habitat within each 1-km square.

Bird surveys were carried out in late November to early December and in early to mid January each breeding season. During each survey, all birds seen by an observer walking along the transect, and the perpendicular distance to each bird from the transect, was recorded. The density of 11 introduced bird species (Table) was estimated for each farm by distance sampling.

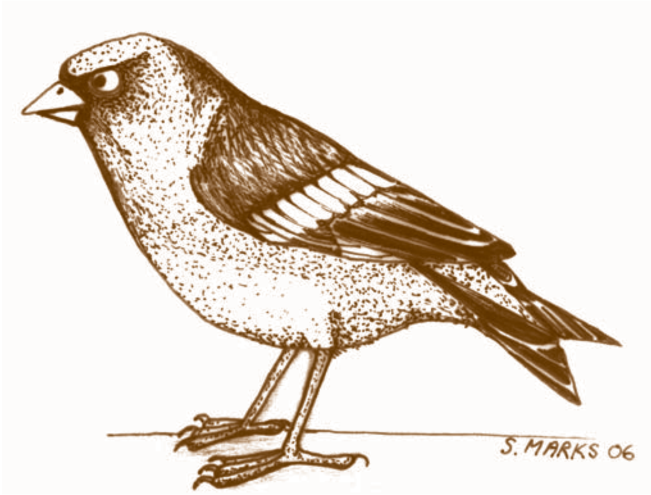
Statistical models were used to investigate whether (a) the density of each species within a 1-km square was related to the proportion of each habitat present and (b) the presence of a species was related to the presence of a particular habitat in each 200-m section.

Boundary type was the best predictor of bird abundance at both the 1-km-square and 200 m¬ section scale (Table). In general, boundaries with shelterbelts supported higher bird abundance, while boundaries with only a fence tended to have lower bird abundance. Crop type was a poor predictor of bird abundance in both the squares and sections. However, starling abundance was higher in 1-km squares with pastoral farming, and house sparrows were more abundant in 200-m sections with cereal present.

Catriona and Keven's results suggest that an experimental reduction in the proportion of shelterbelts on 1-km squares could be used to test the feasibility of habitat management to reduce pest birds during their breeding season.

However, a cost–benefit analysis of any such manipulation would need to take into consideration the potential benefits provided by these habitats (e.g. wind reduction, stock protection, biodiversity conservation) and possibly by the birds (e.g. invertebrate pest control).

The long-term goal of the research is to help farmers predict the impact of different management strategies on bird pest populations. Testing the sustainability of specific habitat manipulations is important although as yet untried, as New Zealand farmers are under increasing social and economic pressure to implement sustainable farming practices.



A house sparrow, considered a significant pest of radish seed crops.

Table. *Boundary and crop habitat features that were significant predictors of species densities at the 1-km-square scale and species presence at the 200-m-section scale for the 11 most frequently recorded introduced bird species on 19 1-km squares with arable crops in Canterbury. The preferential order of habitat features to birds are indicated.*

Common name	Scale	
	1-km square	200-m section
Hedge sparrow	Shelterbelt > hedge > fence	Shelterbelt > hedge > fence
Blackbird	Shelterbelt > hedge > fence	Shelterbelt > hedge > fence
Greenfinch	Shelterbelt > hedge > fence	Shelterbelt > hedge > fence
Chaffinch	Shelterbelt > hedge > fence	Shelterbelt > hedge > fence
Redpoll	Shelterbelt > fence > hedge	Shelterbelt > hedge > fence
Yellowhammer	Hedge > shelterbelt > fence	Hedge > shelterbelt > fence
Skylark	Fence > hedge > shelterbelt	Fence > hedge > shelterbelt
Starling	Grazed grass > arable > ungrazed grass > cereal	Shelterbelt > hedge > fence
Song thrush	No significant habitat predictor	Shelterbelt > hedge > fence
Goldfinch	No significant habitat predictor	Shelterbelt > hedge > fence
House sparrow	No significant habitat predictor	Shelterbelt > hedge > fence Cereal> other crops

In Europe, birds have been used as an indicator of sustainable land management. Although, 18 introduced bird species and 17 native bird species were recorded over the 2-year study, native species were rare or only occasionally sighted compared with introduced passerines. A key issue for arable farmers will be whether habitat manipulations that aim to reduce bird pest problems also enhance populations of native species in agricultural landscapes or further reduce them.

This work was funded by the Foundation for Arable Research (FAR) and Landcare Research.

