He Korero Paihama
Possum Research News

Issue 6 *March 1997*

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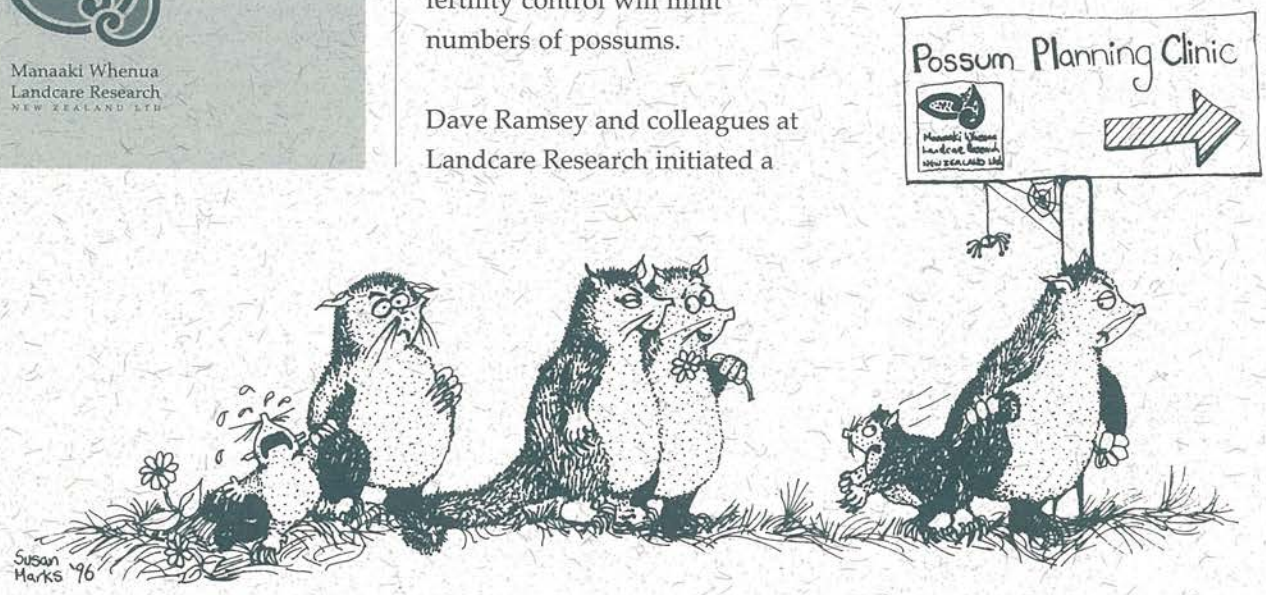
Manaaki Whenua
Landcare Research
NEW ZEALAND LTD

Reducing Possum Fertility – Will it Control Possum Numbers in the Wild?

Biological control using contraceptive vaccines to make female possums sterile could provide a long-term, cost-effective but non-toxic solution to the New Zealand possum problem. However, we do not know whether reducing breeding in this way will actually result in lower possum populations. Research in Australia on the effects of fertility control on rabbits has shown that sterilising 80% of females did not significantly lower rabbit numbers, as the survival of young rabbits improved. While possums do not breed at the same rate as rabbits, there is still an obvious need to determine what level of fertility control will limit numbers of possums.

Dave Ramsey and colleagues at Landcare Research initiated a large-scale field trial looking at the effect of various levels of sterility on possum numbers in the wild. Current models predict that about 70% of female possums must be sterile to obtain a population decline acceptable to pest managers. To test the modelling predictions, Dave will be comparing the effects of two levels of female sterilisation (50% and 80%) with breeding success in unsterilised populations.

In late 1995, Dave's team established three sites (unsterilised, 50% and 80% of female possums sterilised) in the Orongorongo Valley near



Young possum joey, removed from its mother's pouch

Wellington, and three in the Turitea catchment near Palmerston North. Females were sterilised at each site in early 1996 by surgically removing a section of each oviduct under general anaesthesia – a method which should mimic the likely action of a biological control agent. The control sample (non-sterilized) underwent abdominal placebo surgery. Results collected to date indicate that the surgical operations had no effect on the survival of possums. Other data collected includes changes in numbers, rate of breeding, survival, and recruitment of possums at each site using capture-mark-release methods and analysis. This data will allow the team to detect any increase in breeding rates or earlier breeding or survival that could cancel out the effects of fertility control.

