He Kōrero Paihama
Possum Research News

Issue 8 *January 1998*

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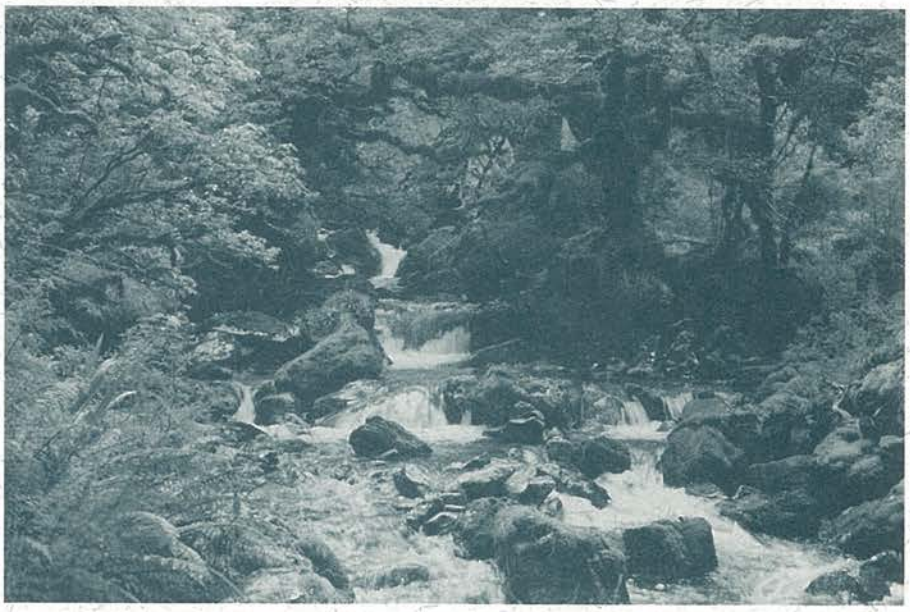
Manaaki Whenua
Landcare Research

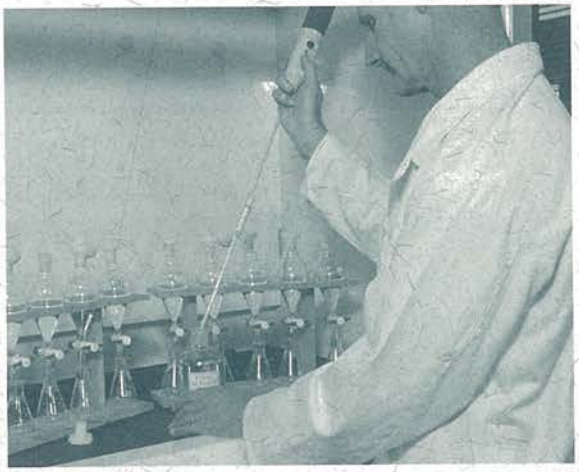
Water Quality Monitoring after Aerial 1080 Pest Control



Control of possums living on agricultural or forested lands in New Zealand relies largely on sodium monofluoroacetate (1080) - loaded cereal or carrot baits sown from the air, or on cereal bait presented in bait feeders. Aerial baiting in particular has given rise to considerable public debate, with the greatest concern being the environmental fate of 1080 and the risk of it contaminating water catchments used for human supply. Because of this concern, Geoff Wright and Charlie Eason have monitored 1080 levels in water following 1080 control operations in a number of catchments.

Over the last six years, Geoff and Charlie have collected water samples from 34 sites throughout New Zealand and analysed 771 samples (see graph). Most (94.3%) of these samples contained no detectable 1080. However, they found residues of 1080 in 5.7% of all samples analysed but in most of these, the 1080 was below 1 part per billion (ppb). In some of these instances, baits were found in the watercourses near to where the samples were taken.