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Unravelling the Tb Web at Featherston

The number of cattle and deer herds infected with bovine Tb in New Zealand has been reduced by 90% over the last 10 years, with many areas apparently now clear of Tb altogether. However, despite the achievements of the Animal Health Board's national Pest Management Strategy for bovine Tb and the vertebrate pest control contractor teams working under this strategy, some locations continue to have an unexpectedly high proportion of persistently infected herds of cattle and deer.

One area with a long history of Tb in livestock and wildlife is the highly developed grazing flats and adjacent gorse and native scrub covered foothills of the Rimutaka and Tararua ranges about Featherston. In 2004–2005, Jim Coleman and his colleagues in a joint research project with staff from Epicentre, Massey University, investigated why Tb persisted in livestock in this area. Possible causes included:

- Direct transmission of Tb from ferrets to livestock
- Direct transmission of Tb from pigs and deer to livestock
- Direct transmission of Tb from possums to livestock
- Within- and between-herd transmission of Tb.

Direct transmission of Tb from ferrets to livestock at Featherston appeared plausible but unlikely, although Tb may readily cycle in ferret populations. While Tb-infected ferrets were captured in the area in 2002, none of the 63 necropsied during this study were infected. Concurrent radio-tracking studies indicated that juvenile ferrets confined their activities largely to scrub–pasture margins (Fig. 1) and generally avoided the adjacent grazing land occupied by cattle and deer. Finally, ferret control undertaken by contractors for the Greater Wellington Regional Council appeared to be keeping numbers at about 2/ha, and below the density thought to be required to maintain Tb within ferret populations.

Direct transmission of Tb from wild pigs or wild deer to livestock appeared even less likely. Neither species is generally able to maintain Tb in their populations without input from other

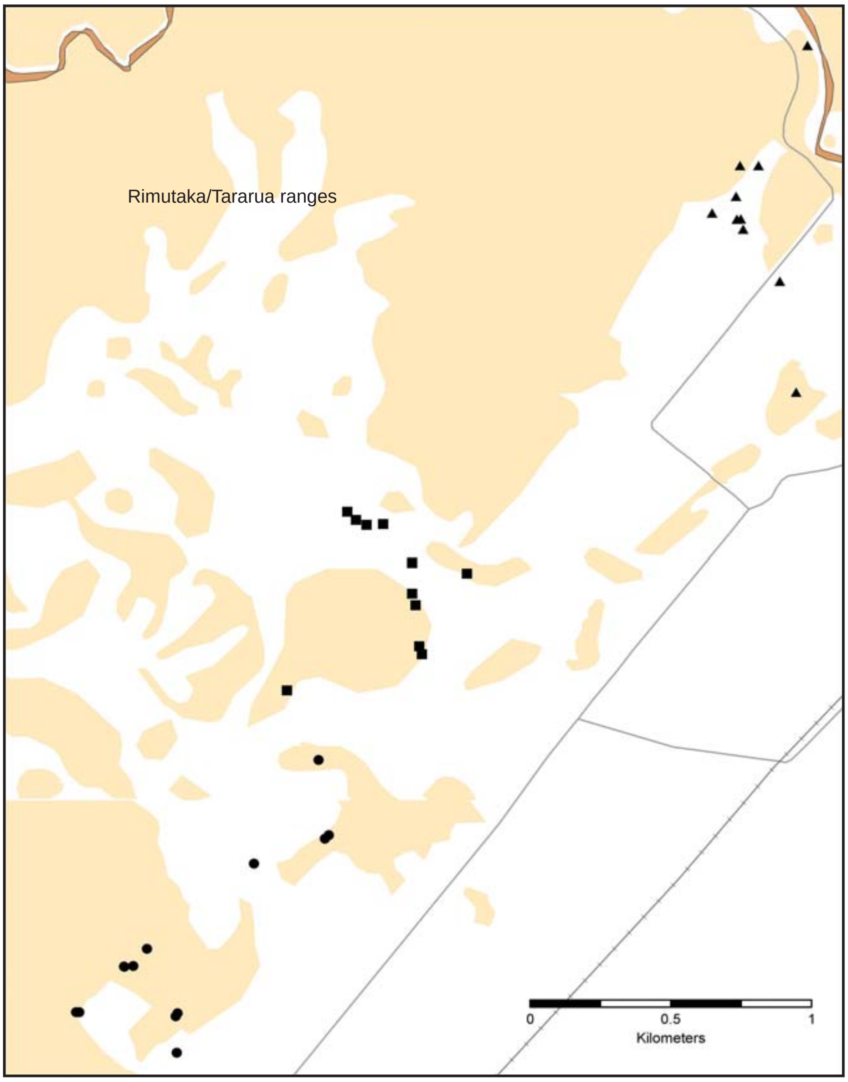

Fig. 1. *Daytime den locations of three radio-collared ferrets at Featherston (represented by different symbols) from February 2004 to June 2004 (▲), and from February 2004 to April 2005 (●, ■). The orange shading represents areas of gorse and native scrub.*