In June/July 1996, breeding success at each study site was recorded to assess how successful the sterilisation treatments were. Initial results indicate that while breeding was suppressed on sites with sterilised females, lower than average breeding was recorded on control sites (also recorded elsewhere in the Wellington region).

Because fertility control depends on natural mortality to reduce possum numbers, it will take longer to produce an effect compared with conventional control. The basic premise is simple, the level of recruitment to the population through breeding and immigration needs to be lower than the mortality rate before populations decline. Thus changes in the population will only occur at the same rate as population turnover. For possums, Dave predicts that the experiment will need to run for at least 5 years before he can determine the extent to which fertility control is successful.

This research is funded by MAF Policy and the Cooperative Research Centre for the Conservation & Management of Marsupials.

__Dave Ramsey__ is an ecologist with Landcare Research's Wildlife Ecology: Tb and Biocontrol team based at Palmerston North and is currently working on the effects of fertility control on possum population dynamics, social organisation and mating strategies.

Editorial

Does possum control actually produce worthwhile conservation benefits? We often presume that it does because of the mass of anecdotal information and research pointing to possums as a serious conservation pest in native ecosystems. However, presuming things is not adequate justification for the many millions ($11.7 million in 1996/97) spent annually to protect conservation values. Hard evidence is needed, for two reasons. First we need to demonstrate real success to ensure that the Government maintains its commitment to possum control. Secondly, we need to know how complex ecosystems actually respond to possum control so that control efforts can be made more efficient and effective. For these reasons, several major Manaaki Whenua - Landcare Research projects focus on determining what happens after possum control and results from two of those projects are presented in this newsletter.

Despite the long history of possum control, there are surprisingly few clear examples of the conservation benefits of possum control. The clearest evidence comes from "special" situations such as Kapiti Island where possums have been completely removed, resulting in many more birds, healthier trees and improved regeneration. Similarly, in island-like places such as Mapara Forest in the central North Island, intensive control of all vertebrate pests has successfully reversed the decline in kōkako numbers (although not all of this benefit came from possum control alone). For large mainland areas subject to less intensive control, however, the benefits seem less striking. In Waipoua Forest in Northland, for example, the condition of the canopy of susceptible tree species did not recover after possums were controlled, although there was no further deterioration (see article in this issue on 'Vegetation Recovery after Possum Culling'). In the Waihaha catchment, west of Lake Taupo, a major reduction in possum density in 1994 resulted in the unexpected resurgence of a previously undetected mistletoe, and in an improvement in canopy condition for Hall's tōtara (*Podocarpus hallii*) and toro (*Myrsine salicina*) but not for kāmahi (*Weinmannia racemosa*) (see article in this issue on 'Forest Recovery Following Possum Control at Waihaha'). Overall, ecosystem responses to large-scale possum control have been variable and unpredictable.

We know even less about the relationship between possum densities and their impacts. At one extreme, it seems that the presence of just a single possum may be too much for highly vulnerable species like *Dactylanthus* (the wood rose) - even a 95% kill is simply not enough to protect this species. At the other extreme, heavy mortality of northern rata (*Metrosideros robusta*) in the Orongorongo Valley is associated with periods when possum numbers are above their long-term average, so a 50% reduction in possums could well protect rata there.

These few results show that the relationship between possum impacts and possum density may vary immensely. Monitoring how ecosystems respond after possum removal must become an integral part of control operations, because ultimately it is the only way the actual effectiveness of such operations can be objectively assessed. Our short- and medium-term research goals in this area are to provide better 'tools' for such performance monitoring, and to provide some of the detailed examples needed to justify Government spending in possum control. Our long-term goal is to synthesize the mass of area-specific detail into a general "response-to-control" model to replace the present seat-of-the-pants presumption that all possum control is beneficial.

