He Kōrero Paihama Possum Research News

Issue 2 March 1995

CONTENTS

Manaaki Whenua
Landcare Research
NEW ZEALAND LTD

Editorial

Manaaki Whenua Landcare Research's new publication, **He Kōrero Paihama - Possum Research News**, was published for the first time in December 1994. Through it, we aim to keep our clients, stakeholders and research colleagues better informed about our latest in-house possum research findings and activities, and to a lesser degree, the happenings in possum research outside Landcare Research in both New Zealand and Australia. To do this, we have established a complementary and comprehensive mailing list of about 800 interested parties. If you fall into one of these three groups, would like to receive a personal copy of **He Kōrero Paihama - Possum Research News**, and have not done so yet, then please let us know. We also welcome comment and enquiries on the composition and content of our publication. Response to date has been gratifying but rather muted - we welcome more and promise a rapid reply where necessary.

About one half of possum research undertaken in Landcare Research, is funded by the Foundation for Research, Science, and Technology (FRST), with input from the National Science Strategy (NSS) committee on Possums/Bovine Tb. Our most significant programmes are:

- Wildlife reservoirs of bovine Tuberculosis
- New Products for Pest Control
- Integrated Management of Vertebrate Pests
- Impacts of Introduced Forest Herbivores, and
- Forest Ecosystems: decline and sustainability.

The NSS goals are the elimination of possums from New Zealand and the elimination of feral and wild animals as reservoirs of bovine Tb. These goals and the underlying science programmes listed above, suggest Central Government funding agencies have a long-term commitment to possum research.

The other half of our possum research is funded principally by the Animal Health Board and Department of Conservation, with lesser contributions from a wide range of land and pest management agencies. We will give a

breakdown of the main areas of this research in a subsequent issue.

This second issue of **He Kōrero Paihama - Possum Research News** includes a variety of possum research studies along with a report on an important new link established with Australian research institutes. We introduce the latest staff to join Landcare Research's possum effort and list a selection of the most recent publications on possums put out by Landcare Research.

***Jim Coleman**, Team Leader, Integrated Pest Management, Landcare Research, Lincoln.*

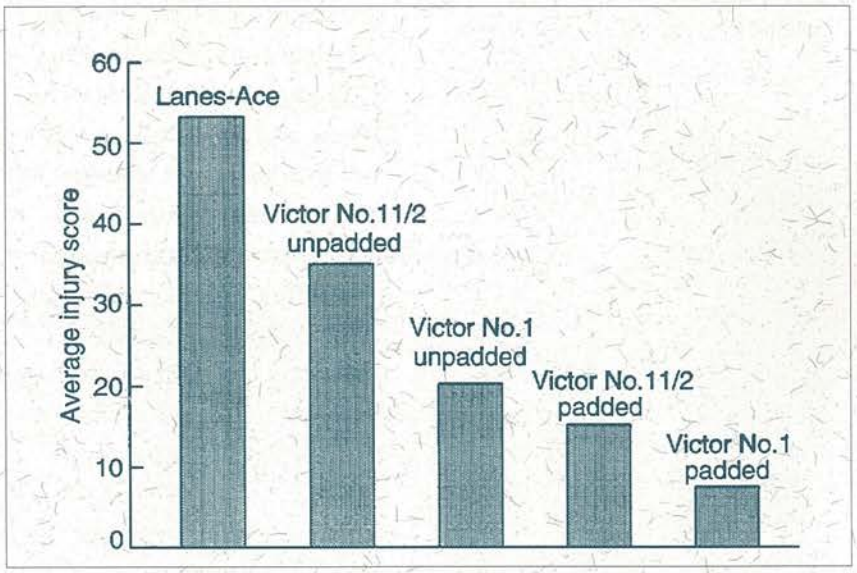
NEW TRAPPING STANDARDS FOR POSSUMS

Animal traps are probably as old as humankind itself. Today, they are widely used to protect native forest communities and farm stock from the plague of possums present throughout New Zealand. Traps and trapping, however, generate considerable public controversy and the long-term use of traps is uncertain because of their perceived cruelty to captured animals.

Over the last 10 years, Bruce Warburton, has been evaluating the performance and humaneness of all traps available in New Zealand for use against possums in an attempt to find a replacement for the commonly used but undoubtedly inhumane Lanes-Ace gin (rabbit) trap.