species. Wild deer are also locally uncommon and rarely, if ever, range out among livestock. Pigs do occur throughout the scrub-covered hillsides, but are heavily hunted, so also rarely range out onto farmland. Twenty-nine pig heads were recovered from hunters for necropsy, and four (13.8%) of them were infected with Tb. The four were widely dispersed (Fig. 2), and at least 30 months old. Conversely, none of the 22 pigs younger than 30 months were infected, indicating that the local infections in pigs arose from an historical source(s) that may be declining.

Direct transmission of Tb from possums appeared to be the most likely reason for the ongoing infection in livestock. While the necropsy of 139 possums failed to identify any infection, infected possums were recorded about Featherston in the late 1990s. The possibility of ongoing local infection in possums is supported by the modest numbers and small percent of the total area sampled for possums in this study, the significant numbers of possums present in scrub habitats that survived local control in past years, and the recent fall in infection in livestock with recently improved possum control. The old age of the infected pigs also indicates a recent infection in some other species, most likely possums.

One likely transmission route of Tb between possums, ferrets, and pigs was examined by video-filming animals scavenging possum carcasses and pig offal. Pig heads were rarely scavenged by any species. However, all the possum carcasses set out were readily scavenged by pigs including a sow and litter of eight. Such behaviour clearly exposed individuals to any infection that might be present.

Within- and between-herd transmission of Tb was dismissed because of the recent and current dispersed location of infected herds, the general lack of contact between them, and the continued presence of infected wildlife in the adjacent foothills. Such wildlife are clearly capable of providing a source of Tb for any livestock grazing within their foraging or dispersal ranges.

In summary, the infection in pigs over 30 months old recorded by Jim and his team at Featherston, the ongoing but reduced infection in wildlife, and the historical infections recorded in possums and ferrets indicate a residual infection in wildlife now confined largely to pigs. Maintaining possums and ferrets below the densities targeted for Tb control at Featherston (i.e. those necessary for maintenance of the disease) should see Tb disappear from local pigs and livestock, as infected old animals die and no new infection enters the pig population.

This work was done under contract to the Animal Health Board.

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Morgan Coleman, Graham Nugent
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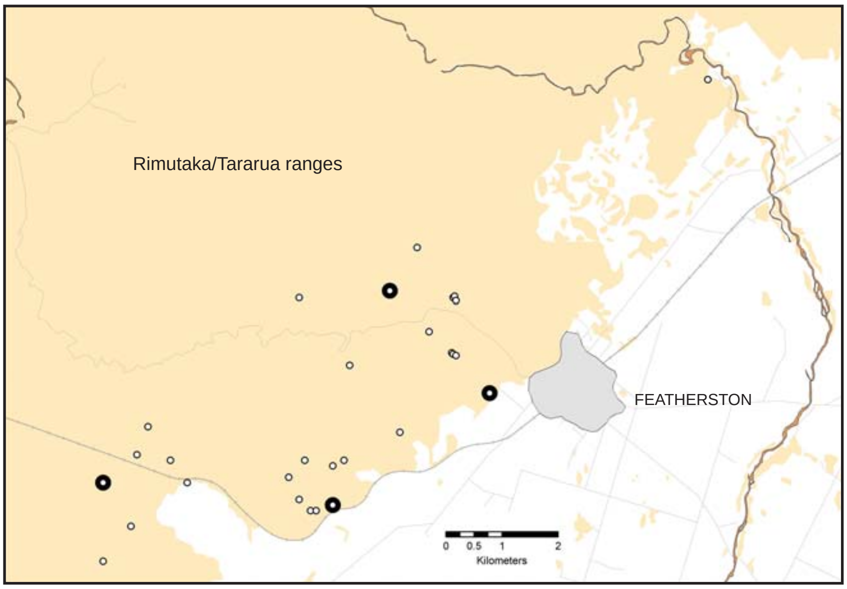

Fig. 2. *Location of pigs recovered for necropsy, with the capture sites of infected animals shown as dark circles.*

Cholecalciferol Gel Bait – a Promising Tool for Sustained Control of Possums

Toxic baiting of possum populations has traditionally been based on carrot, cereal pellet, or paste baits that have a field life of only a few days but rapidly reduce populations to low density. However, to provide efficient longer-term 'maintenance control', baits are needed that control possums over extended periods with only infrequent replacement.