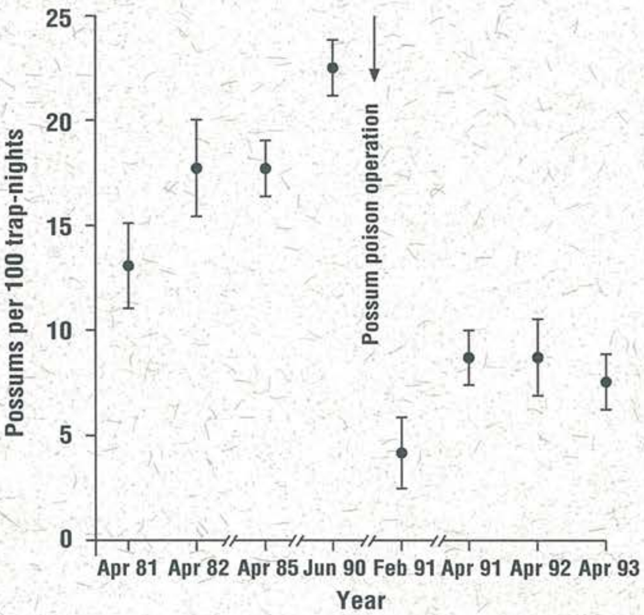
Graham Nugent *is Team Leader for the Pest Impacts and Management Team of Landcare Research based at Lincoln.*

Vegetation Recovery After Possum Culling

Aerial application of 1080 has been used to reduce possum populations for nearly 40 years – primarily to protect native forests. Despite this, there have been few studies of vegetation response following possum population reduction.

In 1990, Ian Payton of Landcare Research and Lisa Forester of the Northland Conservancy of the Department of Conservation set up a study to determine the extent of vegetation recovery after an aerial 1080 operation at Waipoua Forest in Northland. Canopy defoliation and possum damage to foliage and stems was monitored in 8 native tree species within the poisoned area, and in adjacent native forests where no possum control was undertaken. Trees were assessed before the poison operation, and annually for the next 4 years. Possum densities were estimated from trap-catch rates recorded during a study of population trends undertaken during the 1980s by Ian's colleague, Malcolm Thomas, and then from annual trapping after the poison operation.

Possums were first noted in Waipoua Forest in 1960, and by 1990 had reached densities reflected by a catch per 100 trap nights of 22.4. The poison operation reduced the trap catch by an estimated 87%, and ongoing trapping held it at 7-9 per 100 trap nights (about one-third of pre-control density) over the next 3 years (see above graph).