Bruce has been examining both kill and leg-hold traps. Kill traps kill captured possums quickly and are generally considered to be more humane than leg-hold traps which hold possums until a trapper arrives to kill them. That problem notwithstanding, leg-hold traps remain the mainstay of trappers in New Zealand because of their small size and because they consistently catch possums more efficiently than do kill traps.

Bruce's research has centred on an evaluation of the effectiveness of padded leg-hold traps while he continues to search for a kill trap which captures possums as efficiently as leg-hold traps. Field trials of 3 leg-hold traps - the Victor No. 1 unpadded and Victor No.1 and No.1˚ padded Soft Catch significantly reduce trap injuries from the frequent fractures and lacerations caused by the Lanes-Ace trap (12% fractures and 62% lacerations) to only minor bruising and lacerations (0% fractures, 10% lacerations) by the No. 1 Soft Catch.



Evaluation of padded and unpadded leghold traps in relation to injuries sustained by trapped possums.

Unfortunately Soft Catch traps allow a higher number of possums to escape, and the research is looking at ways of minimising this problem.

Bruce's research on kill traps used equipment developed by Industrial Research Ltd Christchurch, to determine the minimum impact and clamping forces required to kill possums quickly. Most kill traps currently available in New Zealand do not deliver enough force to always kill possums quickly. However, latest research results will assist manufacturers to design traps with the forces necessary to kill humanely. Of 4 kill traps mechanically tested at Industrial Research Ltd and then tested on penned possums by Landcare Research staff, only 2 performed satisfactorily enough to progress to field testing. One, the Canadian-developed LDL 101 trap, modified for possums, consistently caught possums across the neck and killed them quickly (<3 min), and had a capture efficiency within 80% of that achieved by the best leg-hold traps. This result showed that it is possible to design a light-weight, compact kill trap that captures possums efficiently and humanely, and is likely to be accepted by most New Zealanders concerned with possum harvesting or control.

A possum kill trap, the modified LDL 101 trap, which has a high capture efficiency and meets the draft standard humane requirements. It is not currently available in New Zealand.

Bruce's involvement in trap research has led to his participation on an international committee which is developing worldwide minimum standards for efficient and humane traps and trapping. The group which comprises representatives from 13 countries, seeks to develop some compromise between trap users who do not want to lose the tools of their trade, and animal welfare groups, some of which are seeking the abolition of trapping and the fur trade. Hopefully, research such as that undertaken in New Zealand, and a rational approach by the committee, will result in standards being established for traps which address the concerns of both groups.

This research was conducted with the approval of the Landcare Research Animal Ethics Committee and was funded by the Foundation for Research, Science and Technology.

***Bruce Warburton** is a vertebrate ecologist in Landcare Research's Integrated Pest Management Team at Lincoln and works on a wide range of techniques and strategies for the improved control of mammal pests.*

Possums Prey on Native Fauna

Possums kill native birds and insects. Recently, John Innes used time-lapse video to record possums eating kokako eggs and killing chicks. Possums caused four of the 19 nests that were filmed to fail. John believes possums were probably responsible for 10 of the 33 instances of predation during his 4-year study. Possums have also been observed killing or eating eggs, chicks or adults of at least 5 other native birds.

Why were possums not discovered to be bird nest predators until now? It is possible that this predatory behaviour is new and only a few individual "rogue" possums are responsible. However, it is more likely that with new technology such as time-lapse video, we can look more closely and record behaviour that was unknown previously. If possums do not swallow eggshell or feathers, evidence of bird predation will not show in gut content or faecal analysis, so nest damage by possums in the past was usually attributed to ship rats.

However, faecal analysis has shown that possums do eat our native invertebrates. Possum faeces examined over a 5-year period from the Orongorongo Valley contained remains of many invertebrates, especially larger insects such as weta. Eating large invertebrates is unlikely to be accidental. Species most at risk are small localised populations of large-bodied, relatively sluggish, nocturnal species that are easy to find. For example, feeding trials established that possums chew neatly through the shell of one of our large, native snails *(Powelliphanta)*, confirming earlier evidence from faecal analysis.

Evidence of possums preying on native invertebrates and birds has turned up in studies that were not looking specifically for possum predation. Remarkably little is known about the causes of death in native animals as in the past, there were few accurate field techniques available for researchers to assess this. However, the success of time-lapse video in recording possums disturbing kokako nests demonstrates the usefulness of modern electronic surveillance. Information can be collected easily by remote recorders working day and night. However, electronic surveillance in the field is still in its infancy and these techniques need to be developed further with assistance from both electronics experts and animal researchers.