Collecting a water sample



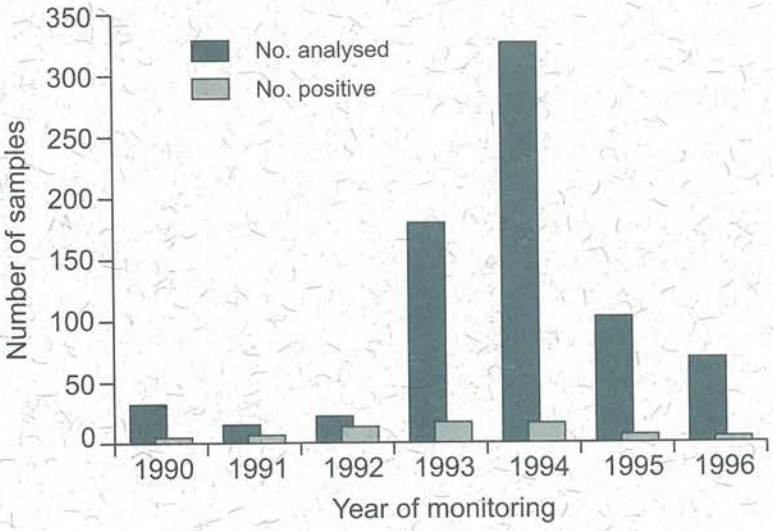
Extracting water for 1080 analysis

These results are well below the provisional maximum acceptable value (MAV) of 5 ppb for 1080 in household drinking water, as published by the New Zealand Ministry of Health in the Drinking Water Standards, 1995.

Geoff and Charlie believe their results suggest that significant or prolonged contamination of waterways after 1080 is used for pest control, is highly unlikely especially if care is taken to avoid watercourses in accordance with the regulations for baiting. These stipulate that poison bait must not be laid in any catchment area which provides water for human consumption, except where approved by appropriate local authorities, i.e., the Medical Officer of Health (Pesticides (Vertebrate Pest Control) Regulations 1983).

Monitoring of waterways for 1080 continues to be a component of aerial operations required by Medical Officers of Health, so we are likely to see more information added to this database for a few years yet.

This work is funded substantially by the Department of Conservation and regional councils.



Water monitoring activity from 1990 - 1996, showing samples containing 1080 residues

***Geoff Wright** and **Charlie Eason** are in Landcare Research's Pest Control Technology team based at Lincoln.*

Guest Editorial

The idea that the present is built on the past and these both will influence what happens in the future, is very true of developments in the possum control industry. The recent focus on quality assurance is but one example of the trend towards resolving the higher order issues that confront the possum control industry. It is part of an ongoing change from the operational and applied dimensions of pest control to the more strategic and should have spin-off benefits in assisting the identification of research needs and priorities.

To make sense of this connection, we may have to go back a bit to 1993 when the need for a co-ordinating forum for the agencies involved in possum control led to the establishment of the National Possum Control Agencies (NPCA).

The fact that possum control at that time was going through a period of rapid expansion, meant that a co-ordinated approach would be necessary if consistent and high standards for possum control programmes were to be achieved.

So the NPCA forum was created where otherwise independent agencies could come together, resolve common issues, and work co-operatively on their solutions. This in turn, has assisted the process of taking a wider view on the on-going development and co-ordination of the systems for the possum control industry.

It is equally true that ideas are products of their time, and the early work of the NPCA tended to focus on the here and now problems. These included things like possum control technology, bait quality, operational matters, publicity and information materials, and public awareness work.

Such initiatives are still very important and are on-going, but they are rapidly being overtaken by higher order and more strategic tasks that address the quality and policy issues of the possum control industry itself.

More importantly they are also very much a product of their time, driven in part by new and impending legislation and the growing awareness among the agencies of how important quality assurance systems are to achieving the objectives for possum control.

This was reinforced recently by the very successful quality assurance workshop run by the NPCA with assistance from Landcare Research. The outcome of this workshop was agreement for the agencies to work together to develop quality assurance systems, the first stage of which is due to be implemented shortly.

Another example is the need for an overhaul of the Vertebrate Pest Control regulations, and in particular, for quality standards to be applied to the licensing and training of operators as well as for the management and use of toxins. The impending shift of these regulations from the Pesticides to the HSNO (Hazardous Substances and New Organisms) legislation in 1998 makes such a review an urgent undertaking.

It is the operational component of the Quality Assurance system in particular that has an indirect spinoff to research. The systematic documenting of quality standards for operating procedures and tasks will highlight gaps and problem areas that in many cases will have a research solution. Moreover, by viewing research needs in this way as part of an overall system it will provide a good basis to determine relative priorities.