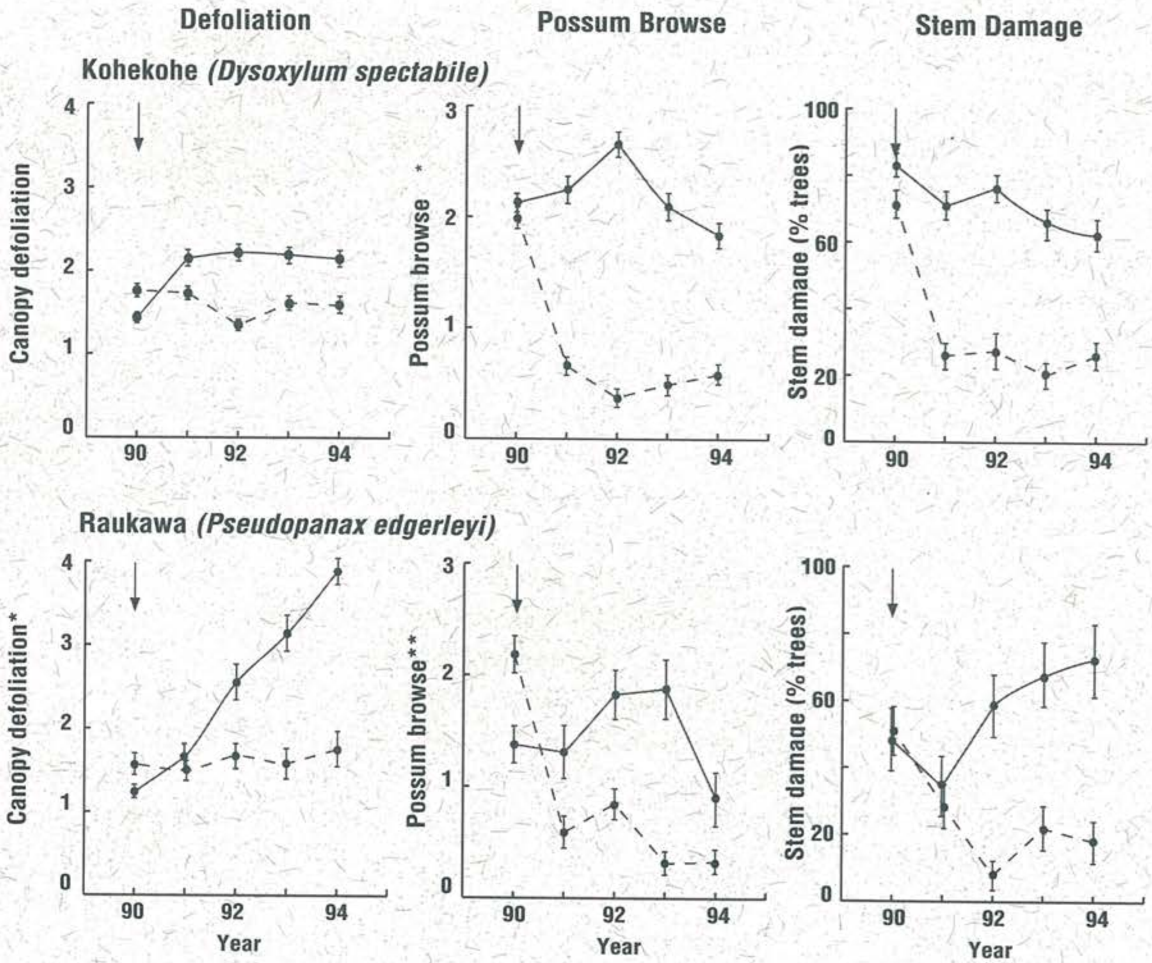


Changes in the trap catch index of possum density at Waipoua forest between 1981 and 1993 (mean +/- standard error)

The reduction in possum browsing which followed the poison operation halted the ongoing decline in canopy condition (still evident in nearby forests where possum densities had not been reduced) and improved the condition of some severely browsed trees. However, the control operation did not produce any significant short-term canopy recovery (see graph on p.5). Other measures of possum impact (browsed foliage, stem damage) showed significant improvement within a year of the poison operation, and these may prove to be more sensitive short-term indicators of forest recovery. A similar lack of vegetation response following possum control has been recorded from rata-kāmahi forests in Westland.

By contrast, on Kapiti Island where possums were eradicated between 1980 and 1986, the improvement in canopy condition was dramatic. The apparent ability of residual possum populations to retard vegetation recovery has important implications for intermittent poison operations intended to maintain forest health. While a large initial population reduction is required to halt vegetation decline, residual possum populations must be kept to very low levels for significant vegetation recovery.

Targeting the increased resources now available for



* 1=<1/3 foliage lost, 2= 1/3-2/3 foliage lost, 3= 2/3 foliage lost, 4= few leaves remaining

** 1= a few browsed leaves, 2=<1/3 leaves browsed, 3=1/3-2/3 leaves browsed, 4=>2/3 leaves browsed

Changes in canopy defoliation, possum browse and stem damage of kohekohe and raukawa in poisoned (- - -) and non-poisoned (—) areas between 1990 and 1994 (mean +/- standard error). The arrow indicates the timing of the poison operation.

reducing possum populations to fewer areas of higher conservation value, may well return greater ecological dividends than attempts to sustain long-term reduction of possum populations over large areas of more modified native forests.

This research was funded by the Foundation for Research, Science, and Technology and the Northland Conservancy of the Department of Conservation.

Ian Payton *is a Plant Ecologist in Landcare Research's Ecosystems South team based at Lincoln.*
Lisa Forester *is a Conservation Officer, Flora, for the Northland Conservancy of the Department of Conservation, based at Whangarei.*

Radio-Tracking Possums

Did you know that the first wild animal to carry a radio transmitter in New Zealand was a possum? It was fitted on 17 December 1968, in the Orongorongo valley near Wellington. The transmitter ran on a pen-light sized mercury battery and weighed a massive 80 g. It had a range of about 100 m and a life of three months.

