Kararehe Kino
Vertebrate Pest Research
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Manaaki Whenua
Landcare Research

Eradication of Vertebrate Pests

Eradication is an attractive option for pest managers because it solves the problem once and for all and is 'strategically' simple compared with sustained control. The question is whether the permanent removal of an entire pest population is feasible. New Zealand managers are recognised internationally for their success in eradicating pests. In recent years Landcare Research staff, and particularly John Parkes, have been asked to assess the feasibility of, and plan eradication proposals for, feral goats on Islas Isabela in the Galapagos, Australia's Lord Howe Island and New Zealand's Banks Peninsula; rabbits on Clarion Island off the Pacific coast of Mexico; deer in Northland and Taranaki; foxes on Wilsons Promontory National Park in Victoria, Australia; Norway rats on Langara Island, British Columbia; and ship rats and mice on Lord Howe Island.

John believes that the issues surrounding eradication as a solution to New Zealand's pest problems are clear-cut. In particular, pest managers must be able to achieve three things before eradication is feasible. They must be able to put at risk all pest animals in the target population (or all of one sex), kill the pests faster than they can replace their losses at all densities, and ensure that the probability of cleared areas being reinvaded is zero. So the first part of any plan to locally eradicate a pest species is to identify how all these conditions may be met — if one or more cannot, eradication will fail.

Mts Gower and Lidgbird on Lord Howe Island. Feral pigs and cats have been eradicated, feral goats are down to single figures, and ship rat and mouse control are under review

In addition to such critical biological conditions, a series of risks and constraints have to be considered. For example, there must be enough money in the budget for the work to achieve the goal within the set timeframe, the general public must want to eradicate the pest population (or at least not oppose such action), there should be an efficient set of tactics developed to achieve eradication, the risks to non-target species should be acceptable or avoidable, and managers should know when to stop the eradication programme and claim success or admit defeat.

New Zealand has over 735 islands over 1 ha, from Raoul Island in the Kermadec archipelago to Campbell Island in the Subantarctic. Surprisingly only 158 islands totalling just 2162 ha (0.008% of the total area of New Zealand) have never had introduced mammals. Over the years, all mammals have died out or been eradicated from 68 islands adding an extra 30 189 ha of islands free of pest mammals — these are precious places because they allow at least some of the most vulnerable native biota to find havens. Campbell Island, at 11 331 ha, is the largest island from which all exotic mammals (but not all exotic birds) have been eradicated (see table). Pest populations of one or more species have also been eradicated from many other islands and from patches on the mainland, although other pests remain.

The islands with extant pest populations provide rather sobering statistics, with many still having a range of exotic species. Despite recent attempts to create pest-free places on the mainland by fencing out pests and removing those within, pest managers cannot abandon their efforts to stop new species arriving and current ones from spreading. Managers must have a long-term commitment to sustaining control of the most critical pests in at least high-priority places.

This work was funded by the Department of Conservation and by some island estate managers.

John Parkes

***Table**. Known status of introduced mammals on islands around New Zealand (after Parkes & Murphy 2003; NZ J Zoology 30:335–359).*

Species	No. islands with confirmed pest populations	No. islands where the species has died out naturally	No. islands where the species has been eradicated	Largest island where the species has been eradicated and size (ha)
Kiore	25	0	34	Raoul (2950)
Mice	28	1	12	Enderby (710)
Norway rats	26	0	30	Campbell (11 331)
Ship rats	46+	0	9	Moturoa (146)
Feral cats	24	5	10	Raoul (2950)
Feral dogs	0	2	0	
Stoats	28+	0	5	Anchor (1130)
Possums	14	2	10	Rangitoto (2321)
Wallaby species	1	0	3	Rangitoto (2321)
Hedgehogs	7	0	0	
Rabbits	24	10	14	Enderby (710)
Feral pigs	8	9	16	Great Mercury (1718)
Feral goats	10	9	22	Raoul (2950)
Deer species	37+	3	1	Nukuwaiata (242)
Feral cattle	3	2	2	Campbell (11 331)
Feral sheep	4	4	2	Campbell (11 331)

Search Theory – Understanding the Reliability of Wildlife Monitoring Data

Wildlife management depends on the ability to monitor changes in population abundance. In most situations, it is not practical to count all the individuals at a site, so sampling is used to estimate population abundance. However, for intensively controlled possum populations, densities are so low that the sampling method typically used to estimate abundance (trap catch) is being pushed to the limits of its usefulness. Steve Ball and colleagues (Graham Nugent, Bruce Warburton, Dave Ramsey, Murray Efford and Blair Brown) have been assessing the reliability of the trap-catch technique for sampling low-density possum populations.