Earlier research by Dave Morgan, reported in He Kōrero Piahama (No.14, 2000), identified that a gel bait loaded with cholecalciferol (Vitamin D3), manufactured by Kiwicare Corporation, proved the most long-lived bait type of six tested. It remained palatable and toxic to possums under high rainfall conditions in Westland for at least 26 months. The research also revealed the bait was unpalatable to a range of non-target animals, including 20 species of birds, short-tailed bats, common skinks, and invertebrates such as honey bees, large-headed weta, and kauri snails. Since possums are particularly susceptible to cholecalciferol, additional safety towards non-target species, including livestock and pets, is granted by the relatively low concentration of the toxin used in the gel. The final step in evaluating this product to meet registration was to conduct a field trial of its effectiveness in controlling possums in the short term.

In conjunction with staff from the Department of Conservation, Dave carried out a field trial of the gel bait in two replicates of paired treated (baited) and non-treated (non-baited) sites in beech forest in the Hopkins Valley, Canterbury, in 2005. Possum populations prior to the trial were monitored by trapping along the lower bush-edge of each site. All trapped possums were tagged and released, and all recaptures during post-control trapping were noted.

After initial population monitoring, stations containing 100 g of non-toxic pre-feed gel bait (photo) were established 20 m apart along the bush edge and along two parallel lines 200 m apart further into the forest. Two weeks later, these baits were replaced with toxic baits. Baits were then checked periodically over the next 3 months and replaced if <20% remained. The percent kill was calculated from both the reduction in trap-catch and the proportion of tagged possums recaptured after control. For both methods, kill data were corrected for population changes

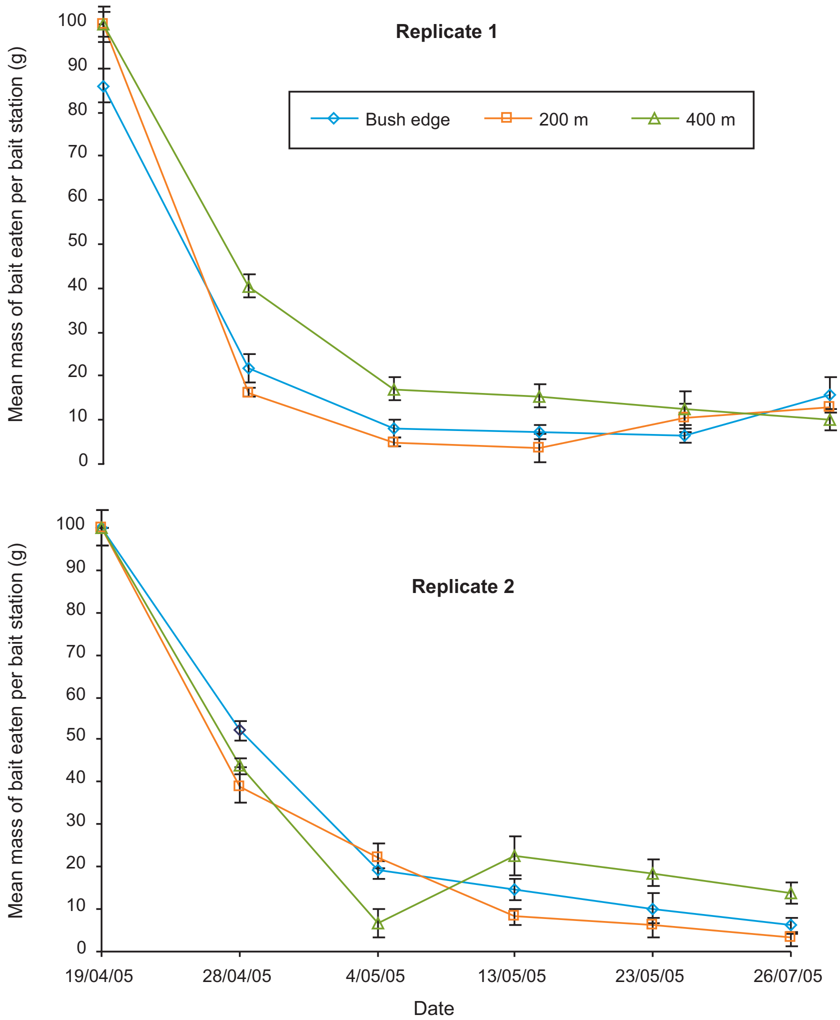

Fig. Mean quantity of toxic bait eaten per bait station (±SE) on three lines in each treatment site.