That huge, grossly inefficient transmitter carried by a rather stressed possum was built by Larry Keuchle who, seventeen years later, left research to start "Advanced Telemetry Systems" in Minnesota. It was built as a demonstration for Dave Ward who now manages Sirtrack Ltd (a subsidiary of Landcare Research), which manufactures telemetry equipment for a wide range of uses. And as for the possum – it survived the experience to become the first of many hundreds of possums that were, and still are, being radio-tagged in the Orongorongo valley.

The technology has been applied to many other species and since 1968 radio-tracking has advanced considerably. A major shift in frequency from 27MHz to 160MHz during the seventies did much to improve the performance of the equipment, and possum trackers no longer had their nightly beep-beep-beeps interrupted by citizen band radios operating on similar frequencies. A typical transmitter package for possums today weighs around 25 g, will run for 15 months, and has a range of several kilometres. Furthermore, the transmitter can be fitted with options to sense such things as body temperature, heart-rate, sound, or death. New types of transmitters will turn themselves on at predetermined times, or will turn themselves on and off in a cyclical way to prolong battery life. Today Sirtrack transmitters are used on more than two hundred species of wildlife living in a wide range of habitats around the world. Notable examples include frogs living in the Alaskan tundra, antelope in swamps in East Africa, camels in deserts in North Australia, wētā in rain forests in New Zealand, and penguins on ice floes and in the sea about Antarctica.

Progress with other radio-tracking equipment has been more variable. Receivers are shrinking and becoming even more portable but the efficiency of tracking antennae is about as good as it is going to get. Users really are stuck with their current size for the time being.

Possum fitted with a radio collar.

***Dave Ward** is Manager of SIRTRACK Ltd based at Havelock North.*

Research Notes

POSSUM PRODUCTS MARKETING COUNCIL INC.

Although possums are recognised by most New Zealanders as a serious conservation and animal health pest, some people still view them as the fur resource for which they were originally introduced from Australia. To attempt to capitalise on the potential marketable products of possum fur, meat, fibre, and leather, a charitable trust was established in 1996 to increase the demand for possum-based products and incidentally increase commercial control pressure on possum populations. By identifying new products, new markets, and developing a co-ordinated approach to product marketing, the Possum Products Marketing Council hopes to achieve a high but sustainable demand for possum-based products. The Council has established three sector groups (meat, fibre, and fur) to address the specific problems of these products. The Council and sector groups have representatives from the major fur exporters, fibre and meat producers, employment agencies, TRADENZ, and Landcare Research.

For further information regarding the Possum Products Marketing Council contact Neil Allan, RD1, Otara Rd, Opotiki. Phone 025 787 885

CAMPAIGN® POSSUM BAITS FIND FAVOUR

Campaign® possum baits which contain cholecalciferol are finding favour with hunters. The February edition of TANNZ (1080 Action Network NZ) newsletter heralded Campaign® as a useful "tool" in the possum control "kit-bag". Campaign® baits are a relatively new tool, being first available in 1995/96. They are formulated as cereal baits for use in bait stations.

The main advantage of Campaign® bait is the low risk of secondary poisoning of dogs from eating carcasses poisoned by this toxicant (primary poisoning of dogs may also occur). The TANNZ review points out that: "It is expensive compared with 1080, but if it is used to best advantage, it can achieve a very good result and be cost-effective. The possum only needed to eat a small amount of bait (10–20 g) to receive a lethal dose."

For further information on product availability contact Ross MacLean, Key Industries Ltd, P.O. Box 34373, Birkenhead, Auckland. Phone (09) 483 5526. Fax (09) 483 39760.

FERATOX® LAUNCH IMMINENT

In April 1996 *He Kōrero Paihama - Possum Research News* first reported a novel cyanide pellet developed through the collaborative efforts of Feral Control Ltd, Auckland, Landcare Research, and the Animal Health Board.