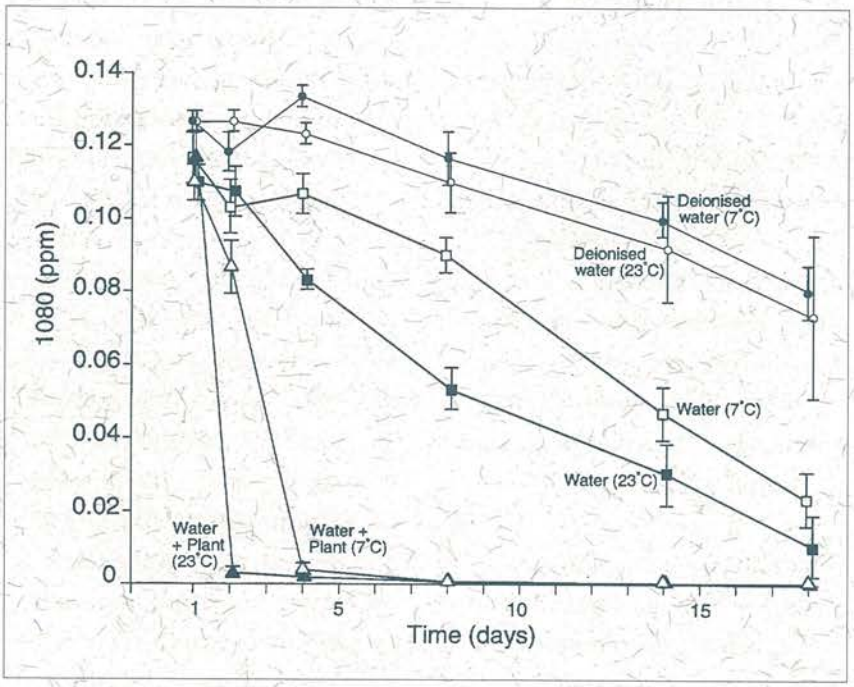
This research was collaborative between Landcare Research and Department of Conservation staff and was co-funded by the Department of Conservation and the Foundation for Research, Science and Technology.

John Innes *is currently working on predation of forest birds, controlling rats on the mainland and managing the recovery of North Island kokako populations. He is in Landcare Research's Conservation Biology Team based in Hamilton.*

Fate of Sodium Monofluoroacetate (1080) in aquatic systems.

Sodium Monofluoroacetate (1080) is the most widely used vertebrate pesticide in New Zealand and this has aggravated concerns over its fate in the environment.

Recent aquarium experiments by Shaun Ogilvie have shown that 1080 is detoxified in streamwater at varying rates, depending on the temperature of the water and the presence of aquatic plants and micro-organisms (Fig. 1). Experiments showed that in the presence of the endemic plant (a water milfoil *Myriophyllum triphyllum*), an amount of 1080 equivalent to that found in 2-3 normal possum baits put into 80 litres of water (from the Waimakariri river) was very largely detoxified within 2 days at 23°C and within 4 days at 7°C. In aquaria containing streamwater free from macroscopic aquatic plants but containing micro-organisms, 75% of the 1080 was detoxified after 14 days at 23°C, and 61% detoxified at 7°C in the same time period. Although many New Zealand freshwaters may contain micro-organisms that have the ability to degrade 1080, the longer time needed by them compared with when macroscopic plants are present further highlights the important role of plants as mediators in the detoxification of 1080.



Detoxification of 1080 in aquatic systems

Shaun suggests the results from this research indicate that 1080 is unlikely to be a long-term hazard in stream water in carefully conducted pest control operations and that any 1080 baits landing in streams are likely to detoxify quickly. Where water quality is a particularly sensitive issue, further protection could be achieved by using alternative control strategies such as avoiding sowing bait along stream banks, or by using bait stations for bait delivery.

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

Shaun Ogilvie *(Te Arawa me Mataatua) is currently working on the fate of 1080 in the environment, and on new toxic baits for ferret control. He is in Landcare Research's Pest Control Technology Team at Lincoln.*

Monitoring possum and deer control in the Hauhungaroa Range

One of the largest vertebrate pest control operations ever undertaken in New Zealand took place in 1994 in the Hauhungaroa Range where more than 30,000 ha were poisoned using aerially-sown 1080 carrots. This operation targeted both possums and deer, and aimed to reduce the levels of bovine tuberculosis (Tb) in these populations and to protect conservation values.

