

International Year of Biodiversity

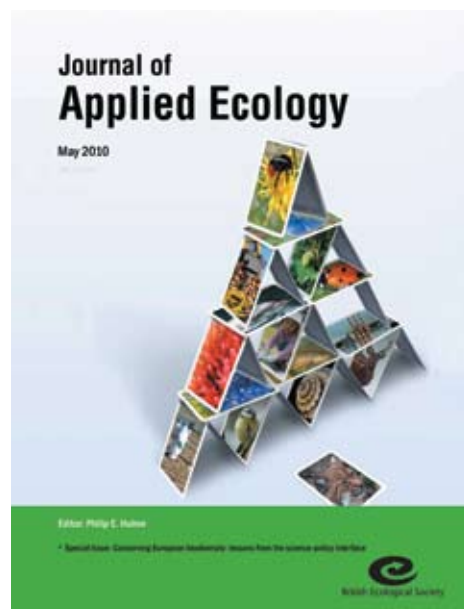
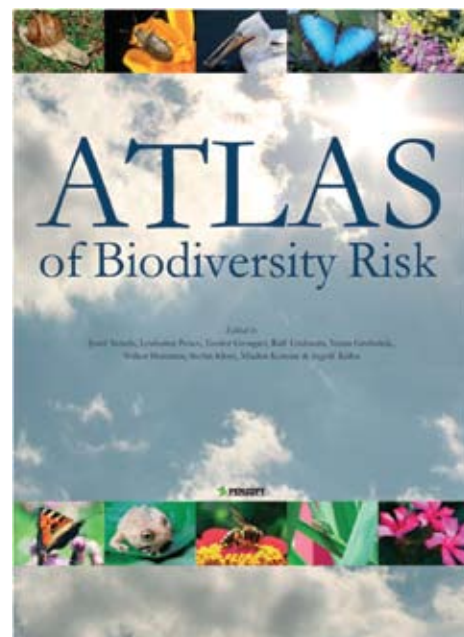
The United Nations proclaimed 2010 to be the International Year of Biodiversity, and numerous meetings are taking place across the globe to draw attention to the threats currently facing the diversity of life. By far the biggest of these events, the European Commission's Green Week conference was held in Brussels in June. It attracted over 3000 delegates and addressed the state of biodiversity and nature in Europe, the benefits they bring, pressures on them, and possible solutions to the current rates of loss.

Prof Philip Hulme, co-leader of the Centre's Biosecurity Theme, gave an invited plenary talk on biological invasions and the challenges they pose to biodiversity. Drawing on New Zealand's experience of successfully managing biosecurity risks, Philip highlighted how Europe might best address invasive species in the face of increasing pressures from trade, tourism and global travel.

"Economic growth is a key correlate of biological invasions, as risks increase with international trade and the environment becomes increasingly vulnerable due to pollution, fragmentation and species loss."

Philip's recent research was also highlighted in a groundbreaking publication, "The Atlas of Biodiversity Risks" which was launched at Green Week. Combining the results of 366 authors from 43 countries, the Atlas of Biodiversity Risk is the first of its kind to describe and summarise in a comprehensive, easy-to-read and richly illustrated form the major pressures, impacts and risks of biodiversity loss at a global level. Philip explains that "the Atlas emphasises that conserving biodiversity has become an increasingly challenging task and one that requires novel solutions and strategies as well as the combined efforts of many stakeholders".

Philip has a particular interest in seeing scientists, policymakers and the public work more closely in combating the threats to global biodiversity. With this goal in mind, he also edited a special issue of the Journal of Applied Ecology, one of the top ranked academic journals in its field, to coincide with Green Week and the International Year of Biodiversity. Twenty of the most influential biodiversity papers bridging the policy-science divide and published by the Journal over the last five years were brought together in a single issue. Philip's goal in producing this special issue was "to inform the ever diverse set of biodiversity stakeholders on the options available to governments on biodiversity and nature policies as well as emphasise the economic value of ecosystem services". For this reason all the articles in the special issue are free to download.



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Bioprotection science for N

From the Director



Prof Alison Stewart

In June, Deputy Director Richard Falloon and I attended the 13th Congress of the Mediterranean Phytopathological Union in Rome, before travelling on to the University of Florence and the University of Turin to discuss potential research collaborations with researchers at those institutions.