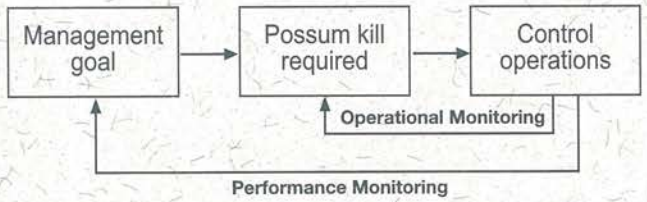
The possum control industry then, is changing its focus to deal with industry problems on a more strategic basis.

It can do this in part because of the ground work that has already been achieved in recent times, and in part because the timing is right. It is an idea whose time has come and reinforces the notion that the past and the present really do have a message for the future.

Maurice Kennedy *is the National Issues Co-ordinator, National Possum Control Agencies (NPCA), and is based in Wellington.*

Operational Monitoring

Pest managers should assess the effectiveness of control operations (against possums, for example) using two complementary techniques (see figure):



- **Operational monitoring** assesses whether control targets have been achieved (this article). This information enables pest managers to identify technical problems associated with operational failures and to decide whether commercial contract payments should be made.

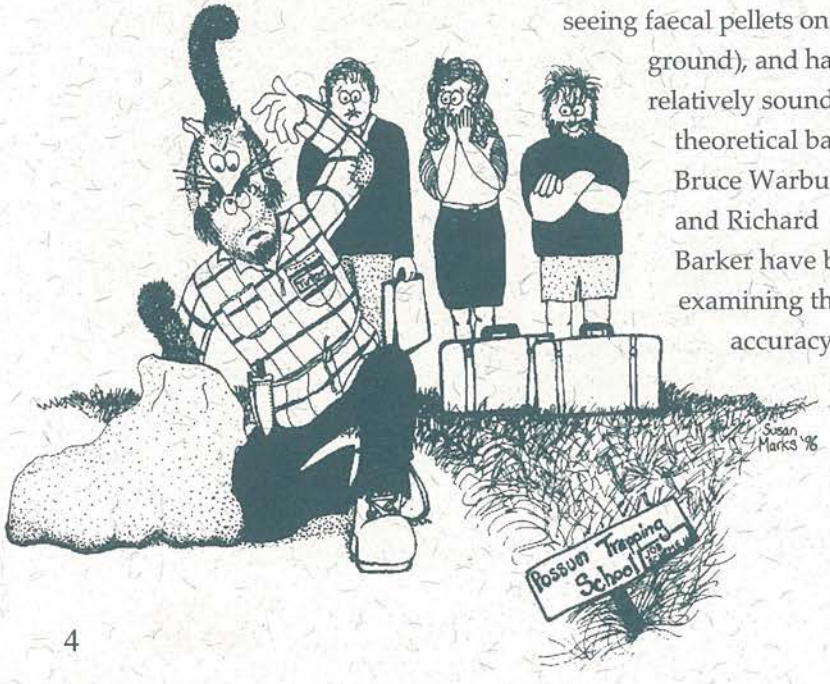
- **Performance monitoring** assesses how well the operation has protected a resource, e.g., native forest or a Tb-free cattle herd. Landcare Research has developed a number of monitoring systems for various resources, one of which is the Foliar Browse Index (next article), a method for assessing recovery of native vegetation.

In 1995, the Animal Health Board asked Landcare Research to develop a national protocol for monitoring possum populations. A workshop was held in late 1995 with participants from the Department of Conservation, regional councils, MAF Quality Management, and Lincoln University. Several methods for monitoring possum populations were evaluated (e.g., faecal pellet counts, spotlight counts, bait interference, and trap catch). Trap catch was selected as the favoured option because it could be used in a wide range of habitats, had good user acceptance (seeing possums in traps is more convincing than seeing faecal pellets on the ground), and had a relatively sound theoretical base. Bruce Warburton and Richard Barker have been examining the accuracy and precision of trap-catch methods and developing minimum standards for monitoring possum populations and possum control operations.

Trap-catch monitoring provides an index of possum abundance. This is commonly expressed as a percent catch (e.g., 20% or 20 possums per 100 trap nights). Because trap-catch is influenced by many environmental variables (e.g., weather, season, habitat), the national protocol that Bruce and Richard helped develop standardises trapping conditions as much as possible. It recommends trap spacings, the lure used, the number of traps set per line, trap-site selection, weather, and timing.

Operational monitoring estimates possum abundance over a large area from a few trap-lines. To ensure that monitoring lines are unbiased and not located in areas of easy access, the National Trap-Catch Protocol stipulates that the starting points of all trap lines are selected randomly.