Besides basic management goals, the operation included an experimental component to test the relative effectiveness of various "buffer" widths (controlled areas adjacent to farmland) for possum control. Three buffers (1-km, 3-km, and 7-km) were treated with a single pre-feed of non-toxic carrot baits followed by the toxic 1080 carrot baits. In addition, a fourth area was included where no pre-feeding was carried out (i.e., toxic baits only).

Monitoring possum and deer kills

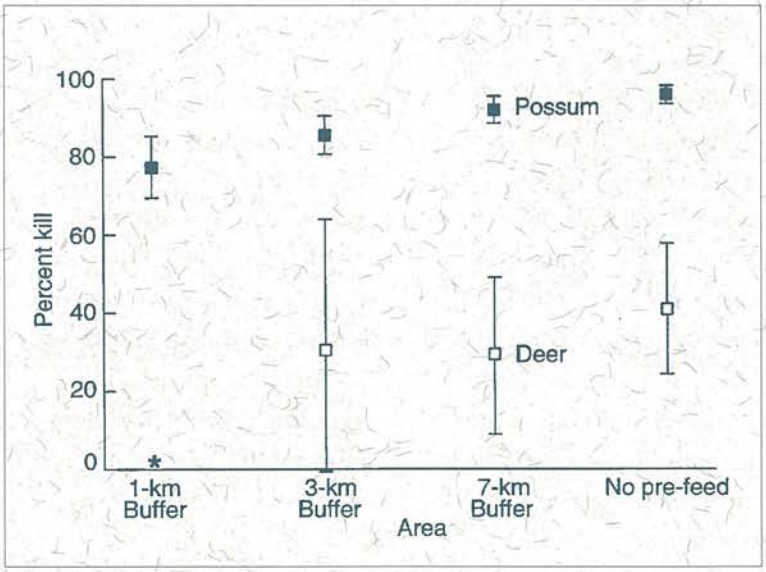
Wayne Fraser and his team of up to 12 people spent several weeks before and after the poison operation monitoring the populations of possums and deer in the treatment areas and also in two nearby non-treatment areas. They assessed faecal pellet counts on more than 5000 plots.

Although the data are still being analysed, preliminary results suggest that the control operation was successful. There were considerable reductions in possum densities in all four areas, ranging from a 78% kill in the 1-km buffer to a 96% kill in the no pre-feed area (Fig. 1). However, the deer kill was lower and ranged from a kill of 30% to 42% in three of the areas with an apparent 12% increase in the 1-km buffer. This apparent increase in the 1-km buffer was not surprising as the area covers only a small part of deer home range and it is believed that deer moved out of the area during the pre-count in winter and then moved back again at the time of the post-count, in spring.

The high possum kill in the no pre-feed area suggests that there may be no real advantage in pre-feeding, and even that pre-feeding may lower poisoning success. Several bait acceptance trials carried out by Landcare Research colleagues with captive possums have produced similar results (i.e., after pre-feeding with non-toxic baits, some possums avoid feeding on toxic baits).

Future research

Wayne's team will undertake annual monitoring at this site using faecal pellet counts (for possums and deer) and information from recreational hunters (for deer and pigs) over the next 4-5 years to determine the overall rates of recovery of



*Reduction in possum and deer populations (± % standard error) estimated from pre- and post-control faecal pellet counts. * indicates a 12% increase in deer density in the 1-km buffer.*

the populations in the three buffers and, for possums, whether there is any variation in the pattern of recovery.

Complementary research is being undertaken by Jim Coleman and Graham Nugent to monitor any changes in Tb prevalence within the possum and deer populations. Besides the immediate comparisons between the pre- and post-control populations, regular surveys of the residual populations will be undertaken to address the question of whether local pockets of infection can be eliminated by maintaining these populations at low levels.

This research was funded by the Animal Health Board.

***Wayne Fraser** is in Landcare Research's Ecological Impacts Team at Lincoln and works on wild animal biology and management.*

Possum Population Recovery Following Control - Preliminary Results

An increase in possum numbers follows possum control as inevitably as night follows day. Possums tend to move into controlled areas from surrounding country so that areas must be controlled repeatedly to maintain low possum densities. This limits managers' ability to get control in an area and increases control costs. Murray Efford and colleagues are undertaking an intensive study of possums at Pigeon Flat, a 13-ha remnant of mixed-hardwood forest (beside the Dunedin northern motorway), to understand more about why possums move back into an area after trapping or poisoning.