Such international links are crucial for us to grow our reputation as a Centre of Research Excellence beyond these shores. For this reason we regularly host visiting academics from around the globe for periods ranging from a few days to a year or more and are fortunate that our researchers are also welcomed into overseas laboratories for similar periods of time. Such exchanges provide opportunities for the exchange of skills and knowledge and for the establishment of valuable research collaborations.

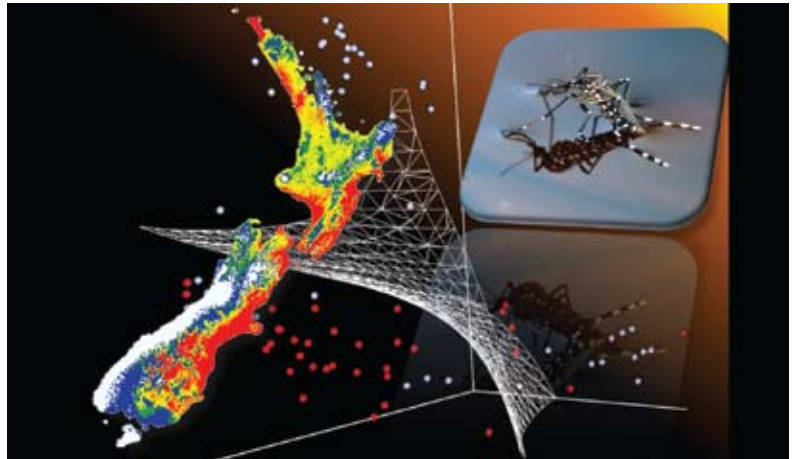
A new initiative that will support this internationalisation plan will commence next year when the Centre hosts a high profile research symposium. This event will focus on a key aspect of bioprotection research, with invited speakers from top international institutions. It will provide us with the opportunity to profile aspects of our research to international experts, and develop further links for collaborative projects.

But that is in the future. At present we are keeping a close eye on the developments resulting from the CRI Task Force Review Recommendations. The key outcome of CRI restructuring will be the provision of more stability to the CRIs, allowing them to carry out more strategic long term planning. This in turn is good for the Centre as it will enable our CRI partners, AgResearch and Plant and Food Research to interact more meaningfully with their University colleagues, opening up opportunities for better collaboration.

Our key task at present is the development of the Centre's proposal for the TEC mid-term review. The outcome of this review impacts on the Centre's on-going funding and provides us, and the rest of the CoREs, with the opportunity to highlight the progress we have made over the last eight years in establishing wide ranging collaborative networks both in New Zealand and overseas. In order to illustrate our success in delivering improved human capability development we have been reconnecting with our former postgraduate students and it has been rewarding to be reminded of the quality of students who have spent time in the Centre and to see the ways they are contributing to bioprotection research, policy making and implementation all around the world.

Alison Stewart

Identifying potential invertebrate invaders



The Asian tiger mosquito is one of the exotic invertebrates investigated

Are native plants and animals in New Zealand's lakes and rivers at risk from invasion by exotic invertebrate species?

Assoc Prof Sue Worner has recently completed a project for MAF, modelling the potential for establishment of 21 exotic freshwater invertebrates which are known to be invasive elsewhere in the world.

The sorts of creatures involved ranged from the Asian tiger mosquito that can transmit Eastern equine encephalitis and West Nile virus to a small shrimplike crustacean called the spiny water flea that can compete with fish larvae and other small animals for food. Such invaders would have serious consequences for freshwater ecosystems were they to establish in New Zealand.

Sue says there were two parts to the project, first identifying the best modelling system for the job and then using that model to screen the selected species.

"To do this we modelled global distribution and environmental data for each of the species using nine different modelling approaches. Results were compared and the 'best' model was used to project the potential global distribution of each species including its potential distribution in New Zealand.

"The sorts of things we looked at were mainly associated with climate as that is an important driving variable in freshwater systems. Very little data is available globally for more specific freshwater variables affecting the distribution of these species. We are currently working with a French research team to source such data to refine predictions."