recorded in the non-treated sites, so that the true impact of the toxic gel baits could be isolated.

The trap-catch along the bush-edge of all four areas was high (31–67%) before control. Cholecalciferol baits achieved mean population reductions in the two treatment blocks of 81% (trap-catch) and 100% (mark-recapture) during the 2 weeks following toxic baiting, and this was reflected in a decline in bait consumption (Fig). However, the trap-catch result was likely to have markedly underestimated the kill (and hence the effectiveness of the cholecalciferol bait) because the populations in the non-treatment blocks fell by 70% due to poaching along the bush edge. Poachers did not remove any possums from the treatment sites, probably because the population had already been greatly reduced by the gel baits. Conversely, since eight possums were caught in the treated sites after control (from 300 trap-nights), the estimate of 100% reduction from mark-recapture is clearly an overestimate, resulting most probably from the poaching of some tagged possums from the non-treatment sites. Therefore, the true mean population reduction from treated areas was between 81 and 100%.

The bait consumption data indicate that most control was achieved within 2 weeks of laying the toxic baits, but further bait was removed thereafter. While some of this loss may have been due to surviving or immigrant possums, spillage was noted from about 10% of stations but may not have been noticed at others and hence was recorded, in error, as eaten. This finding has led to modifications in the

D. Morgan

Cholecalciferol gel bait in a prepackaged plastic bait station being stapled to a tree.

plastic bait station to ensure better containment of the gel. Rodents interfered with up to 15% of the toxic baits during the first week of baiting but not thereafter, suggesting that either they were killed or they found the bait relatively unpalatable (confirmed in recent cage trials), or they became bait shy after eating a sublethal amount. There was no evidence of bait interference by other non-target species.

The cost of control using cholecalciferol gel bait is comparable with other widely used methods. However, because such baits have a long field-life and were deployed at a close spacing in Dave's trial, there appears to be potential for reducing both the cost of materials and labour in developing a highly efficient baiting strategy for long-term control of possum populations. On the basis of these and related trials, registration has been sought for the product by Kiwicare Corporation.

This work was done under contract to the Animal Health Board.

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Improved Testing of Possum Fertility Control Vaccines

New methods for manipulating the reproduction of possums all year round will speed the testing (in containment) of possum fertility control vaccines and shorten the time until field trials of these agents.

Possums are seasonal breeders that normally produce a single egg per breeding cycle. In past trials, hormone treatments were used to induce female possums to produce many mature eggs (superovulation) that were then fertilised by artificial insemination with sperm from donor male possums. This technology has been used to test the efficacy of vaccines to reduce fertility. However, female possums only respond to this superovulation treatment reliably during their normal autumn breeding season, restricting fertility testing to the months of April to June.

Landcare Research scientists at the National Research Centre for Possum Biocontrol (Lincoln) developed a new superovulation protocol for use both during and outside the possum's normal breeding season. Females are treated with follicle stimulating hormone (FSH) instead of with pregnant mare's serum gonadotrophin (PMSG) used in the past to stimulate the development of ovarian follicles, then with luteinising hormone (LH) to induce ovulation. Initially many of the eggs recovered were immature. However, the doses of FSH and LH used are now optimised for maximum recovery of mature eggs.

Frank Molinia and Vaughan Myers have now confirmed that eggs produced from this new superovulation protocol in possums are able to be fertilised using artificial insemination, and eggs and embryos were recovered from April to October (Fig.). Compared with PMSG-superovulated possums, this has led to the recovery of at least twice the average numbers of eggs (8 versus 4) and embryos (5 versus 2).

