

# Discovery 11

APRIL 2011 << ISSUE 33



**DIVERSE LOCATIONS**



**Landcare Research**  
**Manaaki Whenua**

# WE LIVE IN TURBULENT TIMES

>> IN RECENT MONTHS WE HAVE WITNESSED RECORD COMMODITY PRICES, SOME OF THE LARGEST EVER RECORDED WEATHER STORMS, NATURAL DISASTERS AND 'PEOPLE POWER' IN THE STREETS OF THE MIDDLE EAST AS ITS CITIZENS STRUGGLE WITH, AMONG OTHER THINGS, RISING FOOD AND FUEL PRICES.

Commentary about these events has streamed into our homes and workplaces 24/7. The changing circumstances provide insight to the future we will all have to adapt to – a world with reduced access to cheap natural resources, operating closer to environmental limits and exposed to more frequent, extreme weather events. Combined they will increase price volatility, sovereign risk and, in parts of the world as noted recently this week by the World Bank, political unrest.

These circumstances, however, also provide the ideal seedbed for transformational innovation and, from a 20+ year perspective, confirm the strength of New Zealand's position. Investment in renewable, low-carbon and resource-sparing technologies is now enormous, notably in Korea, China and Germany. By virtue of its size, isolation and infrastructure New Zealand will largely be a follower in these developments. Therefore to keep up, we must extend our international engagement with the world's research and technology leaders to access and quickly adapt their discoveries into our business and environmental context. The close engagement of the CRIs, universities and business is a critical element to being successful at this – we must collaborate domestically to compete globally. After years of intense contestability this requires a big shift in thinking and organisational culture; I am pleased we started this change at Landcare Research several years ago and are now seeing the benefits in terms of stronger research terms, better stakeholder engagement and faster innovation than in the past.

However, while investment and innovation is increasing, there is also reason for concern. There is a general lack of urgency to address the collision between conventional economic growth fuelled by consumption and the environment's capacity to support this. Market signals are opaque, public policy mostly sets a

urged motorists driving styles, fuel bill, been had no so international "The price they're going substantially spokesman sa Inflation is peak at more this year, bo increase in G

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**Nuclear meltdown**

**A tenth of CBD firms ponder closing doors**

**INFLATION THREAT**

**Petrol risk to record level again**

Hamish Rutherford

Consumers are facing a fresh blow to household budgets as the price of petrol equals a record high, piling more pressure on inflation.

All of New Zealand's major fuel companies added 3 cents a litre to petrol yesterday, taking the pump price of 91 octane, the most popular grade for motorists, to \$2.18.9c a litre at most forecourts.

This week the all-time high

urged motorists driving styles, fuel bill, been had no so international "The price they're going substantially spokesman sa Inflation is peak at more this year, bo increase in G

# downs feared



**QUAKE TOLL**  
■ More than 10,000 people  
have died after quake and  
tsunami destroy towns.  
■ Even as many as 200 people  
may have been exposed to  
radiation after reactor collapsed.  
■ Huge trail of devastation  
along Japan's north-west coast  
leaves regions in ruins.

## Kiwis rush to help in rescue

While rescue teams fly in to Japan, with assurances they will be safe from radiation, Kiwis are lining up to help search for survivors. The advance party was to be followed by the rest of a team.

New Zealand Earth Search and Rescue (NZESR) team was due to arrive in Japan last night to help search for survivors. The advance party was to be followed by the rest of a team.

USAR team today.

### VISITING SCIENTIST

# Climate talks countrywide

One of the world's top climate scientists will visit New Zealand for the first time in May. American James Hansen, who is an adjunct professor at Columbia University's Earth Institute and director of the Nasa Goddard Institute for Space Studies in New York, was invited to New Zealand by a coalition of individuals and organisations, including Greenpeace and Oxfam.

Coalition spokeswoman Jeanette Fitzsimons, a former Green Party MP, said Hansen's 10-day tour from May 11 would involve meetings across the country.

"I think Dr Hansen's visit will provoke a debate in New Zealand about how we can play our part in global efforts to prevent the worst of climate change," Fitzsimons said.

The talks will highlight the future of coal, which will be crucial for this country, considering the plans for lignite production in Southland.