The study of detection probabilities comes under the general umbrella of 'Search Theory'. For intensive possum control, the aim is to make sense of the many trap lines that produce no captures – does this mean the population has been eradicated or simply that surviving possums are undetectable? For example, following the removal of possums from Kapiti Island, an enormously labour-intensive effort of over 10 000 trap nights without captures in high-quality habitat was required as evidence of eradication. An understanding of 'possum detection probabilities' would have provided a much more cost-effective basis for estimating the certainty of eradication.

To directly measure detection probability, Steve and his team placed traps at random locations within the known ranges of 18 radio-collared possums that inhabited mixed bush and farmland in the Canterbury foothills. Each trap site was monitored by a video camera and by a proximity detector that indicated when one of the radio-collared possums approached (Fig. 1). The equipment revealed that there was only a 7% chance of trapping an individual possum in one night with a single leghold trap, even when the trap was placed at the centre of its home range. Worse, this probability decreases rapidly when the trap is placed away from the centre of the home range. At 150 metres, there is <0.2% chance of catching the possum on any one night (Fig. 2).

These results indicate that a large number of traps must be placed within a home range, and/or set for a large number of nights, to have a high chance of detecting an individual possum. For example, with the current protocol for monitoring the effectiveness of possum control (lines of 10 traps

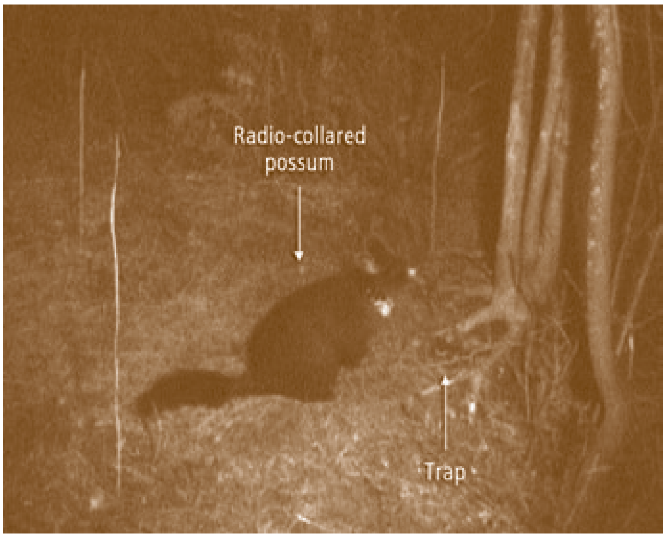


Fig. 1. *Will this possum go undetected? Even a trap in the centre of a possum's home range has only a small chance of success on a given night.*

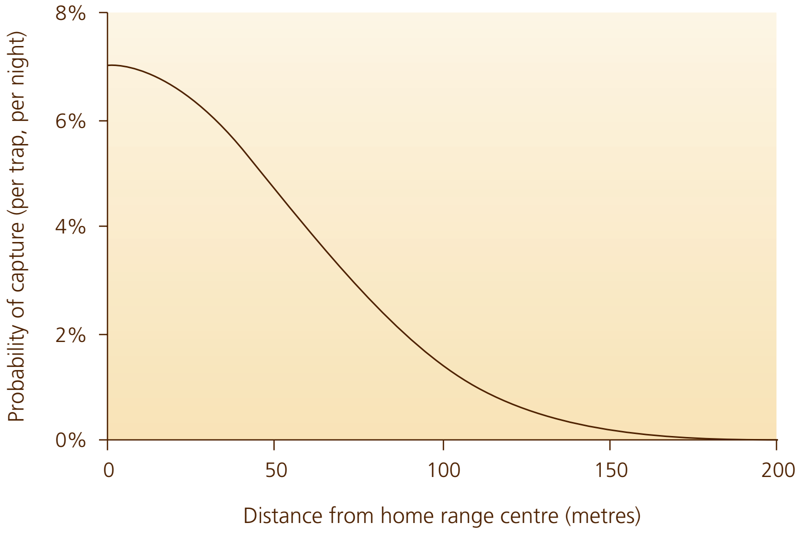


Fig. 2. *Detection probability of individual possums in mid-Canterbury. At the home range centre (distance = 0), a single trap has a 7% chance of capture success per night.*

set 20 m apart for 3 nights), a single possum with a home range centred in the middle of a monitoring line has a 75% chance of capture. This probability decreases to <1% within 150–200 metres of the trap line. Achieving adequate two-dimensional coverage for monitoring the successful eradication of possums from conservation areas, or the removal of clusters of possums to eliminate bovine Tb, is obviously a challenge.

Some options to improve the reliability of the technique are to increase the numbers of traps and traplines, and the number of nights monitored. This is costly because the traps used must be checked daily. However, there are 'set-and-forget' monitoring devices such as kill traps, toxic baits, or wax blocks that possums chew. The placement of such devices in two-dimensional patterns rather than one- (i.e. along a trapline) may be a more reliable way of detecting more possums per monitoring effort.