Regular live-trapping of possums over 16 months showed a resident population of about 20 possums/ha. Radio-tracking on 4 nights a month was used to establish the foraging range of individual possums. A control operation was carried out over part of the study area during August and October 1994, in which 80% of possums were killed. Possums in a neighbouring area were then radio-collared and they are now being tracked to see if they move into the 'vacuum' created by the control operation.

Early results from the weekly checks on where possums had denned suggest that 3 out of 27 shifted towards or into the control area during the three months following control. One possum shifted her foraging

Releasing a live-trapped possum at Pigeon Flat

Locating possum den sites by radio tracking

range from a borderline position into the controlled area within 6-8 weeks of the killout. The project will continue over the next 12 months to see how many other possums shift into the 'vacuum' created by the control operation. The final results of this project will be reported in a later issue of this newsletter.

This work is funded jointly by the Foundation for Research, Science, and Technology and the Animal Health Board, with a view to improving computer models of population recovery.

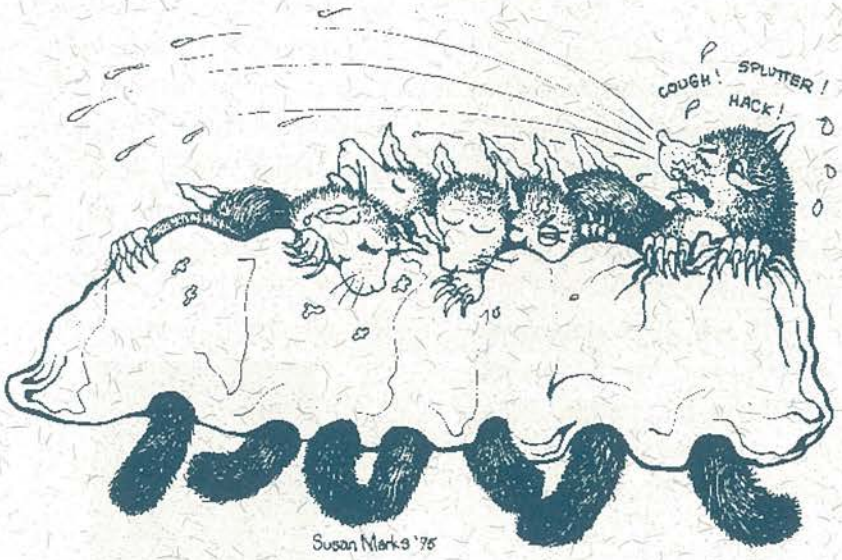
***Murray Efford** is in Landcare Research's Bovine Tuberculosis Team at Dunedin and is currently gathering data on possum life-history for use in developing models on possum population recovery following large scale control.*

Den sharing as a factor in Tb transmission among possums

Knowledge about how bovine tuberculosis (Tb) is transmitted among possums is critical to developing strategies for controlling it and reducing the transmission of Tb to domestic cattle and deer. To be effective, control strategies may need to break the possum-to-possum transmission cycle rather than just aiming to reduce possum numbers. For example, infected den sites could maintain infection in possum populations after control operations.

Simultaneous sharing of den sites is one way in which Tb could be transmitted between possums. It has been discounted in the past mainly because of the belief that den sharing occurs too infrequently to be important. If Tb transmission among possums results from inhaling bacteria from infected animals, then sharing the same den and breathing the same air would result in a high probability of spreading the disease. Research by Peter Caley aims to shed more light on the role of den sharing by possums in the transmission of Tb.

Peters' inspection of possum dens has revealed that in high density populations at least, den sharing between possums is common. Sometimes as many as six possums are found in the same den, as up to 10% of all possums may be sharing dens at any one time. Possums sharing dens are often in close body contact with each other and are in a confined space, which should facilitate the transmission of disease.



The reason that possums share dens is unclear, as it appears that even in sites with a high population density of possums there are unused den sites available. In one study area, only about a quarter of the den sites known to have been used by possums were in use at any one time. Sharing dens does not happen all the time, but may be brought about by bad weather forcing possums to share the most sheltered dens. This raises questions of the relative quality of den sites from a possum's point of view and what factors govern den choice by possums.

Further study to determine why and how frequently possums share dens may help us to model the spread of biological control agents being proposed for the efficient reduction of the prevalence of bovine Tb in possum populations and transmission to domestic stock.