Hansen is known for instigating global warming to the United States Congress in 1988, one of the first times a scientist stated publicly that Earth's atmosphere was warming and humans were to blame, with potentially devastating results.

His New Zealand talks will focus on what Hansen calls a "scientific, legal and legal issues". There was a meeting in Auckland on May 11.

Oil Market  
S&P/ASX200  
Nikkei 225  
10254.43 -49.23 -0.47%

Hang Seng  
23249.78 -159.08 -0.68%

Straits Times

minimum bar for compliance, and the natural resilience of ecosystems generate time lags between impact and effect. Not surprisingly, investment criteria support less environmentally viable options and consumers favour the cheapest rather than the most environmentally benign goods.

In New Zealand, land use comes to mind. Although this natural asset is clearly a fundamental driver of our primary industries, it is not managed from a strategic perspective or, as the Land & Water Forum identified, well with respect to water availability or quality. Irreversible decisions, such as urban development on some of our highest quality soils, is still occurring despite an anticipated 70% growth in global food demand over the next 40 years and reduced availability of critical inputs such as phosphate and potash. And, catchment impacts of land-use change are inadequately accounted for in spatial and temporal terms even though we have models to assess this. This is not smart economic development!

Collectively this points to the need for all parts of the economy, government and community to participate in developing robust, enduring solutions. There are no silver bullets. Rather prosperity will arise from a shared commitment and vision that all are inspired by and able to engage in.

I came to Landcare Research over 5 years ago because I saw environmental sustainability as the greatest challenge of the 21st century and I wanted to contribute to developing solutions to this. When I left in mid-February to take up the CEO role at 'sister CRI' Scion, the big and increasingly important role of Landcare Research at the nexus of the economy and environment is clear. During my time at Landcare Research our role in maintaining market access, lowering biosecurity costs and reducing environmental impacts has grown. We

have incubated new environmental services such as the carboNZero<sup>GerT</sup> programme for reducing and verifying GHG emissions, EcoGene for rapid genomic diagnosis of environmental threats, Enviro-Mark<sup>®</sup> to raise the bar for environmental management and launched technologies for the biocontrol of weeds, eradication of animal pests and shown both water and nutrient management can be improved through precision irrigation. We have developed a framework for biodiversity measurement and prioritisation that will enable expenditure on biodiversity protection to be better targeted and, in the mid-term, support options such as biodiversity offsets. At the same time our relationships with long-term clients – DOC, MAF, MfE, AHB and local government – have strengthened to a new level of shared understanding and quality of science delivery to meet the challenge of sustainable use of land resources. Our work to build genuine partnerships with iwi – Tūhoe, Ngāi Tahu, Tainui, Ngāti Whatua and others – has been patient and deliberate. And we have emerging research relationships with the business sector such as through BusinessNZ and the dairy sector. All in all, Landcare Research – Manaaki Whenua is well poised for the new post-CRI Taskforce operating environment, to play an influential role in growing New Zealand's prosperity in a dynamic world with serious environmental challenges.

**Warren Parker**  
Former Chief Executive

Dr Richard Gordon is acting CEO of Landcare Research

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motorists to review their driving styles to try to cut their fuel bill, because New Zealand has no scope to influence international markets.

"The prices don't look like they are going to be heading down initially any time soon," a spokesman said.

Oil is already expected to rise more than 5 per cent later this year, boosted by last year's increase in GST, but economists



# ANTARCTICA MONITORING SOIL CLIMATE IN THE ROSS SEA REGION

**>> IT'S CONSIDERED BY MANY TO BE THE EARTH'S LAST FRONTIER BUT WORK BY LANDCARE RESEARCH IN ANTARCTICA IS GOING SOME WAY TO BETTER UNDERSTAND AND PROTECT THE ENVIRONMENT THERE AS WELL AS FURTHER AFIELD.**

In collaboration with the Natural Resources Conservation Service of the United States Department of Agriculture (USDA) and the University of Waikato we established soil-climate stations in the Ross Sea Region to study the thermal state of the active layer and the permafrost, which are key indicators of climate change.