To assess which sampling tools and strategies are most efficient and reliable, the data from this and several related studies are being compared in computer simulation models developed by Dave Ramsey and Murray Efford. Although the current focus of the team's work has been on possums, Search Theory is applicable to a range of situations in which rare animals (or even plants) are being monitored.

This work was funded by Landcare Research.

Steve Ball

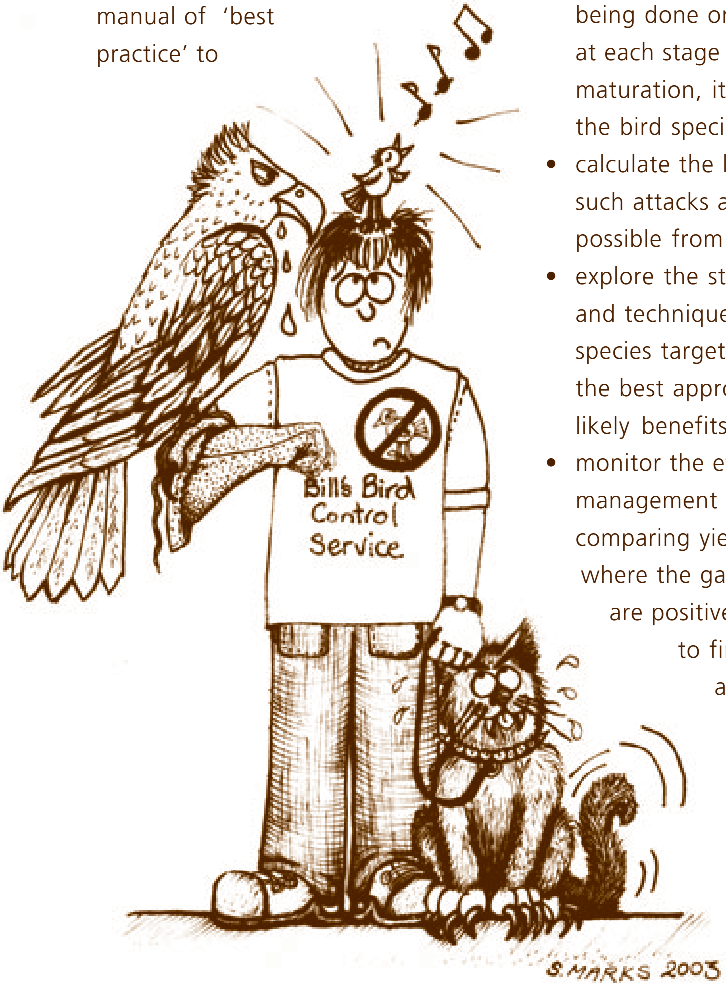
Management of Bird Pests in Arable Crops

In the arable industry, more than 50% of crops may be lost to bird pests. Despite this heavy toll, management of bird pests is generally poor. Many farmers see crop damage as an unavoidable part of farming life, but most of the birds involved are introduced species and control of their populations is possible. Much of the poor management of bird pests stems from economic losses being largely unquantified, and the control techniques currently available being usually of limited effectiveness, often overly expensive, and sometimes too noisy to use in semi-urban areas or near homesteads.

Juvenile goldfinch feeding on a radish seed crop

Jim Coleman and Eric Spurr have recently developed a manual of 'best practice' to protect horticultural crops from bird pests. Farmers are encouraged to:

- determine the kind of damage being done or likely to be done at each stage of the crop's maturation, its patchiness, and the bird species involved
- calculate the likely losses from such attacks and the benefits possible from bird control
- explore the strategic options and techniques available for any species targeted, and determine the best approach based on likely benefits
- monitor the effectiveness of any management undertaken, comparing yield results, and, where the gains from control are positive, looking at ways to fine-tune the approach in successive years.



Jim and Eric identified four strategic options for controlling bird pests in all crops (see Fig.):

- One-off control: the implementation of a single action that has a long-lasting effect on bird abundance. The only effective option is erecting permanent overhead netting systems to exclude birds. Such systems are expensive and require a careful cost–benefit analysis.
- Sustained control: the reduction of bird populations using lethal or non-lethal techniques, followed by long-term control. Sustained control is best used against species confined by their foraging movements to areas around at-risk crops (e.g. house sparrows and greenfinches).
- Crisis management: reactive control following the recognition of unacceptably high levels of crop damage. Crisis management is the most common response. It includes both lethal and non-lethal techniques. The latter are generally unsuccessful, as, by