The project involved a degree of innovation, with the team developing a new procedure for choosing species absence data that reduced the problems often associated with this type of modelling.

Based on the global environmental data that was available for use in this study, all but three of the species modelled would find at least one spot in New Zealand with the right combination of water type, climate and food supply to support establishment. Map overlays show the Manawatu and Rangitikei water catchments in the North Island and the Nelson and Marlborough catchments in the South Island to be the most likely bioclimatic hotspots for high risk exotic freshwater species.

This knowledge will be used in the development of surveillance programs which in turn should increase the chance of early detection and associated eradication, containment or suppression campaigns.

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New Zealand

Taking action against future weeds

Biosecurity usually focuses on the national border, but in the case of weeds, our cities, towns and farms form the biosecurity coal face.

Most future weeds are already here, just starting their creep out across New Zealand's landscapes. Their management is primarily laid out in the Regional Pest Management Strategies (RPMS) of regional councils, which are reviewed every five years.

Assessing how regions should best spend their biosecurity resources requires solid estimates of both anticipated control costs and weed impacts with and without regional control, projected into the next decades. Until now, that has typically been done by an economically robust cost-benefit analysis method that included little weed ecology and only accounted for weed impacts on agricultural, horticultural and forestry land.

Bio-Protection Research Centre ecologist Jon Sullivan has been working with Environment Bay of Plenty to refine this method and apply it to the latest Bay of Plenty RPMS. In essence, he's been taking the latest scientific knowledge of weed spread and impacts, much of it from Centre researchers, and applying it to estimating the future costs and benefits of weed control.

For example, Sami Aikio recently completed postdoctoral research at the Centre estimating rates of weed spread from New Zealand herbarium records using some of the latest mathematical modelling techniques. Jon incorporated Sami's findings to refine the estimates of weed population growth when calculating weed impacts.



Environment BoP senior pest plant officer John Mather with a seedling of wild kiwifruit which is listed as a Control Pest on the proposed Bay of Plenty RPMS. Jon Sullivan's cost-benefit analysis estimates that the net benefit of ongoing regional control will be over \$1 million in net present value over the next 50 years.

This approach of modelling weed spread in more detail and incorporating non-market values such as the impacts on biodiversity, human health and recreation, generally increases the calculated costs of taking no action against weeds, especially for species with impacts on non-productive land.

The results of this new approach have matched up remarkably well with Environment Bay of Plenty's Biosecurity Unit recommendations. For almost all species, the control scenarios proposed are projected to be cost beneficial to the region, often by millions of dollars over the next 50 years.

Given that New Zealand is still in the early stages of weed invasion and that early action is highly cost-effective, it is important that advances in scientific knowledge of weed and pest invasions are incorporated into decision making tools used in current weed management. Jon's refinement of the cost-benefit analysis system for regional pest management strategies is an example of Centre research making a difference.

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Smithsonian links



Smithsonian Tropical Research Institute

The Bio-Protection Research Centre is collaborating with the Smithsonian Tropical Research Institute (STRI) to investigate chronosequencing on the West Coast of New Zealand.

Prof Leo Condrón, co-leader of the Sustainable Bioprotection Theme explains that a chronosequence is a sequence of related soils that differ in their degree of profile development because of differences in their age. "Current research into tropical ecosystems is raising a number of fundamental questions about plant-soil interactions. This project, with Dr Ben Turner from STRI is looking at the links between soil ecosystem development and nutrient dynamics. It's fundamental ecosystem biology from a below-ground perspective."

Leo has recently returned from STRI in Panama where he and Dr Turner discussed joint publications on the West Coast research, as well as the potential for using the New Zealand Biotron at Lincoln University in future projects.

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Next Generation Sequencing Success

Centre researchers have demonstrated for the first time the power of combining genetics with a new sequencing technology to understand the molecular basis of symbiosis between a fungus and a plant.

Eaton, C.J., M.P. Cox, B. Ambrose, M. Becker, U. Hesse, C.L. Schardl, and D.B. Scott. 2010. *Disruption of signaling in a fungal-grass symbiosis leads to pathogenesis*, will be published in the July issue of *Plant Physiology* and is already attracting international attention.