We have eight soil-climate stations and two permafrost temperature-monitoring boreholes. Four of the stations border the Antarctic coast, three are in the McMurdo Dry Valleys, and one is on Mt Fleming at the head of the Wright Valley on the edge of the polar plateau.

At each site, atmospheric and below-ground measurements, extending from the active layer into permafrost, are made on an hourly basis.

Data loggers record air temperature, relative humidity, solar radiation, and wind speed and direction. Thermistor temperature probes and Vitel moisture probes are installed at depths of 2 cm to 1.2 m. Soil variables are measured every 20 minutes. All measurements are averaged and recorded hourly and at each locality the instruments are replicated to provide information on variability. USDA staff visit sites annually for maintenance and downloading data.

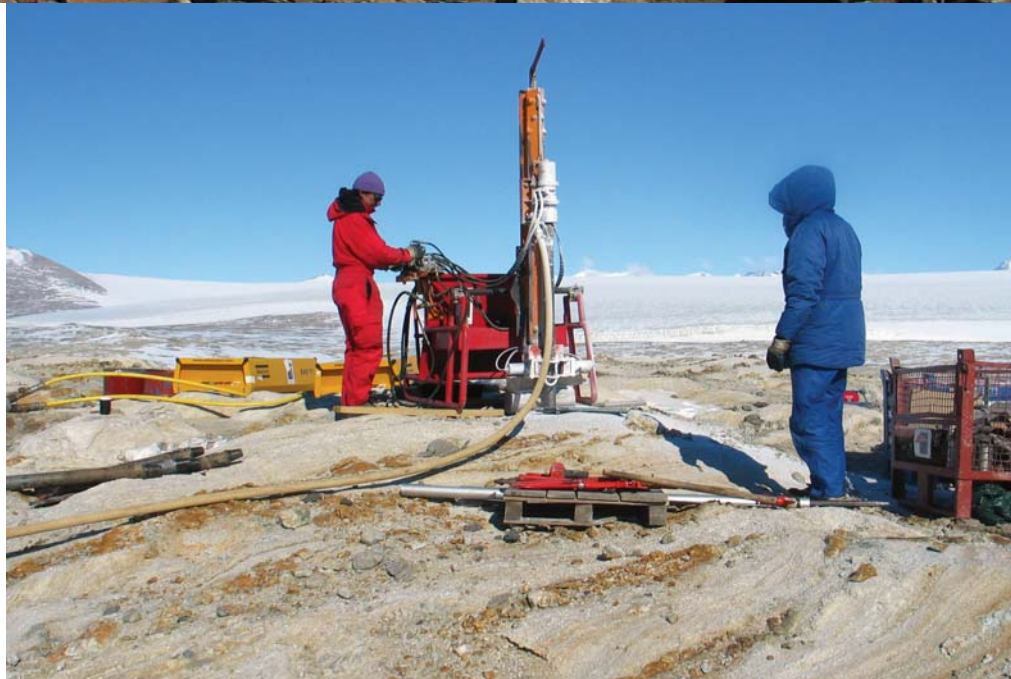
'With up to 10 years of continuous monitoring for each site our database is becoming increasingly valuable and the value is increasing with the length of the record,' says Dr Jackie Aislabie, who leads the project. Extensive analysis of the climate data provides the best available data on active-layer depth of soils in the Ross Sea Region and establishes an unexpectedly high



level of between-season variability in active-layer depth and in the timing of maximum thaw within the summer season.

The climate data contribute to the international global programme Circumpolar Active Layer Monitoring (CALM) to help determine the impacts of global warming on permafrost stability. As climate models predict that the high altitudes will be most sensitive to changes, we provide observational data to test the models.

A key collaborator in this project is Dr Cathy Seybold, USDA Soil Scientist, who is responsible for maintaining the soil-climate stations and ensuring quality and accessibility of data collected. The soil-climate stations and costs for maintenance and ensuring data quality and accessibility are met by the USDA.



# ENVIRONMENTAL DOMAINS CLASSIFICATION FOR THE ROSS SEA REGION



that are otherwise easily overlooked at the continental scale) to be grouped based on their environmental character regardless of their geographic location,' says Dr Aislabie.