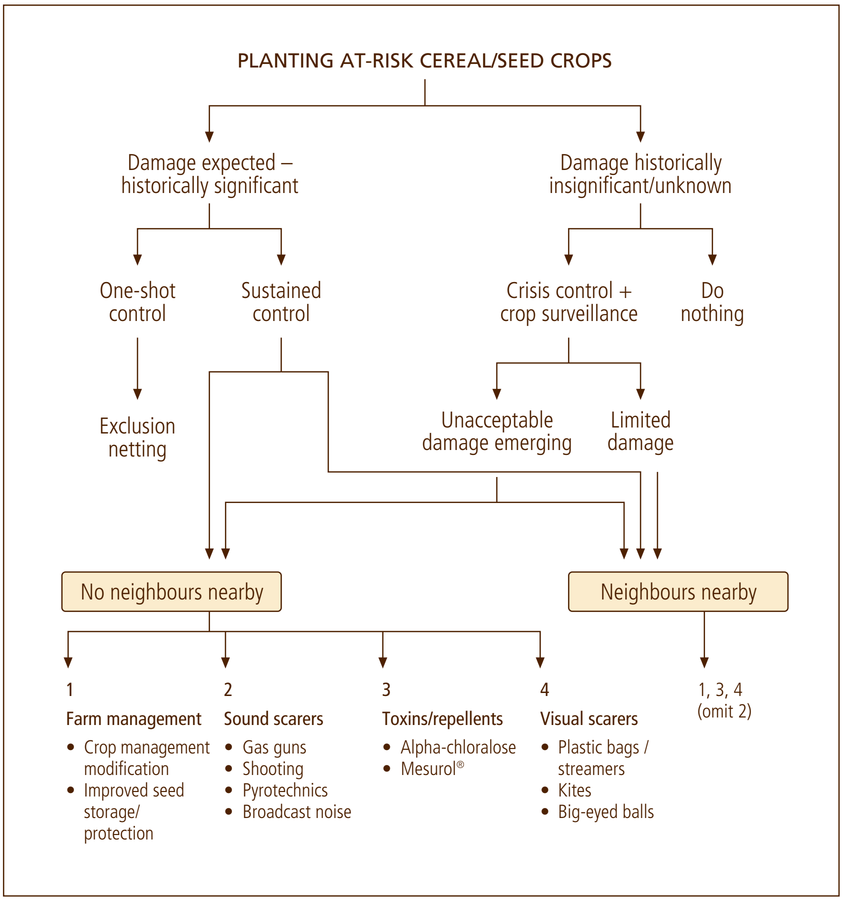


Fig. *Action plan for bird control in arable crops.*

the time they are applied, much of the damage has been done and foraging patterns are difficult to disrupt.

- Doing nothing: the acceptance that the cost of any control undertaken will exceed the value of any crop losses. Doing nothing is not an option for growers of high-value crops, as the likely losses without control impel action.

Jim and Eric ranked the tools most suitable for protecting at-risk crops:

- Exclusion netting: overhead netting is environmentally and socially acceptable, and provides total crop protection. However, it is extremely costly (up to $14,000 per hectare plus erection costs).
- Chemical repellents: only one product that is available for local use, Mesurol®, has proven efficacy against most bird species. Application costs are approximately $190 per hectare including spraying.
- Toxic chemicals: only two toxins are registered for use against bird pests in New Zealand. They are alpha-chloralose and DRC-1339, but only alpha-chloralose is freely available. Alpha-chloralose is relatively humane and safe to non-target species, and works best in cool weather. Costs are $24–28 per hectare.

Radish seed crop protected from bird damage by both netting and spraying with a repellent

- Auditory and visual scarers: numerous scarers exist including gas guns, broadcast noise, shooting, plastic kites, tapes and balloons. All are widely used, all are harmless to target and non-target species, and all generally work for only a short period before pests realise they pose no threat. To be effective, such devices must be in place before feeding patterns are established, frequently shifted, alternated with other similar devices, and used with regard to local bylaws. Costs of scarers are generally low to moderate.

- Farm management: most farmers have limited flexibility in the location, time of sowing or depth of drilling to protect at-risk seed. Greater coordination between adjacent farmers of sowing and hence ripening of seeds could be considered, with high value at-risk crops not grown in strict isolation from other crops likely to be attacked by birds (due to an 'oasis' effect).

Successful control of bird pests attacking arable crops is usually costly. Before undertaking such action, farmers should carefully assess the need for control, look at the advantages and disadvantages of the techniques available, and (if needed) develop and progressively fine-tune a best-practice programme that meets their particular problem. The need for control should be determined from the level of damage sustained in previous years.

This work was funded by the Foundation for Arable Research and the Foundation for Research, Science and Technology.

Jim Coleman

Eric Spurr

Possums Damage Pine Plantations

Brushtail possums damage native forests but did you know that pine plantations are also at risk from these animals?

