**Drowned in lakes and trapped in amber: diverse terrestrial arthropod faunas from Miocene New Zealand**

Uwe Kaulfuss [*1]

[1] Department of Geology, University of Otago, Dunedin, New Zealand

Until recently, fossil evidence for pre-Quaternary terrestrial arthropods in New Zealand was virtually unknown; prior to 2007, only six insect fossils were known from the Triassic to Pliocene - a period spanning ~200 million years of New Zealand's geologic and biologic history. However, our research on Cenozoic fossil lagerstätten in Otago and Southland has yielded exquisitely preserved diverse terrestrial floras and faunas that have greatly expanded our biodiversity perspective of ancient terrestrial ecosystems in New Zealand. In particular, laminated sediments from volcanic lakes (maars) and fossilized tree resin (amber) are proving to be exceptional paleontological archives preserving highly diverse arthropod assemblages, often with minute anatomical details that allow taxonomic identification below family level. We have now collected more than 240 specimens of arthropods: they include members of the Araneae, Acari, Pseudoscorpiones, Collembola, Odonata, Plecoptera, Isoptera, Hemiptera, Coleoptera, Hymenoptera, Trichoptera, Diptera and Lepidoptera. These fossils allow a first evaluation of past arthropod diversity in New Zealand and provide potential time-calibrations for phylogenetic studies. They chiefly represent ground–dwelling taxa from forest floor, leaf litter and lake margin palaeohabitats; large-winged taxa with high potential for long-distance dispersal are comparatively rare. Evidence for diverse arthropod-plant-interactions commonly present on the associated flora (e.g. leaf feeding damage, leaf mining, galling, and seed predation) further indicates that arthropods were vital components of Cenozoic forest ecosystems in New Zealand. Key findings of our ongoing study of arthropods from maars and amber are 1), evidence for the antiquity of terrestrial arthropods in New Zealand, with some lineages dating back at least 23 million years, 2), a higher diversity in the Cenozoic than today of some families (e.g. Formicidae), and 3), a high diversity of ground-dwelling and flightless arthropods in the earliest Miocene, coeval with or shortly after maximum marine transgression in Zealandia.

**Exaggerated trait evolution in brentid weevils**

Christina Painting [*1], Greg Holwell [1]

[1] School of Biological Sciences, University of Auckland, Private Bag 92019, Auckland Mail Centre, Auckland 1142

The extent of exaggerated trait evolution in animals can inform us about the degree of sexual selection pressure on males between closely related species. In particular, sexual selection is hypothesised to drive the evolution of positive allometries, such that males in highly competitive environments will be expected to increase their relative investment into traits that enhance their mating success. Allometric slopes can evolve rapidly in response to different levels of sexual selection pressure and therefore have the potential to vary among populations and related species. The Brentidae (Coleoptera: Curculionoidea) are a highly diverse family, with more than 290 genera and 1690 species currently described. Brentid weevils are ideal as models for exploring secondary sexual trait evolution because many species exhibit high levels of sexual dimorphism, often due to the possession of exaggerated traits, such as rostrum length in males. Male rostra are likely to be under sexual selection, highlighted by several studies that have demonstrated the importance of this trait as a weapon used between males to fight for access to females. This study determined the extent of exaggerated trait evolution and sexual size dimorphism among brentids using photographs of museum specimens from 55 species across seven subfamilies. We predicted that sexual selection on rostrum length would result in positive allometries in species where rostrum size influences male mating success. Using sexual dimorphism as a proxy for sexual selection pressure, we predicted that those species with exaggerated rostra in males will have the highest levels of sexual dimorphism. By placing this study in a phylogenetic context we can also determine the extent of exaggerated trait evolution across the family and determine the variation in allometric slopes between closely related species. Finally, we explore the diversity in shape of the allometric slopes, highlighting evidence of male polymorphism in some species.

**Not drowning, just waving? What do insects tell us about Zealandia, the Oligocene and dispersal in New Zealand biogeography?**

Adrian Paterson [*1]

[1] Lincoln University, Lincoln

There has been an extensive debate about the biogeographical history of New Zealand's biota over a number of decades. More recently there has been the suggestion that most modern lineages have arrived in New Zealand over the last 20 million years. Numerous insect studies have addressed this issue over the last decade and seem to support the idea of dispersal rather than vicariant origins for their presence in New Zealand. I will summarise this research with regards to long distance dispersal and age of lineages within New Zealand, identify possible vicariant lineages (as well as making a few scathing comments about panbiogeography).

**_Laelaptoseius_: a poorly-known endemic mite illuminates its superfamily**

Matthew Shaw [*1]

[1] Canterbury Museum, Rolleston Ave, Christchurch 8013

The enigmatic New Zealand mite *Laelaptoseius novaezelandiae* Womersley 1960 is found in litter habitats on the North and South islands. Nothing is known of its biology, but it is probably a predator of springtails or nematodes. It has been placed in two different superfamilies since its description, however, none of its previous placements are here considered satisfactory. Even its name spells out this confusion. The prefix refers to the family Laelapidae in the Superfamily Dermanyssoidea whereas its stem *–seius* is usually reserved for mites in the Ascoidea. I argue for its placement in yet another superfamily (Eviphidoidea) and this new placement is based on a re-interpretation of the ventral shields of various Eviphidoidea. This example shows how homology assessment can detect instances of convergence and reveal new systematic and biogeographic patterns.