'We will develop an environmental classification of the Ross Sea Region within the context of our Antarctic-wide classification. The Ross Sea Region classification will use a suite of environmental variables including climate, landform, soil, and biology data. We will gather and collate available data, along with those derived from our new research on soil attributes, climate and microbial diversity and abundance. As data are freely available for research purposes, Antarctica provides an ideal opportunity to develop the next-generation environmental domains analysis.'

Collectively the research will deliver improved understanding of inland and coastal Antarctic ecosystems. In particular we will provide a spatially explicit characterisation of the terrestrial environments of the Ross Sea Region, their biodiversity, and potential roles in ecosystem functioning and responses to environment change.

**>> ICE-FREE AREAS OF ANTARCTICA (MOST OF WHICH ARE SOIL FORMING) ARE THE MOST BIOLOGICALLY ACTIVE AND VULNERABLE TERRESTRIAL SITES IN THE CONTINENT.**

Much of the ice-free area in Antarctica occurs in the Ross Sea Region and as an Antarctic Treaty partner New Zealand is committed to the comprehensive protection of this region and its ecosystems.

Achieving this goal requires an understanding of the biogeographic character of terrestrial ecosystems and to meet this need we are aiming to develop an environmental domains classification for the Ross Sea Region.

'Environmental domains analysis (EDA) is a systematic environmental classification framework that allows similar environments (including small distinctive environments

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# ASIA PHYTOSANITARY TRAINING

Developing countries are generally at a disadvantage when it comes to meeting international phytosanitary requirements for trade in agricultural commodities imposed by importing nations (usually developed countries). However, many aid donors recognise their obligation to ensure all nations have equal access to export markets.

And that is where an NZAID project, Phytosanitary Capacity Building in the Mekong Region, fitted in during 2006–2009. The project involved Cambodia, Lao PDR, Myanmar, and Vietnam – the ‘CLMV’ countries – and was to help facilitate such trade. It aimed to establish pest and disease collections and provide plant protection and quarantine staff with skills to collect, identify and curate specimens, and to prepare authenticated pest lists.

Auckland Landcare Research scientists Trevor Crosby (Principal Entomologist) and Eric McKenzie (Principal Pathologist) visited each country at least seven times over the 3-year period to help establish collections, run workshops on crop surveillance, and provide ongoing mentoring in field surveillance and identification of specimens. As well, two participants from each country spent 3 weeks with the Landcare Research collections in Auckland learning curation requirements for collections. In addition 3-week diagnostic clinics were held at Landcare Research, Auckland, for nine entomologists and nine pathologists from these countries.

The CLMV countries fully supported the project, in part due to awareness-raising of phytosanitary issues through annual meetings

with senior government officials and industry leaders. In Myanmar, this New Zealand project was the first assistance and training received since 1988. In Lao PDR, we were the first to present a training course at their Plant Protection centre.

The four countries have established reference collections, but vagaries of weather dealt cruel blows to both the Lao PDR and Myanmar collections. In Vientiane (Lao PDR) a storm blew the roof off the plant protection building, while rain destroyed the newly established plant diseases collection and also some of the equipment supplied by the project; however, the insect collection survived after staff followed disaster recovery guidelines (the laboratories have since been restored). In Yangon (Myanmar), serious drainage problems followed earthworks next to the plant protection centre – torrential rain and water build-up led to flooding of the newly established collection room, and Cyclone Nargis damaged buildings so that the replacement facility had to be deferred.

Existing equipment, facilities, and staff knowledge was often basic and out-of-date. However, staff in these countries were hungry for knowledge

and were very receptive to advice from Landcare Research scientists.

Trevor Crosby is now involved in a project in Brunei to rehabilitate the Department of Agriculture insect collection and train entomology staff in collection management and identification. As with the aims of the NZAID project, Brunei wants to ensure that it has authenticated pest lists that meet international standards.

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# TONGA ENVIRONMENTAL IMPACT ASSESSMENT, FIJI-TONGA CABLE SYSTEM



The development of many Pacific island countries has long been hampered by small and dispersed populations and vast ocean distances but Landcare Research scientists are helping to minimise what is often referred to as the 'digital divide'.