Pine plantations aren't prime possum habitat because pine trees provide limited food and plantations offer few alternative food sources. Never-the-less, some plantations do contain moderate numbers of possums. Most possum damage occurs in late winter and spring when other foods are scarce and possums are foraging for the highly nutritious pollen cones. However, unlike the situation in native forests, it isn't the eating per se that causes most of the damage. Rather, it's the weight of a 3–5 kg animal bending and breaking terminal shoots (leaders) and lateral branches in the upper part of the tree. Such damage is most commonly reported from young (<15 years) stands. Possums rarely kill established trees, but their damage can lead to reduced tree vigour, loss of apical dominance, and an increased incidence of fungal diseases.

During the 1990s, Ian Payton, Case Pekelharing and Chris Frampton developed the Foliar Browse Index method for monitoring possum damage in native forests. Ian and Chris have now followed this up with the Canopy Indicator Assessment (CIA) method, which provides a standardised means of describing possum damage to pine trees, and quantifying the damage within plantations.

Lateral branch damage attributable to possums. Note the upturned tips on the depressed branches

Pines at the seedling or sapling stages are most vulnerable to animal damage because the whole plant is accessible to all browsing mammals (e.g. rabbits, hares, rats, possums, cattle, sheep, goats). Damage is easy to see, but difficult to attribute to a causal agent. Once over 2 m tall, the main leader is out of reach of all ground browsers, but the stem is vulnerable to bark biting, stripping or rubbing until the trees are 10–12 years old. As trees mature, the increasing thickness of the bark protects the main stem from damage. However, the terminal leader and the upper whorls of branches remain vulnerable to arboreal browsers (e.g. rats, possums) until height growth is complete, and trees take on their final form.

Assessing possum damage requires a clear view of the tree crown, ideally from all sides, and a good pair of binoculars. Damage can be assessed at any time of the year, but is most obvious in late winter and spring.

Ian and Chris's technique requires observers to record, for each tree, life-history stage, leader damage, lateral branch damage, needle loss, and bark damage, using a set of standard categories. For branches and stems, damage is classified as recent or old, with older damaged laterals having upturned tips reoriented to the light. Recent bark damage is characterised by the presence of resin stains similar to those associated with pruning wounds. Older wounds are typically calloused.

Because a number of CIA variables are assessed (rather than counted or measured), questions of reliability and repeatability take on an increased importance. As part of the process of developing the method, variation within and between observers was assessed for each of the variables at several locations near Rotorua, in May 2002.

Where two observers independently assessed variables such as life-history stage (4 categories) or leader damage (7 categories), they reached the same conclusion on nearly every occasion. For other variables, both observers agreed on 70–90% of occasions, and seldom differed by more than one category. Where a single observer reassessed a subset of these trees the following day, the level of repeatability was either similar to that between observers, or better.

Recent bark damage to a pruned Pinus radiata *stem*

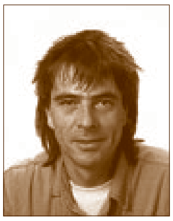
The present study didn't reveal any systematic bias between observers. However, similar trials during the development of the Foliar Browse Index method demonstrated that some observers consistently assess variables above or below the mean value obtained by a group of observers. To minimise any systematic bias between observers, both members of the two-person sampling teams are required to agree on the score of assessed variables. Where several teams are operating, personnel must be rotated between teams.

Canopy Indicator Assessment data can be displayed and analysed by a range of standard graphics and statistical packages. In addition to descriptive summaries, statistical tests can be used to compare differences between forest stands or changes in damage levels within them.

Sound quantitative methods are essential if the nature and severity of possum damage in pine plantations is to be reliably determined. Ian and Chris have developed a method that provides forest managers with a new tool to do just that.

This study was funded by the Forest Health Research Collaborative (FHRC). Copies of the CIA method can obtained as a .pdf file from Ian Payton, and will shortly be available on the FHRC website.

Ian Payton



Chris Frampton

Keeping Track of Wallabies in South Canterbury

Bennett's wallabies were introduced into the Hunters Hills near Waimate in the 1870s. Since then they have spread throughout the Hunters Hills, north into the Albury and Dalgety ranges, and the Two Thumb Range, and west to occupy the Kirkleston Range. Individual wallabies have also been sighted near Lake Pukaki and in Oxford forest. By the 1940s, this animal was recognised as a serious pest, primarily because of its competition with livestock for food. Official control of wallabies started in 1947, with government cullers shooting more than 70 000 between 1947 and 1956. Aerial control of wallabies using 1080 baits began in 1960, and resulted in further significant reductions in their numbers over a large part of their range. However, increasing opposition to the use of aerially sown 1080 baits (mainly because of the need to destock baited land) led to the formation of the South Canterbury Wallaby Board in 1969, and a decline in aerial baiting. The board employed a team of shooters who used dogs to flush wallabies from cover to facilitate their shooting. Between 2500 and 3000 wallabies were shot each year in the 1970s and 1980s.