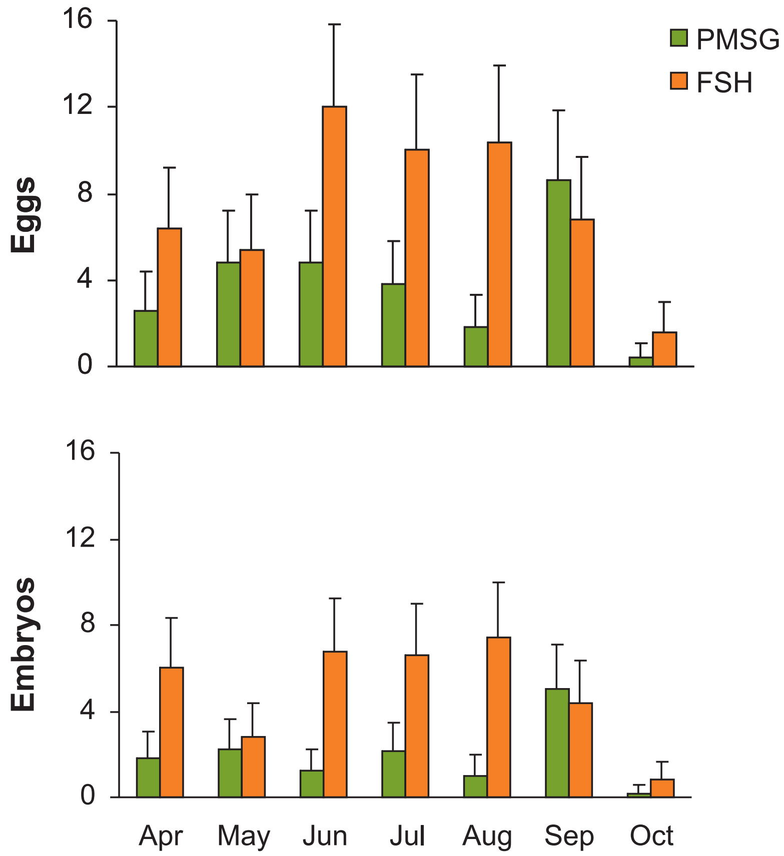

***Fig.** FSH and PMSG superovulation treatment of possums from April to October for the recovery of eggs and embryos after artificial insemination.*

This approach means that testing of fertility control vaccines in possums can now be undertaken reliably over an extended period of the year. This is good news for the group who are testing various vaccines and vaccine delivery formulations in possums, as they will use the new superovulation and artificial insemination technology to identify those vaccines most suitable for testing in natural breeding trials in containment, ahead of limited field trials due to commence in 2008.

This research was funded by the Foundation for Research, Science and Technology, and the Cooperative Research Centre for Conservation and Management of Marsupials.

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***Vaughan Myers** (not shown)*

The Landcare Research Toxicology Laboratory: What It Can Do for You

The Landcare Research Toxicology Laboratory team, led by Lynn Booth at Lincoln, carries out testing for vertebrate pesticides and lures in various materials, e.g. baits for pest mammals, water, body tissues, urine, and blood plasma. Clients for such services include local territorial authorities, private pest control companies, other laboratories, government departments, and universities, as well as colleagues at Landcare Research working on cost-effective pest control.

The laboratory is accredited under International Accreditation New Zealand (IANZ) and the New Zealand Food Safety Authority (NZFSA) laboratory approval scheme (LAS), and offers several internationally accepted services. It provides quality assurance testing for baits containing any of the pesticides currently registered (or being developed) for vertebrate pest management New Zealand, i.e. alpha chloralose, brodifacoum, bromadiolone, cholecalciferol, coumatetralyl, cyanide, diphacinone, flocoumafen, pindone, rotenone, sodium fluoroacetate (1080), warfarin, and zinc phosphide. Quality assurance testing of lures and repellents such as cinnamon and anthraquinone are also undertaken.

The laboratory also plays an important role in monitoring pesticide residues in water in rivers, streams, or wastewater, and can analyse samples for 1080 down to 0.1 parts per billion (ppb), as well as for brodifacoum, diphacinone, p-aminopropiophenone (PAPP), pindone and rotenone. The majority of sample analyses for 1080 in New Zealand are undertaken at the Lincoln laboratories, where a database is maintained of all water samples tested from 1080 operations from 1990 onwards, plus background information on the samples.

For circumstances where there is potential for human exposure to vertebrate pesticides, the toxicology team has developed sampling protocols for use by general practitioners, pathology laboratories, medical officers of health (MOH), and employers in the pest control industry.