Peter Newsome led a team undertaking the environmental impact assessment of a proposed underwater fibre-optic cable from Fiji to Tonga which, if delivered, could provide the advantages of secure, high-capacity, high-speed and lower cost communications to Tonga, which is vital for improved economic and social development.

But, building and maintaining a cable that would stretch 800km along ecologically sensitive, and seismically, volcanically and tectonically active seabed carries some environmental risks and impacts, and that was where the skills of Landcare Research staff were utilised.

Mr Newsome worked alongside James Comley from the University of the South Pacific in Suva,

in a collaboration made simpler following the signing of a Memorandum of Understanding between Landcare Research and the university just months earlier.

Their study was based on an extensive literature search in material relating to the locality, the subject domain, and the proposed development. It included extensive consultations with government and private-sector agencies and individuals and the team also visited Fiji and Tonga inspecting the nearshore environment in the vicinity of the proposed landings, including consulting and observing customary users of that environment.

Numerous hazards and risks were identified including hazards to the cable from fishing around seamounts, hydrothermally altered water in volcanic vent zones, and future mining in mineralised areas. The simplest – and recommended – mitigation measure in these situations is avoidance.

Meanwhile, significant hazards from the cable (or the cable-laying operation) are to cetaceans, caused by sonar operations by survey and cable-laying vessels. The mitigation measures recommended here are a combination of avoidance (of the whale migrating season) and suspension of activities where conflict is anticipated or observed.

In the Tongan coastal environment there are potential threats to the cable from fishing, shipping and dredging, which requires mitigation in the form of notification and operational awareness. Potential impacts from the cable are in respect to coral reef communities, seagrass beds, aquaculture, and subsistence fishing. Mitigation measures proposed to reduce these effects to low or not-significant levels are a combination of avoidance and minimisation.

However, Mr Newsome and Mr Comley's report concluded that the impact of the proposed cable after all mitigation measures were applied was of low, not-significant, or no environmental or social impact and was a positive economic and social development outcome for the Kingdom of Tonga.

Tonga Cable Ltd funded the EIA which was a necessary step in the investment processes for the Asian Development Bank and the World Bank who are interested in financing this important infrastructure project.

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# CENTRAL ASIA

## REMOTE SENSING IN UZBEKISTAN

An unexpected phone call with a request to undertake remote sensing work in a remote Central Asia nation took researcher Stella Belliss by surprise.

A Korean company undertaking oil and gas exploration in Uzbekistan needed expertise in mapping land use and land cover and, through contacts, knew of Landcare Research's capabilities.

Independent from Russia since 1991, the country has 28 million inhabitants, although the exploration area is sparsely populated, being mostly desert. Mining is a major component of Uzbekistan exports, especially gold. The country also contains major reserves of fossil fuels, especially natural gas, and proven reserves lie to the south of this exploration area.

A team consisting of David Pairman, Stephen McNeill (digital elevation modelling and 3-D perspective view preparation), Stella Belliss (geology and project management), Ian Lynn (geomorphology and topography) and Peter Newsome (land cover and land use) was developed and the project began.

'We used both optical Landsat imagery and PalSAR radar data from a Japanese sensor and got a digital elevation model from a Space Shuttle mission a few years earlier. Stephen processed that and we used it to improve the orthorectification of the images,' says Ms Belliss.

Orthorectification is the process of making aerial photos and satellite imagery conform to a map projection, including correction for terrain displacement, and a digital elevation model is necessary for this.