Prof Barry Scott, from Massey University's Institute of Molecular BioSciences says the techniques used highlight the very fine balance between plant-fungal symbiosis versus pathogenesis.

"I think this is going to be a landmark paper thanks to the outstanding biology and genetics done by our recent PhD student Carla Eaton and the powerful computational input from Murray Cox, in analysing the huge data sets (84 million mRNA sequences) associated with this project. The work also involved collaboration with Prof Christopher Schardl at the University of Kentucky who provided access to the fungal endophyte genome sequence."

Since a preview of the paper has gone online Prof Scott has received two invitations to write reviews on the work, one from *Plant Signaling and Behavior* and one from *Plant Science*. It is also profiled on the website of Cofactor Genomics in the USA who did the sequencing. See <http://www.cofactorgenomics.com>

Dr Carla Eaton whose PhD work led to this paper began a Postdoctoral Fellowship at the University of California, Riverside in March. Dr Murray Cox is a Research Fellow in the Bio-Protection Research Centre.

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Ross Beever 1946 – 2010

We note with sadness the death of Centre and Landcare Research mycologist and plant pathologist Dr Ross Beever, whose scientific accomplishments spanned fungal and plant taxonomy, plant physiology, biochemistry, genetics, and molecular biology.

Within the Centre Ross worked with Assoc Prof Mike Pearson (The University of Auckland) investigating mycoviruses of *Botrytis*. He was a key part of this project, providing resources and intellectual input, both as a co-researcher and a PhD supervisor. He will be sorely missed by everyone in the team, not just for his scientific input but also for his enthusiasm, generosity and encouragement.

Ross was a Fellow of the Royal Society of New Zealand, the New Zealand Institute of Agricultural and Horticultural Science and the Australasian Plant Pathology Society as well as a life member of the Fungal Network of New Zealand and the Auckland Botanical Society.



Centre visitors

Hon Dr Wayne Mapp

The Minister of Research, Science and Technology, the Honourable Dr Wayne Mapp visited the Centre in May. Dr Mapp was accompanied by his Senior Advisor, Stuart Boag and Lesley Middleton, Acting Chief Executive of MORST.

The group met with representatives of the Centre's partner institutes for a discussion on Centre research and direction.

Ruth Richardson, Unicom Advisory Panel

UniCom Advisory Board member Ruth Richardson met with Alison Stewart, Travis Glare and Peter John to discuss the commercialisation processes of *Trichoderma* products.

UniCom is a consortium comprising Lincoln, Waikato and Canterbury Universities and The Auckland University of Technology which successfully bid to receive devolved investment capital from the Pre-Seed Accelerator Fund operated by FRST.

Professor Alan Dodson, The University of Nottingham

Prof Alan Dodson is the Pro-Vice Chancellor of The University of Nottingham and had meetings with Alison Stewart, Steve Wratten and John Hampton on his visit to Lincoln University in late May.

Indigenous studies visitors

Academic staff from Trent and Guelph Universities in Canada visited Lincoln in May to discuss opportunities for collaboration between the three institutions in the area of Indigenous Environmental Studies.

Dr Dan Longboat, Director of the Indigenous Environmental Studies Programme, Trent along with Assoc Prof Stephen Crawford from the Department of Integrative Biology, Guelph and Kara Wehkamp, Aboriginal Student Advisor, Guelph, were welcomed with a powhiri before giving presentations on the work they have done in promoting indigenous research and encouraging participation by indigenous communities.

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Bio-Protection
Bioprotection science for New Zealand

Bio-Protection Science Ambassadors



Sam helps Branston students identify insects caught in the school's vegetable garden.

“What’s the biggest...smallest...ugliest...most dangerous...rarest...coolest insect you have ever collected?”

These and a hundred other questions assailed Futureintech Ambassador Samuel Brown during a visit to a Year 7 class at Branston Intermediate in Christchurch.

The students were learning about “The Living World” and were so enthralled by Sam’s stories about insect collecting around the Pacific that they asked questions for nearly an hour and almost ran out of time to go outside and collect some insects of their own, a fact that impressed Sam.

“It was cool how the kids were so enthusiastic and interested both in the talk and in the collecting afterwards and I was surprised by the number and depth of the questions they came up with.”