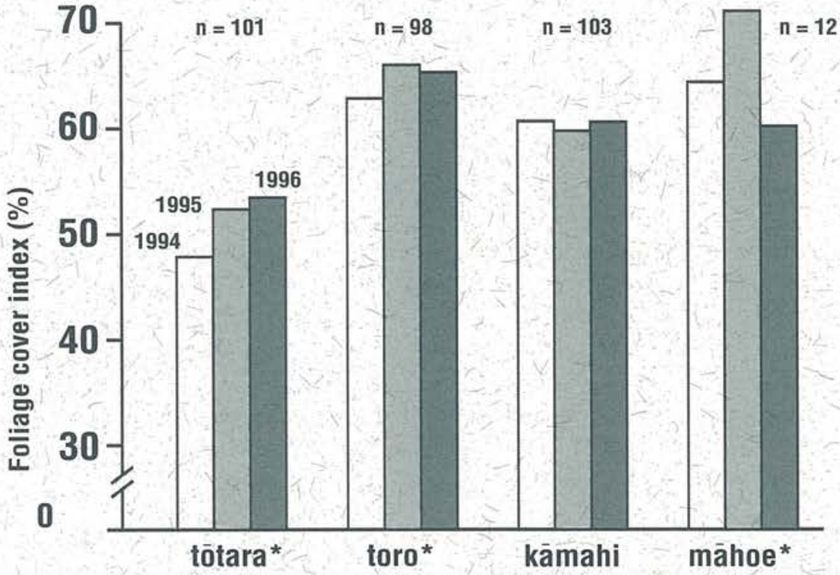
The Feratox® pellets are very rapid in action and field trials have how demonstrated them to be extremely effective. This new product will be distributed nationally from Wrightson and other stock and station outlets, following a product launch in April/May. As part of the launch activities Feral Control will hold seminars throughout New Zealand on using the product.

Additional information is available from Feral Control NZ Ltd, P.O. Box 58613, Green Mound, Auckland. Phone (09) 273 4336. Fax (09) 273 4334

Forest Recovery Following Possum Control At Waihaha

What happens to native forest after possums have been controlled? It is easy and logical to assume that it "recovers" or "improves", but does it? Building on previous research in the area, Graham Nugent, Peter Sweetapple, Case Pekelharing, and Wayne Fraser have monitored changes in the forest canopy in the Waihaha catchment, west of Lake Taupo, since possum numbers were reduced by 95% (from 3/ha) in 1994. They measured possum densities, and the amount of possum browse and foliage cover in the crowns of six tree species preferred by possums at the time of the control operation, and again one and two years later.

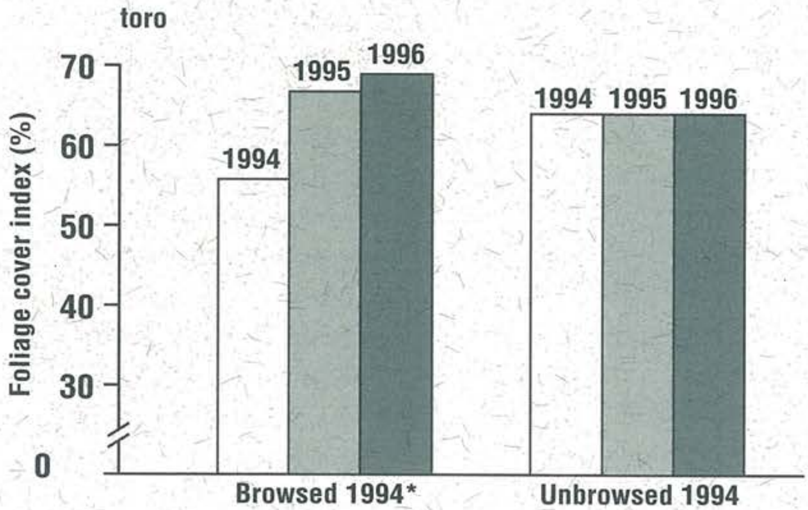
Previous research had shown that tōtara (*Podocarpus hallii*), kāmahi (*Weinmannia racemosa*) and toro (*Myrsine salicina*) were the main local possum foods and that, although uncommon in the study area, māhoe (*Melicytus ramiflorus*) was also heavily browsed. In 1994, 50% of tōtara and māhoe and 20% of toro and kāmahi trees were browsed by possums. Since then virtually no browse has been recorded on any of these tree species, indicating a massive reduction in possum browse pressure. In contrast, the changes in foliage cover since 1994 have been small (see graph above), with small increases for tōtara and toro, but no change for kāmahi. Interpretation of the patterns for māhoe was complicated by heavy insect browse in 1996.