In 1989, the powers and functions of the South Canterbury Wallaby Board were taken over by Environment Canterbury and central government subsidies for wallaby (and rabbit) control were stopped so the full cost of such control passed on to local landholders. As a result, landholders with wallabies on their properties chose to do their own control.

Wallaby shot in the Hunters Hills

With the development of the Biosecurity Act 1993, and the requirement for local authorities to develop regional pest management strategies (RPMS), Environment Canterbury implemented an annual monitoring and inspection programme to ensure landowners met their responsibilities for wallaby control.

Wallaby numbers were indexed from faecal pellets, where a score of <4 (based on a 'Guilford' scoring system scaled from 1 to 5) indicated acceptably low numbers.

Such changes in wallaby management also led to Environment Canterbury contracting Bruce Warburton to upgrade the programme to monitor changes in local wallaby numbers. Bruce recommended a programme based on permanently marked faecal pellet lines located in high-, medium- and low-density wallaby habitat and remeasured at 1 or 2-yearly intervals. On each line, plots 80 cm in radius located at 10-m intervals are searched for wallaby faecal pellets and the frequency of plots with pellets is used as a measure of the relative abundance of wallabies.

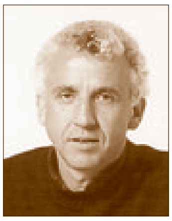
Monitoring over the past 5 years indicates that wallaby numbers across South Canterbury have increased by about 50% from 1999 – the mean frequency of plots with pellets increased from 15% in 1999 to 23% in 2003. This increase is supported by anecdotal evidence of similar increases in the number of sightings of live wallabies, of kills by recreational hunters, of winter shooting kills by Environment Canterbury, and of sightings during property compliance inspections. Of the

Recreational hunters after a wallaby shoot

30 properties inspected in the 2002/03 year, 10 contained populations in excess of the permissible Guilford pellet score. As they had not complied with the requirements of the RPMS, these landowners were required to undertake additional control.

A review of Environment Canterbury's RPMS is currently underway. Given the results of their recent monitoring of wallaby population trends, Bruce and Graham Sullivan (Biosecurity Officer, Environment Canterbury) have need to identify potential control strategies to both stop the wallaby population increasing further and to reduce their populations where they are exceeding acceptable levels.

This work is funded by Environment Canterbury.



Bruce Warburton

Graham Sullivan

Patchiness of Bovine Tb in Possum Populations

The temporal and spatial patterns of bovine tuberculosis (Tb) in possum populations has been investigated by Landcare Research in several studies over the last decade. These studies have led to better targeting of infected possums and more cost-effective control of the disease in livestock.

Early field experience indicated that tuberculous possums in populations under limited control (or no control) often occurred in foci (clusters) that often persisted for many years. Studies by Jim Coleman, Graham Hickling, and Peter Caley in the 1990s indicated that such foci were least common in deep or high-altitude forest and most common at lower altitudes, which often correlated to, though were not necessarily a result of, farm–forest margins (Fig. 1). This may have been because possums were then present in highest numbers on forest margins and consequently possum-to-possum interactions were more likely. Jim and veterinary staff from Massey University also determined that while Tb prevalence in uncontrolled possum populations fluctuated over time (i.e. 8 years; Fig. 2), the

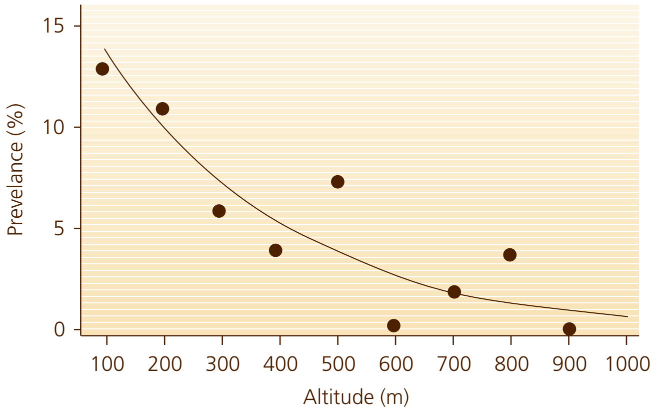


Fig. 1. *Prevalence of Tb infection in possums in relation to altitude on the Hohonu Range, Westland, where the bush–pasture margin is at low altitude grading to deep forest at the higher altitudes (from Caley et al. 2001; NZ Veterinary Journal 49: 82-87).*