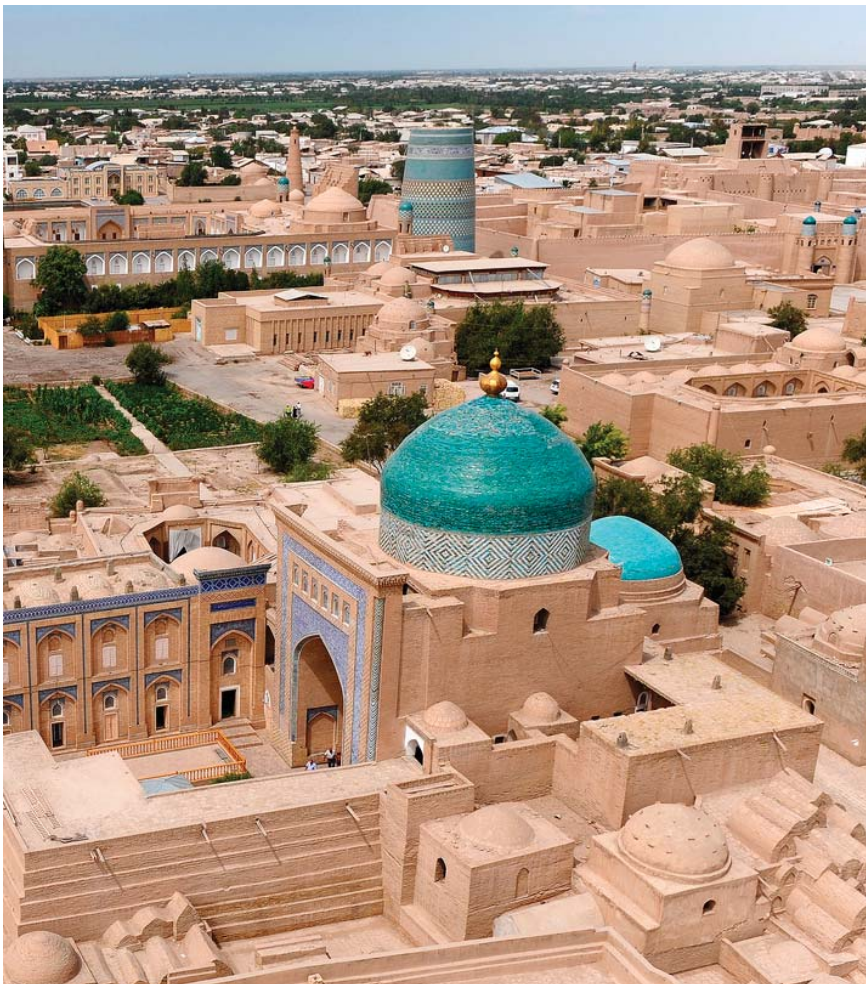
'Without this process, you wouldn't be able to make direct and accurate measurements of distances, angles, positions, and areas, nor would you be able to correctly overlay other geometrically corrected information layers or images,' Ms Belliss says.

'However, it's quite hard to orthorectify images, especially in a part of Uzbekistan that is almost totally desert and where there are few points of reference.

'Of course it would've been great to visit there but that's one of the downsides of remote sensing, you can do it all from your desk.'

The area researchers were asked to prepare exploration maps for is near the Aral Sea. This is a saline lake 4th largest in the world in 1960 but now a mere 25% of its former volume, due to a combination of overuse (irrigation for 'white gold' (cotton) and grain) and environmental change.

The remote sensing team has also worked in other diverse parts of the world in recent years including Ecuador, Papua New Guinea, Tibet, Vietnam, and Tonga.



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# EUROPE FRUIT LOGISTICA 2011, GERMANY

Two organisations in separate countries on opposite sides of the Pacific Ocean joined forces in Germany to further highlight the benefits of combining successful business and environmental stewardship.

Landcare Research's carboNZero<sup>Cert</sup>™ programme combined with the Chilean Fresh Fruit Exporters Association to certify the South American country's pavilion at February's world-leading trade fair for the fresh fruit and vegetable industry – Fruit Logistica – in Berlin as being carbon neutral.

More than 2,300 companies from across the entire fresh-produce value chain were present at Fruit Logistica – including global players as well as small and medium-sized suppliers.

'The event offers unparalleled opportunities to showcase not only the carboNZero programme but also how it can strengthen business,' says Daniela Ramirez, carboNZero programme Business Development Manager – Chile.

The project has measured the carbon tonnage associated with all trade delegates, as well as the carbon output of the Chilean pavilion at Fruit Logistica. The industry has offset the carbon footprint by acquiring accredited carbon credits from a Latin-American project, allowing the fruit industry's participation at the fair to be certified carbon neutral.

'This type of pilot programme signals our industry's commitment to tackling the key issues related to increasing our sector's sustainability throughout the supply chain,' says Ronald Bown, Chairman of the Board of the Chilean Fresh Fruit Exporters Association (ASOEX).