Analysis of pesticide residues in other environmental samples is also undertaken. As the result of a trucking accident on 23 May 2001, approximately 20 tonnes of rodent bait containing brodifacoum fell into the sea near Kaikoura. As this is a particularly persistent pesticide in animal tissue, the effects of the spill in samples of water, sediment and marine animals were monitored for up to 31 months. These results guided a ban on the collecting of shellfish for human consumption in the immediate area, with health warnings issued by Community and Public Health only being lifted by the NZFSA in May 2004.

In cases where dead non-target animals may have been exposed to vertebrate pesticides, there may be a requirement to establish the cause of death(s). The team is able to diagnose poisoning by a number

C. Thomson

The gel permeation chromatography system used to 'clean' samples.

C. Thomson

Processing samples in the toxicology laboratory.

C. Thomson

Lynn processing samples at the high performance liquid chromatograph.

of vertebrate pesticides. Results are maintained in a national database along with relevant background information. This database is a unique, searchable resource for New Zealand, and, along with the 1080 database, available to researchers, pest contractors, regional councils, the Department of Conservation and other regulatory agencies.

The NZFSA monitors pesticide residues in game species, and the lab works with NZFSA to assay samples and assess the risk of toxic residues in game animals caught or shot in areas where toxic baits have been laid for vertebrate pest control.

All samples for analysis should be packaged following the protocol set out in http://www.landcareresearch.co.nz/services/laboratories/toxlab/index.asp and sent to:

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New Directions in Vertebrate Pest Science at Landcare Research

The first half of 2006 has seen major changes in science management structures at Landcare Research. While these changes will not undermine the organisation's historical focus on improving the management of vertebrate pests in New Zealand, they do provide new and innovative opportunities to set this work in a different context.

Areas of science activity at Landcare Research are now collected into ten science teams under two science portfolios. The Environment and Society Portfolio (led by Dr Richard Gordon based at our Lincoln campus) comprises science teams focused on 'Built Environments', 'Sustainability and Society', 'Global Change Processes', 'Soils and Landscapes', and 'Informatics'. The Biological Systems Portfolio (led by Dr David Choquenot based at our Auckland campus) comprises science teams focused on 'Biosystematics', 'Biodiversity and Conservation', 'Ecosystem Processes', 'Wildlife Ecology and Epidemiology' and 'Pest Control Technologies'.

While these last two Science Teams obviously encompass most of our science capability in pest management, many science staff based in these two teams are heavily involved in projects in other science teams. For example, science staff from Wildlife Ecology & Epidemiology are undertaking large research projects seeking to understand how pest species within forests interact to limit each others' abundance and the factors that drive variation in pest abundance across landscapes. Further, they are linking this research into projects undertaken in Biodiversity & Conservation and Ecosystem Processes, by seeking to understand how introduced predators affect the viability of threatened populations and the long-term dynamics of native forests. Similarly, staff from Pest Control Technologies are undertaking major research projects that aim to make the achievement of zero or near-zero pest densities feasible over large areas, but using this information to identify optimal investment strategies for biodiversity conservation.

The specific research directions that will characterise the two science teams focused on pest management are:

Wildlife Ecology and Epidemiology

- Understanding the distribution and abundance of pests in relation to their control
- Linking interaction between pest and native organisms to the viability of threatened populations
- Understanding the effect wildlife diseases have on agricultural production, human health and biodiversity conservation, and how to manage these effects, and
- Using bioeconomic approaches to link the costs and benefits of pest control, and identify optimal pest management strategies.

Pest Control Technologies

- Identifying and developing new pest control platforms based on emergent technologies
- Maximising the cost effectiveness of established pest control techniques, and
- Continuing to explore and refine pest biocontrol methods.

The new science team structure will allow Landcare Research to continue to provide innovative solutions to pest management problems, but allow these solutions to be linked to a broader set of environmental, economic and social outcomes.