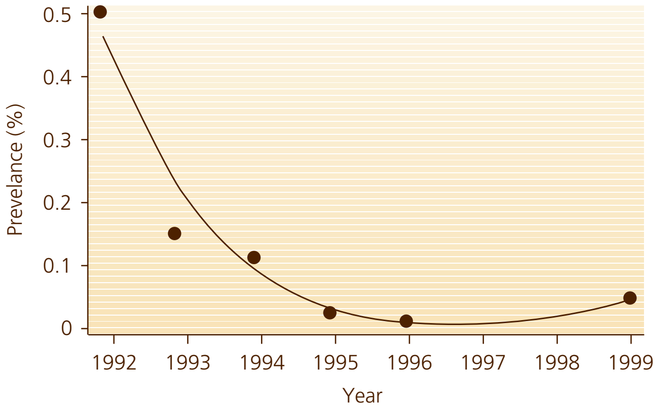


Fig. 2. *Prevalence of Tb infection in possums over time on Flagstaff Flat, Westland. (adapted from Coleman et al. 1999; NZ Veterinary Journal 47: 118-124).*

distribution of infected individuals largely remained unchanged.

Jim and colleagues also undertook two separate studies in the mid-late 1990s to determine how well control operators achieved the possum population target that was thought necessary at the time to locally eradicate Tb (i.e. post-control trap catches of 3–5%). Surveys at six sites indicated control operations generally did not keep possum populations in check for very long, nor achieve the permanent clearance of Tb locally from livestock or limit its spread in wildlife. Reasons for the persistence of Tb in possum populations (despite annual control) were examined at seven sites in a follow-up study of the distribution and numbers of Tb-free and infected possums. In general, each population was kept below the 5% level overall but, importantly, surviving possums were found in clusters. These clusters of possums were often above target 'densities'. This 'survivor patchiness' coinciding with Tb foci contributes to the persistence of Tb in possum populations under control.

Possums caught at Flagstaff Flat on farm–forest margins before being necropsied

The target for controlling tuberculous possum populations has now been lowered (in most areas) to trap catches of <2%. Ongoing studies are increasing our knowledge of the dynamics of Tb in populations held at this level. At six sites, Jim and Wayne Fraser have found that where possum populations are rigorously kept below trap catches of 2% for 1–2 years (0.1–1.3% in the sites chosen), possums with Tb are difficult to find. In contrast, at two other sites where possum populations were lowered to <2% trap catch but then allowed to exceed the target, Tb remained.

Michele Cooke of Massey University checking possums for infection with tuberculosis

More recently, Graham Nugent and colleagues examined whether the natural occurrence of possums with patchy distribution coincided with foci of Tb in an uncontrolled population of possums at moderate densities (a trap catch of 8–10%) in deep forest. In this study, Tb foci appeared independent of the overall patchiness of the population, perhaps because of the higher levels of interaction (and Tb transmission) inherent throughout denser populations.

Such patterns of ongoing infection in possum populations provide strong messages for vector managers. Firstly, tuberculous possums are highly aggregated within populations so local control must be sufficiently widespread to include all such foci. Secondly, the prevalence of Tb in possum populations is influenced by possum density with infected individuals rarely found in populations held consistently below national control targets. Any patchiness amongst survivors at such densities (and hence higher local densities) is harmful to good disease control. Finally, population targets for possum control should be maintained at trap catches of less than 2%. At this level, discernible patches of large numbers of survivor possums are rare, and Tb seems to disappear both from the possum population and from nearby livestock more consistently than at higher trap catches.

This work was funded by the Animal Health Board and by the Foundation for Research, Science and Technology.

Possum with tuberculous axillary lesion

Jim Coleman

Graham Hickling

Peter Caley

Wayne Fraser & Graham Nugent (not shown)

Reducing Deer Deaths Caused by Aerial 1080 for Possum Control

Deer are considered pests by some New Zealanders, but are valued by hunters. Hunters often oppose aerial 1080 poisoning for possums because deer may also be killed. In a recent trial, however, Grant Morriss and colleagues have shown that when a deer repellent is added to poison baits, the majority of deer are deterred from eating the baits.

Early in 2002, Dave Forsyth began trials on behalf of Epro, a Taupo-based pest control company, in which he presented farmed red deer with a

Farmed red deer feeding on bait in the deer repellent trial

variety of potential deer repellents that could be applied to carrot bait without reducing its acceptance by possums. When one formulation that repelled deer was offered in bait to captive possums, it did not appear to affect either bait palatability or toxicity. This compound was then field trialled against standard toxic carrot bait (0.15% 1080) by Epro. Both the deer-repellent and standard carrot bait gave significant kills of possums.

In winter 2002, Roger Lorigan (Epro), Ivor Yockney and Graham Nugent conducted a pilot field trial in which repellent-coated 1080 carrot bait was tested on wild red deer in the Hampden area, North Otago. No dead deer were found in the 700 hectares baited, and some live deer were seen there shortly afterwards. In contrast, many deer carcasses were found in an adjacent area treated with non-repellent bait.