The carboNZero programme is an internationally recognised scheme for organisations, products, services and events, offering optional mitigation strategies through the provision of credible and verified offsets.



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# AFRICA RESEARCH IN THE SERENGETI

Landcare Research wildlife ecologists regularly travel to diverse parts of the globe so when researchers from the Serengeti Biodiversity Programme asked for assistance, Lincoln-based Wendy Ruscoe and Andrea Byrom were only too happy to help.

They spent a month in Tanzania assisting the Serengeti Biodiversity Programme, a 40-year programme focusing on the factors that affect all species in the Serengeti ecosystem and how the protected area affects human populations surrounding the park.

Serengeti researchers had been trapping rodents for 10 years but they wanted extra assistance to ensure the trapping techniques were correct. Drs Ruscoe and Byrom were able to also provide assistance on field techniques including labelling individual animals correctly and matching that with written data, preparing samples for genetic identification, collecting specimens, as well as identifying, measuring and handling rodents in the field.

'What we found is that just like our rodent populations, theirs go up and down every year. But we wanted to know if this was a cyclic population or if it's an 'eruptive species' based on some sort of a resource. Ultimately, we were able to link the periodic large rodent population increases to extended short rainfall seasons,' Dr Ruscoe says.

There are two rainfall seasons in the Serengeti – short rains (November–December) and long rains (February–May) – and if the short rains are larger than usual this allows more grass growth over summer providing more seed and other food for rodents. Once rodent numbers increase, the next year we see carnivores that are rodent specialists, such as the black shouldered kite, increasing in numbers as well.

Although this is a natural system and animal numbers fluctuate over time, there can be significant impacts on people living around the park.

Dr Ruscoe says that once the rodent numbers erupt, they also erupt in the villages surrounding the park, which causes crop losses and disease. So, being able to predict when there are going to be spikes in rodent numbers allows managers to predict potential outbreaks and transmission of disease.

These findings will be published in the next Serengeti book, SERENGETI IV: Biodiversity.

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# SOUTH ALLIES IN BIOCONTROL

# AMERICA

In recent years South America has become an important ally in New Zealand's efforts to control pest plants. Biocontrol is the use of insects or diseases to control these plants and researcher Hugh Gourlay says Landcare Research's significant involvement in South America marks a monumental shift.

'Twenty years ago all the weeds we were working on came from Europe and the United Kingdom – gorse, broom, ragwort, thistle species and old man's beard – but in the last 5 years most of the weeds we're working on are South American in origin and hence our interest in that continent to look for possible biocontrol agents.

'What this means of course is that at some point in New Zealand's recent history South American plants became very popular for people to import, sell and grow in gardens. Now, as with so many other plant species, we're seeing them evolve into weeds.'

Mr Gourlay and his colleagues spend several weeks every year in South America talking with experts and searching the areas where the plants originated from for insects and diseases attacking the plants that might be good biocontrol agents for New Zealand.

'It's important that we search these areas overseas where the weeds originate from, as that is where it is most likely that we will be able to find natural enemies that may have potential as biocontrol agents.'



■ Fruit fly *Toxotrypana australis* a potential biocontrol collected agent for Moth Plant.

Currently there are projects in three South American countries (Colombia, Brazil and Argentina) and other projects are likely soon. We also have had close links with Chilean researchers seeking biocontrols for hieracium, gorse and barberry.

- Colombia – Seeking biocontrols for banana passionfruit. Unfortunately, the most recent batch of insects perished following the September 4 earthquake in Canterbury.
- Brazil – Currently working on three species of beetles for the control of tradescantia (wandering Willie). One beetle is being mass-reared for release and an application to release the other two is currently with ERMA.
- Argentina – Collecting insects for testing against moth plant, which is a significant problem, in parts of the North Island. Researchers are also looking at possible biocontrols for Chilean needle grass and will soon investigate possible biocontrols for pampas.

Getting insects out of South American countries has become quite difficult because of these countries' strict adherence to an international convention on the protection of endemic genetic material. This is one reason why Landcare Research is continually needing to develop formal partnerships with South American researchers and research organisations.

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