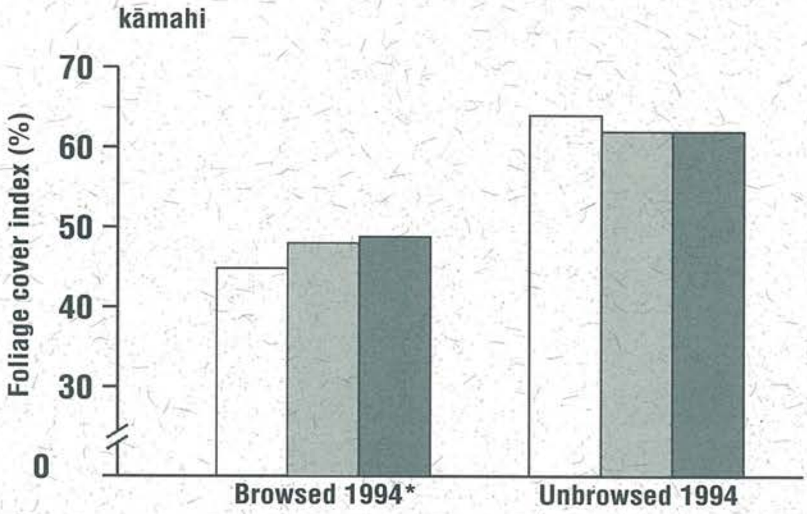


Mean foliage cover scores for four possum palatable tree species at Waihaha.
** indicates significant differences between years*

Within species, recovery patterns differed between individuals. For toro, the individual trees being browsed in 1994 had lower foliage cover scores than unbrowsed trees, but these browsed trees rapidly recovered (see graph on p. 9). In contrast, changes in foliage cover for the 20% of kāmahi trees being browsed were small, despite these values being much lower than for unbrowsed kāmahi.

Overall the changes in foliage cover are not readily apparent to the eye, except perhaps for the new growth on tōtara. However, there have been two other more visually striking responses to possum control. A parasitic mistletoe (*Tupeia antarctica*), which was previously unrecorded from the study area, has been found in several locations since 1994. Similarly, young fuchsia (*Fuchsia excorticata*) up to 3 m tall can now be found throughout the study area on sites inaccessible to deer. Before 1994, seedlings rarely exceeded 30 cm. Possums had almost eliminated adult fuchsia from the study area many years ago, so its widespread reappearance was surprising.





Changes in mean foliage cover scores over three years for trees browsed and unbrowsed by possums in 1994.
** indicates significant differences between years*

Small changes in the condition of the main possum food species and the unexpected reappearance of other plants illustrate how difficult it is to predict the outcomes of pest control, and highlight the need to determine actual as opposed to presumed benefits.

This research was jointly funded by the Department of Conservation and the Foundation for Research, Science and Technology.

Department of Conservation

Foundation for Research, Science and Technology




Graham Nugent, Peter Sweetapple, *and* ***Wayne Fraser*** *are all in the Pest Impacts and Management team of Landcare Research based at Lincoln.* ***Case Pekelharing*** *has recently retired from Landcare Research.*