This research is funded by the Foundation for Research, Science and Technology.

***Peter Caley** is an ecologist working on aspects of possum ecology relevant to the epidemiology of bovine tuberculosis in possums and is based at Landcare Research's Massey site with the Bovine Tb Team, in Palmerston North.*

CRC : The International Lubricant

Kiwis and Aussies may not be able to co-operate on trans-Tasman airlines but we can co-operate when it comes to science. Manaaki Whenua - Landcare Research and four Australian organisations have joined in a successful bid for Australian Federal Government funding under the Cooperative Research Centre (CRC) programme.

Our partners in the new CRC for Conservation and Management of Marsupials are Macquarie University, Sydney, Newcastle University, NSW, the Queensland Department of Primary Industries Agricultural Biotechnology Centre, and the Centre for Endangered Species at the Perth Zoo.

The success of the proposal guarantees the new Centre approximately $1.5 M new funding annually for 7 years.

The purpose of the Centre is to undertake research and education to enhance the conservation of endangered marsupials and to develop acceptable methods for the humane management of problem marsupial populations.

The Australians are mainly interested in research to enhance the conservation of their endangered marsupials, although they have an objective of developing fertility control for pest kangaroo populations.

Manaaki Whenua is interested in researching methods for the management of New Zealand's biggest problem species - possums. The Centre's focus on marsupial reproductive biology is highly relevant to both outcomes.

Our possum researchers expect to see extra funding, on either side of the Tasman, for research into possum biology and reproduction - particularly towards the development of a possum contraceptive vaccine. Andy Pearce, CEO of Manaaki Whenua is on the Board of Directors of the new Centre, and Phil Cowan, who leads our Bovine Tb team, is one of the Research Directors and leader of the marsupial management programme.

The Australian government set up the Cooperative Research Centre programme three years ago to bring together outstanding researchers from universities, CSIRO, other research providers, and private industry. For every $2 funding from the partners in the CRC, the Australian Federal government adds another $1.

Until the end of last year, 51 CRCs had been established covering many areas of science and engineering, none including a New Zealand research organisation. Fifty-five proposals were put forward for the last 10 new CRCs and so competition was very strong. Of the 10 new funded proposals two included New Zealand CRI's as core participants. We have no doubt that the funding of this new Centre will have a very positive influence on research towards the effective and humane control of possums through fertility control.

Oliver Sutherland
General Manager
Weeds and Pests
Manaaki Whenua
- Landcare Research

Conferences

10th Vertebrate Pest Control Conference
Hobart, Tasmania
29th May to 2nd June 1995

Contact: Dr Jim Coleman
Manaaki Whenua - Landcare Research
PO Box 69, Lincoln, NZ

8th Australasian Wildlife Management Society Conference
Christchurch, New Zealand
4th to 7th December 1995

Contact: Dr Charles Eason
Manaaki Whenua - Landcare Research
PO Box 69, Lincoln, NZ

Ilam to Lincoln Shift - April 26th 1995

By the time this newsletter is published all the staff at Landcare Research's Ilam, Christchurch, site should have shifted into our new building at Lincoln. So if Ilam people are not answering their telephones from late April - try the Lincoln number and address.

Old Address:
Manaaki Whenua - Landcare Research
PO Box 31-011
Arts Road
University of Canterbury
Ilam, Christchurch, NZ
ph +64 3 351 7099
fax +64 3 351 7091

New Address:
Manaaki Whenua - Landcare Research
PO Box 69
Canterbury Agriculture and Science Centre
Gerald Street
Lincoln
Ph +64 3 325 6700
fax +64 3 235 2418

Welcome to:

Andy Glazier who has just arrived from Britain to take up the post of "Gamete Biologist" in the Bovine Tb Team at Lincoln. He is a reproductive physiologist and is here to set up possum in-vitro fertilisation (IVF) systems for studying possum biocontrol using contraceptive vaccines. Andy previously worked in a London teaching hospital's, human IVF laboratory improving in-vitro culturing conditions for human embryos and undertaking pre-implantation diagnosis of inherited genetic disease.

Tom Montague is an ecologist who joins the Integrated Pest Management Team at Lincoln developing risk assessment models for browsing management, particularly for possums and rabbits. This research will lead to better targeting of toxins and other control strategies. Tom previously worked as a consultant ecologist at Melbourne University on the management of browsing wallabies, rabbits, and possums, and as an ornithologist.