Futureintech is a nationwide, Government-funded initiative of the Institution of Professional Engineers New Zealand, which promotes science and science careers at all levels of the education system. Sam, who was awarded his MSc in April, says he got involved because he enjoys interacting with school students and relishes the opportunity to tell people what he’s passionate about. Lincoln based PhD student Jean Tompkins got involved for similar reasons. Both agree that it’s not a big commitment, but very worthwhile.

Hang on to your hat!

Land of bioprotection was the title of the Centre’s entry in the Lincoln University Garden Party hat competition.

The complex confection was in the style of a graduation ‘mortar board’ and modelled by New Zealand Biotron Manager, Stuart Larsen. The top of the hat was a quadrant reflecting some of the primary industries which benefit from our research: pastoral agriculture; forestry; grain and seed as well as Maori bioprotection.

The tassel was a petri dish featuring our logo grown in *Trichoderma* fungus.

Sadly, the quality of this entry was beyond the judges’ comprehension, and while we made it into the finals we didn’t get the overall prize!



Stuart Larsen made a charming model for our hat.

Student profiles

Ben Hancock

Title: Ecosystem Services of Spiders in Viticulture.

Ben has an MSc (Hons) in Ecology and Biodiversity from Victoria University and has worked on conservation and translocation projects in New Zealand as well as avian ecology research projects in the USA and Panama.

His research will investigate the contribution of spiders to pest predation in vineyards and whether this can be enhanced through supplementary plantings with floral or extra-floral nectaries. The project is part-funded by Wither Hills Vineyard (Lion Nathan Wine Group).

Supervisors: Prof Steve Wratten and Prof Travis Glare (Lincoln University).



Kar Mun Chooi

Title: Molecular characterisation of *Grapevine leafroll associated virus 3* (GVLRAV3).

Kar Mun Chooi received a Top Achiever Doctoral Scholarship from the Tertiary Education Commission in March 2009. Her research focuses on *Grapevine leafroll-associated virus-3* (GLRAV-3), a serious disease estimated to cost New Zealand vineyards millions of dollars due to reduced grape yield and quality. She is investigating the variability of the virus, and the implications for diagnosis of the disease and how infectious it is. Her research is co-funded by Corbans Viticulture.

Supervisors: Mike Pearson (Auckland University) and Dan Cohen (Plant & Food Research).



Milena Mitic

Title: Ca²⁺ signalling in symbiosis of *Epichloë* in perennial ryegrass.

Milena graduated from the University of Belgrade in 2006, where she studied in the Faculty of Molecular Biology and Physiology. Her research explores calcium signalling machinery in *Epichloë festucae* and the role this plays in the symbiotic interaction between this fungus and its host. Of special interest is the potential for crosstalk between calcium and ROS signaling in *E. festucae*.

Supervisor: Prof Barry Scott (Massey University)

Associate supervisor: Dr Jasna Rakonjac (Massey University).



Jennifer Pannell

Title: Predicting Weed Distributions Under Climate Change: Beyond the Envelope.

Jenny has a BSc Honours in Ecological Science from the University of Edinburgh. As part of her BSc, she organised and completed a two month expedition to Finnish Lapland, where she collected a large number of tree cores as the basis of her dissertation “Investigating the Presence of a Temperature Driven Growth Response in High Latitude and High Altitude *Pinus sylvestris*: A dendroecological study”.

Supervisors: Profs Philip Hulme and Richard Duncan (Lincoln University).



Rajan Trivedi

Title: Strategies to control *Alternaria radicina* in carrot seed production.

Rajan has an MSc in Plant Pathology from Sardarkrushinagar Dantiwada Agricultural University in India. He is looking to develop control strategies for both conventional and organic production systems, including a robust method of detecting the *A. radicina* pathogen in soil through baiting, selective agar and PCR.

Supervisor: Prof John Hampton.

Co-supervisors: Dr Marlene Jaspers and Dr Hayley Ridgway (all Lincoln University).
Jo Townshend (Midland Seeds Ltd).



Craig Sixtus

Title: The gorse pod moth (*Cydia succedana*): Is it a successful gorse biocontrol agent?

Craig has an MAgSci from Lincoln University and worked at the Centre as a technician before taking up his PhD study.