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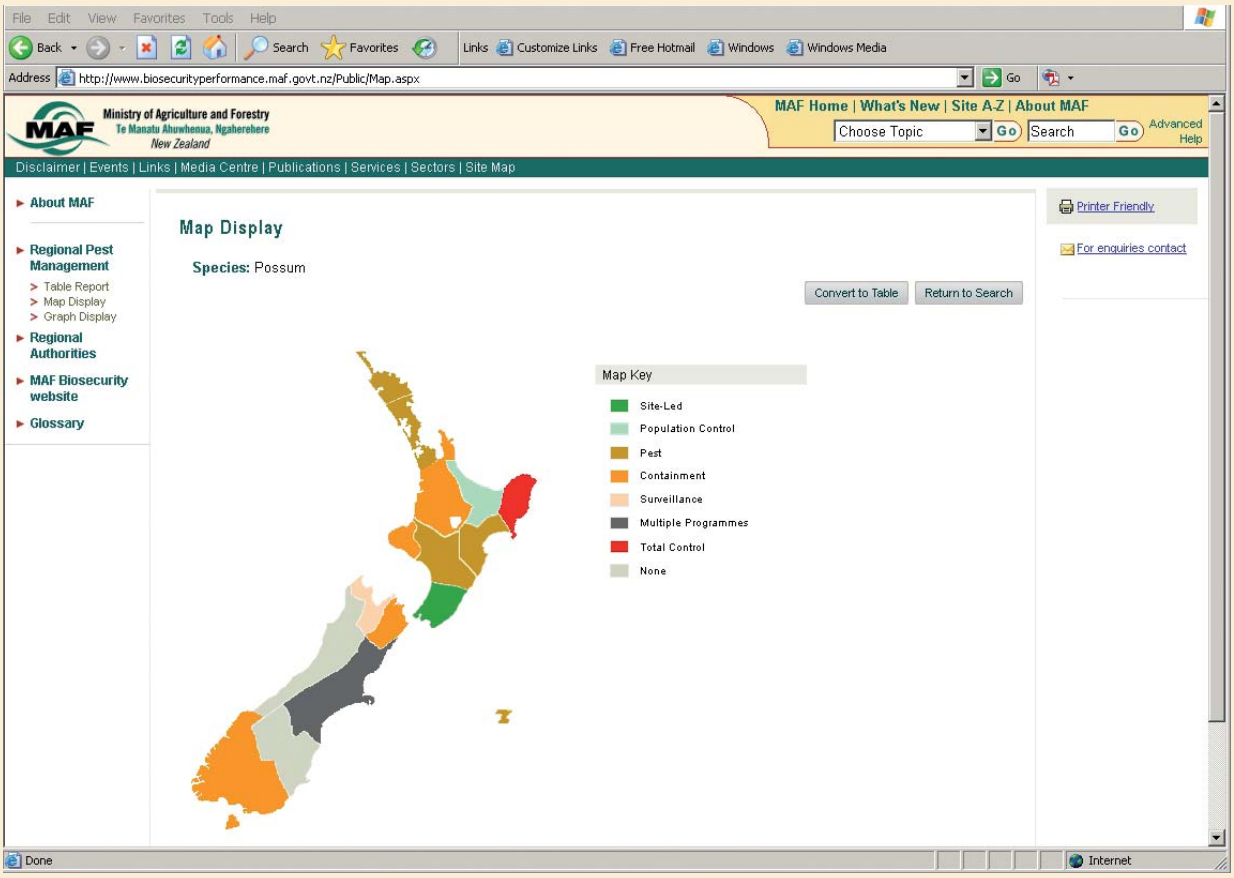
Regional Pest Management Website Launched

The Ministry of Agriculture and Forestry's (MAF's) national biosecurity oversight role requires that it looks across all biosecurity related authorities' activity, not just the directly MAF-related activity. MAF launched an interactive Regional Pest Management website on the 10th of April, as a first step in collecting and presenting biosecurity activity and performance data.

The site provides a nationwide picture of regional pest management activity. It shows which pest species are managed, and how, in each region. Site visitors can search by species, region or by management programme and can view results as maps, tables or graphs.

The information is extracted from individual Regional Pest Management Strategies and will be updated as councils update their strategies.

To find out more, check out the site at www.biosecurityperformance.maf.govt.nz



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Also, for further information on research in Landcare Research see our website: http://www.landcareresearch.co.nz

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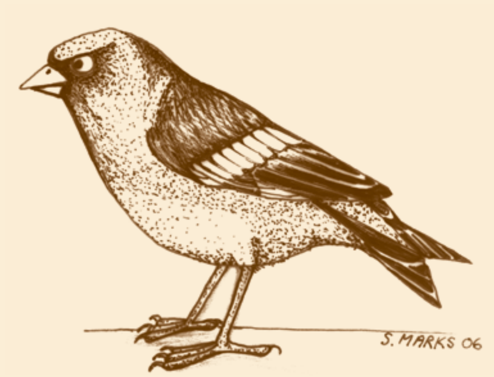

Some Recent Vertebrate-Pest-Related Publications

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