Over the past eight months, the National Possum Control Agencies (NPCA), with Bruce as



a planning tutor, has conducted a series of courses for pest managers and commercial monitoring contractors on the National Trap-Catch Protocol. Participants receive tuition on the trap-catch method and on the rationale of robust sampling. After passing the course, they are certified as being able to implement a trap-catch monitoring programme, and can tender for possum population surveys called for by management agencies.

The courses were implemented to ensure that quality assurance standards in pest monitoring are met as part of the quality assurance programme being developed for all components of the pest management industry (see guest editorial). The courses are held throughout New Zealand and details may be obtained from Maurice Kennedy, the course director (see contacts and addresses).

Ongoing trap-catch research is funded by the Foundation for Research, Science and Technology.

***Bruce Warburton** and **Richard Barker** are in Landcare Research's Pest Impacts and Management team based at Lincoln.*

Monitoring Possum Damage to Forest Canopies

Techniques for monitoring the impacts of ground-browsing mammals in native forests are well established, but those for assessing possum damage to forest canopies are still in their infancy.

Over the last 5 years, the Department of Conservation has funded Ian Payton, Case Pekelharing, and Chris Frampton from Landcare Research to develop a Foliar Browse Index. The method uses ground-based observations of selected tree and shrub species to monitor damage being caused by possums, and forest recovery following possum control. It uses permanently marked trees to determine trends in foliage cover of canopies and possum damage to leaves and stems.

The Foliar Browse Index method has generated considerable interest amongst forest managers and researchers. To help people contemplating using the technique, Ian suggests the following points:

- Indicator plant species for assessing possum damage should be moderately

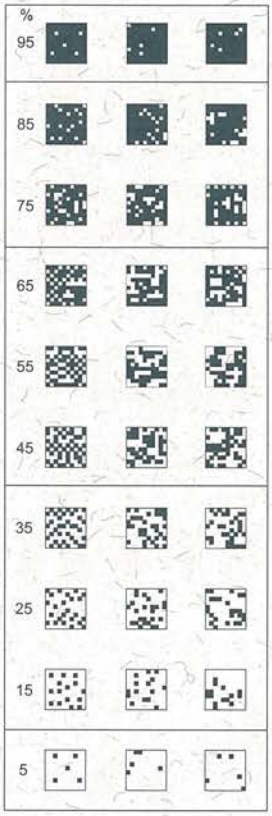


***Fig.1** The chart used to score foliage cover*

common, browsed by possums, and readily visible. Browsing damage is easier to see in larger-leaved, shorter-statured species (e.g., fuchsia, patē) than in small-leaved tall trees such as northern rātā or tōtara.

- Periods of rapid leaf growth or loss must be avoided, especially for deciduous species such as fuchsia and wineberry. At higher altitudes and in southern New Zealand, these species should be monitored only over a 3-4 month period in mid to late summer.

- Possum damage to leaves must be distinguished from that of insects or other causes (e.g., frost). For most indicator species, possum-browsed leaves are characterised by torn edges or jagged leaf stubs. Insect damage typically consists of holes and wavy, clean-edged cuts (caterpillars) or straight, finely milled edges (stick insects) (Fig. 2).

- Possum use of trunks and stems takes the form of scratching and bite marks, and is most readily visible on indicator species with soft, light-coloured bark (e.g., māhoe). It may be difficult or impossible to detect where stems are covered with vines (e.g., climbing rātā) or have hard (e.g., haumakāroa) or flaky (e.g., fuchsia) bark.

- Regular (e.g., annual) reassessment of trees is not necessary. However, because foliage cover and browsed leaves may vary seasonally, trees should be reassessed at the same time of the year as earlier assessments.

The Foliar Browse Index method is based on observations of foliage cover, browse, and possum use of trunks and stems. In each case, the observer makes an assessment against a standard reference scale. The 10-point scale for foliage cover is shown in Fig. 1. The three columns show different representations of foliage cover at each of the 10 points. Browse is assessed on a 6-point scale and stem or trunk use on a 5-point scale. This approach helps to obtain consistency between different observers.