In winter 2003, a larger trial of the deer-repellent bait was conducted on private land at Tataraakina in Hawke's Bay. Six hunters counted red deer and searched for deer carcasses over 18 days in three 2000-hectare blocks before and after poisoning — one block was treated with aerially-sown 1080 carrot bait coated with the repellent; one with 1080 carrot bait with no repellent; and a third was not treated with bait (see table). A novel mark-recapture method involving the random placement of simulated deer carcasses (brown paper rubbish bags filled with leaf litter), throughout each block before poisoning, was used to estimate the percentage of each block searched effectively after poisoning. The percentage of bags found during the searches for real deer carcasses allowed the absolute density of deer carcasses present to be calculated. Possum kill was assessed from trap catch monitoring, and the numbers of three common native bird species (kererū, tomtit, robin) were recorded from 5-minute counts.

Red deer feeding in the wild

The block sown with the deer-repellent bait contained roughly five times as many deer as the block sown with non-repellent bait. All four of the deer found dead after poisoning were in the block with non-repellent bait. Relative to the proportion of deer sighted in this block, a significantly greater proportion of the deer were killed.

In total, 15% of the paper bags in the non-repellent block were found by the combined efforts of hunters and possum monitoring staff, along with four dead deer, indicating that about 26 deer were killed in that block. Some deer survived, with hunters observing about one-third as much sign as before poisoning, suggesting a pre-poison population of about 40 deer.

In the repellent block, the five times higher density of deer indicated a population of about 200. No dead deer were found, but there is a 5% chance that as many as 30 deer were killed without any of their carcasses being found by the hunters. Put another way, the researchers can be 95% confident that less than 15% of the deer in this block were killed. It appears that the repellent protected most, if not all, deer where it was used.

Both poisoned blocks had a post-poison trap catch of possums of less than 1%, indicating good kills. One dead pig and three dead

***Table**. Number of animals seen or heard, or found dead before (pre) and after (post) poison baiting in each block. The number of paper bags deployed and found after control are shown, along with the counts of live birds.*

			Unpoisoned	1080 + repellent	1080 no repellent
No. of bags deployed		Pre	107	268	263
No. of bags found (%)		Post	10 (9.4%)	25 (9.3%)	40 (15.2%)
Deer	No. seen alive	Pre	43	27	4
	No. seen alive	Post	36	12	0
	No. found dead	Post	0	0	4
Pig	No. seen alive	Pre	2	5	3
	No. seen alive	Post	3	2	0
	No. found dead	Post	0	1	0
Sheep	No. seen alive	Pre	0	54	0
	No. seen alive	Post	0	56	0
	No. found dead	Post	0	3	0
Goat	No. seen alive	Pre	3	0	0
	No. seen alive	Post	7	0	0
	No. found dead	Post	0	0	0
Possum	No. found dead	Post	0	21	10
Blackbird	No. found dead	Post	0	1	1
Tomtit	No. heard alive	Pre	11	9	15
	No. heard alive	Post	8	17	6
Robin	No. heard alive	Pre	9	11	8
	No. heard alive	Post	2	6	11
Kererū	No. heard alive	Pre	2	3	6
	No. heard alive	Post	0	0	4

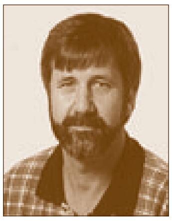
feral sheep were also found, as well as two blackbirds, but the numbers of live sheep, pigs, and birds counted after poisoning indicated that the operation had no major effect on these species.

In parallel with this field trial, Grant Morriss, Cheryl O'Connor and Graham Nugent investigated the use of this repellent on cereal 1080 baits presented to captive possums and red deer. Again, baits coated with the repellent deterred deer but were eaten by possums. Epro have recently confirmed that the percentage of possums killed by repellent-coated cereal bait is as high as for non-repellent bait. The next phase of the research will be to test the use of repellent cereal bait against wild deer.

This work was funded by Epro and the Animal Health Board.

Grant Morriss

Roger Lorigan



Graham Nugent

Cam Speedy

Dave Forsyth, Ivor Yockney & Cheryl O'Connor (not shown)

Erratum – Issue 2

We apologise for an error in Issue 2 of Kararehe Kino:

The following text was omitted from the 2nd paragraph of the "Possums, Rats and Forest Seedlings" article on page 9.

These trials built on earlier work. Flowers and fruit are now known to be important foods for possums. Rats also eat many types of fruit, and probably take flowers and fruits from trees and shrubs. Norway rats and kiore eat seedlings, and possums and ship rats eat buds, leaves and stems and very likely kill seedlings too. Even the seedlings of the unpalatable pepper tree became more plentiful when possums or rats were excluded (Table), presumably because both species ate its berries.

Also, Haumakōroa was incorrectly spelt as Haumakāroa, in the table accompanying the text.

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A Selection of Recent Vertebrate Pest-related Publications

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