Supervisor: Prof John Hampton.
Associate Supervisors: Prof Travis Glare, Assoc Prof George Hill (Lincoln University).



Trichoderma link with China

Prof Liu Xian returned to the Shenyang Agricultural University in China in May after spending a year working with Dr Robert Hill at Lincoln.

Liu was attracted by the Centre’s reputation for world class *Trichoderma* research and has returned to Shenyang with a greater understanding of its potential for enhanced plant growth and vigour, and disease control. He also worked on *Trichoderma* root initiation and biochar trials and learned new taxonomy techniques which he will use for species identification in China.

Translating science for the public

“You have a bum deal as scientists – the general public hates science, although it loves the consequences of your work.”

So began a talk by popular newspaper columnist and author Joe Bennett at Writing for the Media, a Postgrad and Postdoc Transferable Skills Workshop held at Lincoln.

Having outlined what the group was up against, Bennett went on to provide examples of good writing along with tips on language and style, “throw away everything you know about science writing”. Mercilessly dissecting sample stories offered up by the courageous workshop attendees, he eventually convinced them that writing for the media turns science writing on its head and that treatises on scientific methodology, no matter how erudite, are unlikely to produce excited gasps from the general public.

While his manner was jocular, the message was serious. No matter how important or exciting you consider your research, if you want people to read about it, you must make it interesting and relevant to them.

The workshop’s other speakers were Dacia Herbulock of the Science Media Centre, who covered international media trends and their implications for science journalism, and David Williams, Environmental Reporter at The Press who explained how journalists work and outlined the processes involved in writing, editing and publishing a story.

Writing for the Media is the fourth Bio-Protection Research Centre Transferable Skills Workshop. It was organised by Prof Steve Wratten.



Joe Bennett provided a tough but entertaining lesson on writing.

Honours, achievements and appointments

B3 Executive Director

Prof Stephen Goldson, co-leader of the Centre’s Biosecurity Theme, has been appointed the Executive Director of the Better Border Biosecurity consortium.

Best paper

Well done Prof Philip Hulme and co-authors Ezekiel Edward and Pantaleo Munishi from Sokoine University of Agriculture in Tanzania, whose article “Relative roles of disturbance and propagule pressure on the invasion of humid tropical forest by *Cordia alliodora* (*Boraginaceae*) in Tanzania” has been awarded the 2010 Biotropica Award for Excellence in Tropical Biology and Conservation.

The award citation will be published in the September issue of Biotropica along with an essay by Philip describing the work.

Most cited

Congratulations to Prof Barry Scott and former student Carolyn Young who have made the most cited list of Fungal Genetics and Biology.

Young, CA, Felitti, S, Shields, K, Spangenberg, G, Johnson, RD, Bryan, GT, Saikia, S & Scott, BA (2006) Complex gene cluster for indole-diterpene biosynthesis in the grass endophyte *Neotyphodium lolii*. Fungal Genetics and Biology Vol. 43, 10: 679-693

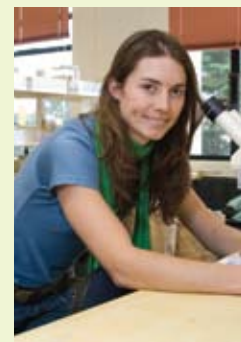
Te Tipu Putaiao Fellowship

Recent Centre graduate Dr. Amanda Black has won a three year Te Tipu Putaiao Fellowship from FRST. Amanda’s project will see her looking at addressing long-term nutrient retention in agricultural soils. Amanda is a Maori researcher based in the Maori Bioprotection Theme but her research sits within the Sustainable Bioprotection Theme.

Writing Prize

Centre PhD student Jean Tompkins won Lincoln University’s inaugural David Jackson Prize for an article on research into methods of enhancing nature’s services in vineyards.

The prize honours the contribution of former Lincoln University academic Dr David Jackson to winemaking in the Canterbury region and is awarded to a student at Lincoln University carrying out research in the broad area of wine and requires them to submit a popular article on their work for judging. Judges said Jean’s submission clearly stood out in terms of innovation, academic rigour and readability, whilst presenting complex inter-relationships.



Jean Tompkins