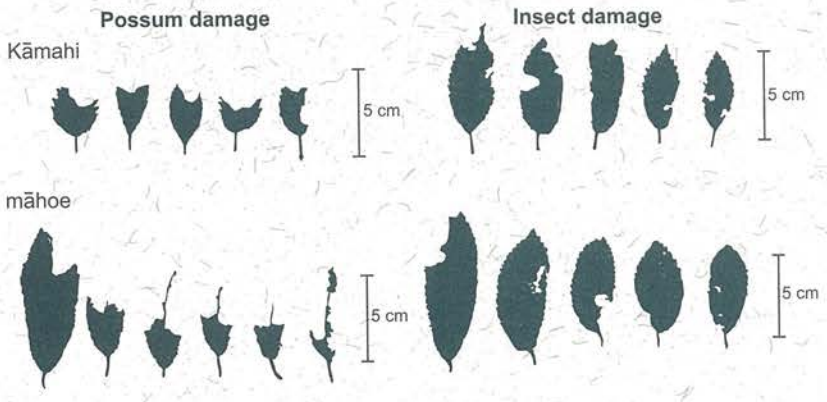


Fig.2 Possum and insect-damaged leaves of kāmahi and māhoe

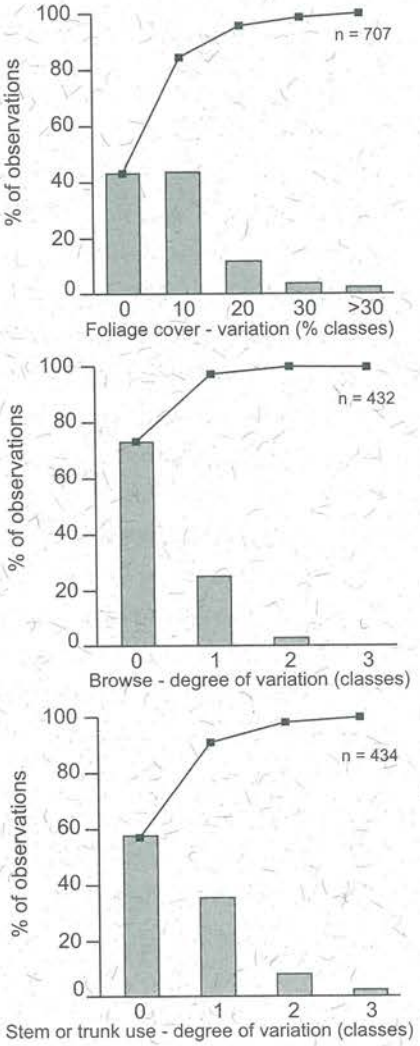


Fig.3 Variation between observers for assessing percentage cover, browse, and stem or trunk use in the Foliar Browse Index methodology. The line indicates cumulative totals.

To assess the reliability and repeatability of the method, Ian's team compared scores between observers working in

pairs. Fig. 3 shows the consistency obtained for the three types of assessment. In 42% of 707 comparisons of foliage cover assessment, the observers agreed. In a further 43% of comparisons, they differed by only one scale point. The level of agreement was even higher for browse (73% agreement, 97% within one scale point) and stem or trunk use (57% agreement, 91% within one scale point).

With both browse and stem or trunk use assessments, the main source of disagreement was between observers who ticked the "unable-to-score" box and those who decided there was no possum damage.

A full description of the method, including protocols for designing a possum damage survey, data collection forms and an analysis package is available from Landcare Research. For further information contact Ian Payton.

***Ian Payton** is in Landcare Research's Ecosystems South team based at Lincoln. **Case Pekelharing** is retired from Landcare Research. **Chris Frampton** (not shown) is now based at Lincoln University.*

Conference

The 11th Australian Vertebrate Pest Conference is to be held at the Lord Forrest Hotel, Bunbury, Western Australia, from 3-8th May 1998.

The conference will enable those involved in research, extension, management, and administration of vertebrate pests from Australia and New Zealand to exchange information covering a wide range of species, methodologies, and management strategies.

The committee is developing a comprehensive and innovative programme designed to examine the essential elements of vertebrate pest management including research, general biological, economic, extension, welfare, social aspects, or technological matters relating to pest animal management, as well as administrative and strategic planning issues.