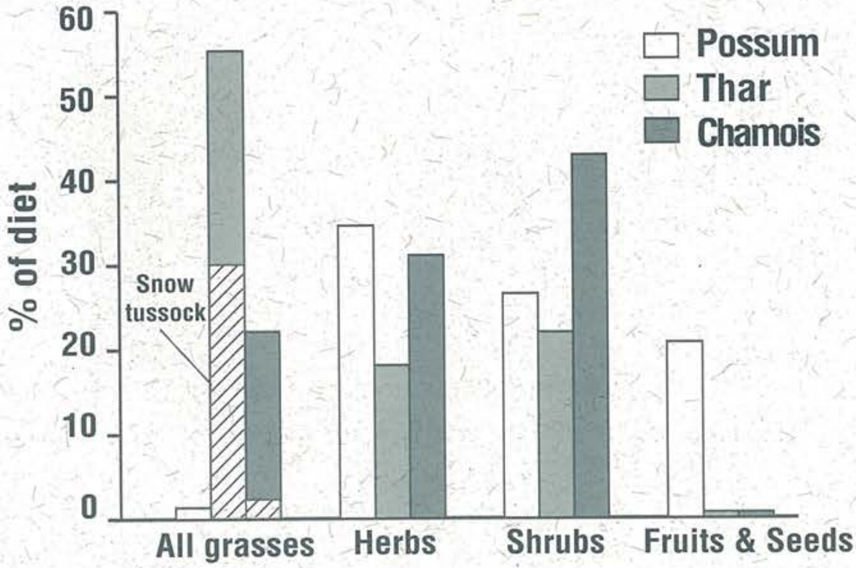
Diet of Possums in the Southern Alps

Possums are widespread and apparently quite abundant in some alpine habitats in New Zealand, although their densities have never been measured. In grassland and shrub habitats such as in the Southern Alps, all or most of the vegetation is physically in reach of all of the herbivores present at some stage of the year. Possums in alpine habitats, therefore have to share all or most of their potential food resource with other introduced species such as Himalayan thar, chamois, and hares.

Currently, the Department of Conservation actively manages Himalayan thar in the central part of the Southern Alps. The target densities for these alpine goats are set at no more than 2-3 animals per km^2, above which the Department may intervene with additional control measures. The easiest way to monitor the effect of thar populations on their mountain habitat is to measure populations of bioindicator plant species (ideally those eaten only by thar). These bioindicator populations would improve or degrade depending on the density of thar present.

John Parkes, Morgan Coleman, and Caroline Thomson looked at which plant species were eaten by thar, chamois, and possums in an alpine habitat (see graph). They found that thar ate mostly grasses including snow tussocks (*Chionochloa* spp.), and some woody plants (particularly *Gaultheria* spp.) but few herbs. Chamois ate mostly herbs (particularly the Mt Cook lily - *Ranunculus lyallii*) and woody plants (particularly native brooms - *Carmichaelia* spp., along with *Gaultheria* spp., and *Hebe* spp.), with only a little grass that rarely included snow tussock (see graph). In contrast possums ate mostly woody shrubs (snow tōtara - *Podocarpus nivalis* formed 16% of their diet and was particularly eaten during winter), herbs (hawkweed - *Hieracium* spp. formed 10% of their diet), and fruit (those of snow tōtara, *Coprosma* spp., *Muehlenbeckia axillaris*, and *Aristotelia fruticosa*, together formed 16% of their diet). Possums ate virtually no grasses (less than 1% their diet).

So despite their origins on three different continents, possums (from Australia), thar (from the Himalayas), and chamois (from Europe) living in the Southern Alps behave as though they had evolved together, i.e., they partition their food resources and so minimise competition. This will make it easier to select plant species as bioindicators of the impact of each animal - possibly using snow tussock for thar, Mt Cook lily for chamois, and snow tōtara for possums.



Proportion of major food types in the diet of sympatric alpine possums, thar, and chamois.

However, these research findings also mean that if managers want to protect the whole range of plants in the alpine ecosystem, they will need to consider management of all the introduced herbivores.

This research was funded by the Department of Conservation.

***John Parkes, Morgan Coleman** and **Caroline Thomson** are all in Landcare Research's Pest Impacts and Management Team based at Lincoln.*

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A Selection of Recent Possum-Related Publications

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Editors: Jim Coleman, Caroline Thomson

Editorial Assistance: Judy Grindell

Layout: Thomas Pearson

Cartoon: Susan Marks

Published by: Manaaki Whenua Landcare Research, PO Box 69, Lincoln, New Zealand, ph +64 3 325-6700, fax +64 3 325-2418

ISSN 1173 - 2784