Terry Fletcher is a marsupial biologist joining the Bovine Tb Team at Lincoln. He will be working on the endocrine control of reproduction in possums, the effect of sterilisation on possum social behaviour as well as aspects of lactation and pouch young survival. Terry has 16 years experience in reproductive physiology and behaviour with special expertise in the hormonal control of the marsupial breeding cycle. Recently he has been working at the Prince Henry Institute of Medical Research, Melbourne University and Monash University.

David Ramsay is an ecologist joining the Bovine Tb Team at Massey. He will be setting up a major field trial to evaluate reproductive inhibition as a method of biological control for possums, using surgical sterilisation to mimic immunocontraception. David has recently completed a PhD at the Queensland University of Technology on the ecology and feeding strategies of wallabies, and he has also worked for several years on the control of rodents of agricultural importance.

Denise Jones is also joining the Bovine Tb Team at Lincoln. Denise has extensive laboratory experience as well as expertise in semen handling from her previous work for Ambreed NZ. She will provide technical support for research projects on possum reproduction, lactation, and behaviour and on contraceptive agents for reducing the fertility of possums.

Contacts and Addresses

Researchers whose articles appear in this issue of He Kōrero Paihama - Possum Research News can be contacted at the following Manaaki Whenua - Landcare Research addresses:

Jim Coleman
Wayne Fraser
Shaun Ogilvie
Oliver Sutherland
Bruce Warburton
Manaaki Whenua
Landcare Research
PO Box 69
Lincoln
ph: +64 3 325 6700
fax: +64 3 325 2418

Peter Caley
Manaaki Whenua
Landcare Research
Private Bag 11052
Palmerston North
ph: +64 6 356 7154
fax: +64 6 355 9230

John Innes
Manaaki Whenua
Landcare Research
Private Bag 3127
Hamilton
ph: +64 7 838 4441
fax: +64 7 838 4442

Murray Efford
Manaaki Whenua
Landcare Research
Private Bag 1930
Dunedin
ph: +64 3 447 4050
fax: +64 3 447 5232

Selected Recent Possum Publications

Coleman J.D., Jackson R., Cooke M.M., Grueber L. 1994: Prevalence and spatial distribution of bovine tuberculosis in brushtail possums on a forest-scrub margin. *New Zealand Veterinary Journal 42, 128-132.*

Dix G.I., Jolly S.E., Bufton L.S., Gardiner A.I. 1994: The potential of electric shock for the humane trapping of brushtail possum (*Trichosurus vulpecula*). *Wildlife Research 21:* 49-52.

Eason C.T., Batcheler D., Frampton C. 1994: The comparative pharmacokinetics of iophenoxic acid in cats and possums. *Wildlife Research 21:* 377-380.

Eason C.T., Gooneratne R., Fitzgerald H., Wright G., Frampton C. 1994: Persistence of sodium monofluoroacetate in livestock and animals and risk to humans. *Human and Experimental Toxicology 13:* 119-122.

Henderson R.J., Frampton C.M., Thomas M.D., Eason C.T. 1994: Field evaluation of cholecalciferol, gliftor, and brodifacoum for the control of brushtail possums (*Trichosurus vulpecula*). *Proceedings of the 47th New Zealand Plant Protection Conference:* 112-117.

Jolly S.E. 1994: Biotechnological biocontrol: Possum control for the 21st century. *Forest and Bird, No.272, 26-31.*

Morgan D.R. 1994: Improving the efficiency of aerial sowing of baits for possum control. *New Zealand Journal of Agricultural Research 37*:199-206

Morgan D.R. 1994: Improving aerial control of possums by precision bait delivery. In: Halverson, W.S. and Crabb, A.C (eds.) *Proceedings of the 16th Vertebrate Pest Conference, Santa Clara, California.* pp. 287-292.

Morgan D.R. 1994: What to do with pests. *New Zealand Science Monthly June 1994.* pp3.

Thomas M.D. 1994: Possum control in native forest using sodium monofluoroacetate (1080) in bait stations. *Proceedings of the 47th Plant Protection Conference*: 112-116.

Warburton B., Drew K.W. 1994: Extent and nature of cyanide-shyness in some populations of Australian brushtail possums in New Zealand. *Wildlife Research 21: 599-605*

Editors: Jim Coleman, Caroline Thomson

Layout: Thomas Pearson

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