To register contact the organisers:

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Colour Phases in Possums

Possums were imported from Australia to New Zealand in the nineteenth and early twentieth centuries to establish a fur industry in a country that was largely free of fur-bearing mammals. The sourcing of possums, their importation, and their liberation has been thoroughly documented (in 1962) by one of New Zealand earliest authorities on the species, Les Pracy. Les identified 36 importations of possums between 1837 and 1920. These animals and their offspring were liberated, legally and illegally, at over 384 sites throughout much of New Zealand.

Such liberations were generally very successful: within about 160 years possums had colonised all of New Zealand except the remotest parts of Fiordland and some off-shore islands.

The possums that were imported came mainly from Tasmania and Victoria, and included both grey and black-furred colour phases. Black possums were generally most favoured as they were believed to be larger, possess denser more marketable fur than grey possums, and to thrive better in areas of high rainfall and heavy forest. However, both colour phases were released widely in New Zealand, and current distributions of possums appear to reflect the nature of the original liberations.

The distribution of black and grey-phase possums in the North and South Islands

The distribution of grey and black-phase possums in New Zealand was also mapped by Les (see figure) but never published. In the North Island black possums are predominant in the Kaimai Range, Urewera National Park, and East Cape. Black possums are also predominant over much of the South Island including Westland (where grey possums rarely occur), Fiordland, and Southland, and on Stewart Island and in the Chatham Islands. By contrast, grey possums are predominant throughout most of the Auckland Province, and in the western and central North Island. Mixed populations occur in most areas of New Zealand and occur in roughly equal proportions in the Wairarapa and in parts of Otago.

The original interest in the distributions of black and grey-phase possums was driven by questions of fur marketing and natural history (was local

climate influencing the proportions of grey and black-phase possums in colonies containing both colours?). In contrast, recent interest in the distribution of both phases is driven by possible differences in biological performance (productivity and longevity), dietary preferences (grey-phase animals appear to predominate on farmland), and susceptibility to various strains of wildlife diseases or vertebrate toxins. If any such differences exist, local strategies for control may need to be adjusted, depending on the operation goals and the predominant colour phase of the possums present.

Les Pracy worked as a field biologist for the Wildlife Division (Department of Internal Affairs), the New Zealand Forest Service, and then as a field inspector for the Animal Pest Destruction Council. He is now retired and lives in Greytown. ***Jim Coleman*** *is a vertebrate ecologist and editor of* ***He Kōrero Paihama****. He is in Landcare Research's Pest Impacts and Management team based at Lincoln.*

'Bycatch' associated with Field Studies on Possums and Other Species

Each year Landcare Research undertakes numerous studies directed towards improving techniques for the monitoring and control of possum populations. Many of these studies involve field trials where possums are caught or killed. One of the consequences of this work is that non-target animals are also caught occasionally and Landcare Research is actively working to minimise this 'bycatch' and to ensure that any non-targets are dealt with humanely.

As a first step, Wayne Fraser and Oliver Sutherland are seeking to quantify the problem. Each year, they survey all research teams involved in catching possums and other wild animals to ask:

- Which non-target vertebrate species (and how many) are caught?
- How many of these animals are killed ?
- What is the fate of the remainder?

The number of 'capture' events engaged in by Landcare Research staff over the course of a single year is substantial (>100,000) and significant numbers (>1800) of non-target animals are taken with kill traps, leg-hold traps, and cage traps (see Table 1). Although there are no non-target captures recorded with the use of cyanide baits, some 'bycatch' probably occurs but is difficult to detect.

Almost 80% of the current 'bycatch' are introduced mammals. The remainder are introduced or native birds (see Table 2). With the exception of Australasian harriers and weka, the 'bycatch' of native species appears low. It does not include any threatened species. However, even the small numbers of native species caught are a concern. Most of the Australasian harriers were caught in leg-hold traps or cage traps set using meat baits for feral cats and mustelids. Most

Table 1. *Principal types of 'capture' used in 1995 and the extent of associated 'bycatch'.*

'Capture' technique	Target species	No. of events	No. of non-targets caught	Non-target capture rate (%)
kill traps	possums, rodents, mustelids, feral cats	49,830 trap nights	361	0.7
leg-hold traps	possums, mustelids, feral cats	34,366 trap nights	1110	3.2
cage traps	possums, mustelids, feral cats	24,275 trap nights	375	1.5
cyanide baits	possums	3770 bait nights	0	0.0

Table 2. *Species and numbers of non-target animals captured or killed in 1995.*

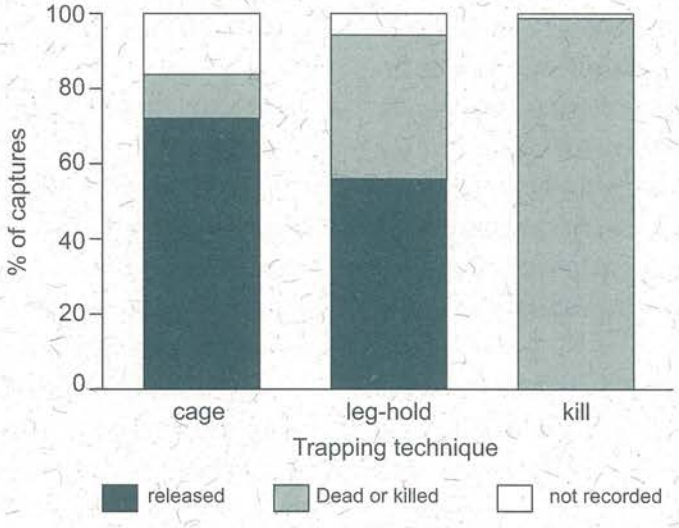
Native birds:	Australasian harrier (264), weka (44), morepork (1), bellbird (1)
Introduced birds:	magpie (45), blackbird (23), little owl (5), thrush (4), paradise duck (3), turkey (1)
Introduced mammals:	rat (671), hedgehog (444), possum (252)*, rabbit (31), ferret (19), sheep (19), feral cat (8), hare (7), stoat (2), goat (1), pig (1)

** These occurred where possums were not the target species.*

of these birds were released although some were injured.

Although kill trapping is the most common trapping technique used by Landcare Research, leg-hold trapping attracts proportionately more 'bycatch' than any other technique used. Approximately 3.2% of leg-hold traps set caught animals other than the target species, compared with 1.5% for cage trapping and 0.7% for kill traps.

Cage trapping is clearly the best technique used in terms of the proportion of the 'bycatch' that is released. Most animals caught in cage traps are released unharmed. However, it is not always practical to use cage traps, especially when working in remote areas or where large numbers of traps are needed. Leg-hold trapping is less acceptable because most of the non-targets captured were injured to a greater or lesser degree, although more than 50% were released. However, more than 400 non-target animals caught in leg-hold traps either died from trap-



Fate of non-target captures in 1995

caused injuries or were humanely destroyed because of their injuries. By comparison, kill trapping catches few non-target species but all are killed by the trap.

This information on 'bycatch' has been used to help develop codes of practice for selecting appropriate trapping techniques in field studies, and for dealing with 'bycatch' in a humane way. The recent wide acceptance (by the Department of Conservation and regional councils) of the National Trap-Catch Protocol, which uses leg-hold trapping for monitoring possum control operations, has probably resulted in an increased 'bycatch' in official operations. Therefore, strategies that reduce 'bycatch' will be important in both research and management activities.

This work is funded by Landcare Research.

__Wayne Fraser__ is in Landcare Research's Pest Impacts and Management team based at Lincoln. __Oliver Sutherland__ is the General Manager of Landcare Research's Weeds and Pests operating group also based at Lincoln.

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A Selection of Recent Possum-Related Publications

Booth, L.H.; Ogilvie, S.C.; Wright, G.R.; Eason, C.T. 1997: Water quality monitoring after 1080 pest control operations. *Water and wastes* 96: 22.

Brockie, R.E.; Ward, G.D.; Cowan, P.E. 1997: Possums (*Trichosurus vulpecula*) on Hawke's Bay farmland: spatial distribution and population structure before and after a control operation. *Journal of the Royal Society of New Zealand* 27: 181-191.

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Payton, I.J.; Forester, L.; Frampton, C.M.; Thomas, M.D. 1997: Response of selected trees to culling of introduced brushtail possums at Waipoua Forest, Northland, New Zealand. *Biological conservation* 81: 247-255.

Ross, J.G.; Hickling, G.J.; Morgan, D.R. 1997: Use of sub-acute and chronic toxicants to control sodium monfluoroacetate (1080) bait shy possums. *Proceedings of the 50th New Zealand plant protection conference*: 397-400.

Sweetapple, P. 1997: How has 1080 poisoning affected hunting in Pureora North Block? *Maniatoto district hunters newsletter.* Department of Conservation.

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