**A tussle with Tachinidae and other parasitic flies**

Franz-Rudolf (Rudi) Schnitzler [*1]

[1] Landcare Research, Private Bag 92170, Auckland Mail Centre, Auckland 1142, SchnitzlerR@landcareresearch.co.nz & Ministry for Primary Industries, P.O. Box 2095, Auckland 1140, Rudi.Schnitzler@mpi.govt.nz

Tachinidae are considered to be the most speciose family of the order Diptera in the world. There are currently about 140 described species in about 58 genera in New Zealand. Many more undescribed species are known and more remain to be discovered. All species with known life histories are internal parasitoids of other insects and arthropods. Therefore they are ecologically important in regulating herbivore populations and in structuring both natural and managed ecological communities. Yet they are very much understudied as they are considered to be one of the most difficult families of Diptera in which to make practical identifications. I will report on the making of the DoC funded TFBIS project a *'Virtual guide to the tachinid flies (Tachinidae) of NZ'*, which will be but one stepping stone towards a better understanding of New Zealand Tachinidae and hopefully will encourage future research and funding. I present examples of an interactive key to New Zealand genera of Tachinidae, relevant character and imago images, as well as fact sheets. These will be made available on the Landcare Research website upon completion. I will discuss observations and perils faced during the development of the key. Furthermore I will comment on a record of another parasitic New Zealand fly family.

**Islands in the snow: Ecology, systematics and biogeography of the New Zealand beetle genus *Protodendrophagus* (Coleoptera: Silvanidae: Brontini)**

John Marris [*1], Ben Wiseman [1]

[1] Ecology Department, Lincoln University

Tectonic activity, the emergence of the Southern Alps, and subsequent periods of glaciation have had a major impact on the evolution of New Zealand's biota. The New Zealand endemic beetle genus *Protodendrophagus* (Coleoptera: Silvanidae: Brontini) is restricted to high altitude (>1400 m) habitats – a trait that is otherwise unknown within the family Silvanidae worldwide. Once thought to be rare and restricted to the northern part of the South Island, recent field studies have revealed the specific microhabitat of *Protodendrophagus* and found it to be widely distributed across the South Island. The combination of high altitude habitat and flightlessness means that *Protodendrophagus* populations are effectively isolated to 'islands in the snow', making the genus an ideal subject to investigate how geological forces have influenced its evolution. We report on the latest findings from morphological and molecular investigations and discuss the ecology, systematics and biogeography of the genus.

**Beetle inquilines of New Zealand**

Rich Leschen [*1], Shuhei Nomura [2]

[1] Landcare Research, NZAC, Private Bag 92170, Auckland, New Zealand
[2] Department of Zoology, National Science Museum Amakubo 4-1-1, Tsukuba-shi, Ibaraki, 305-0005 Japan

It is well known that the diversity of eusocial insects in New Zealand is depauperate. With only 11 endemic species of ants, there have been few documented beetle inquilines, most records referring to the lucanid *Holloceratognathus passaliformis* (Holloway), which was described in 1962 from the Wellington area. Recent collecting has produced 9 species of pselaphine (Euplectitae) staphylinids from *Huberia*, *Pachycondyla*, and *Prolasius* ant nests representing 4 new genera and 7 new species. True inquilinism is inferred from repeated field collections from ant hosts and morphology. Inferred phylogenetic relationships of New Zealand pselaphine inquilines indicate that at least one of the new genera may be related to an Australian genus also found with ants. Phylogenetic data from formicids suggests that some ant genera may have been in New Zealand since the late Cretaceous, and maybe, some of New Zealand's pselaphine inquilines could also be this ancient.

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**Brown meets Broun: Inspecting the type specimens of broad-nosed weevils at the Natural History Museum, London**

Samuel Brown [*1]

[1] Bio-Protection Research Centre, Lincoln University

Eligible for student prize

The broad-nosed weevil genus *Irenimus* is one of the larger genera of weevils in New Zealand. The genus is found throughout the country, though they find their greatest diversity in the southern half of the South Island. They are found in forest-edge, shrubland and grassland habitats, with an altitudinal range that spans over 2000 m. A total of 65 species were described by Broun and Sharp between the years 1880--1920; however, it is very difficult to identify species based on these descriptions alone. As part of a taxonomic revision of the genus, it was necessary that the type specimens held in the Natural History Museum, London be inspected in order to confirm the identity of previously described species and to validate previous determinations. This was done in August and September 2013. Of the available names relevant to my study, 28 are valid species and 37 are synonyms. During my time in Europe, I was also able to visit the Muséum national d'Historie naturelle, where I was able to look at a substantial amount of Broun material deposited there. This collection contains a number of syntypes; but has been largely neglected by New Zealand coleopterists.

**An acrostic abstract about Acroceridae**

Cor Vink [*1]

[1] Canterbury Museum, Rolleston Avenue, Christchurch

**A**rguably the most interesting family of flies, Acroceridae are very rarely **c**ollected. There are ten described species in New Zealand and three new species **r**equiring descriptions. All acrocerids are parasitoids and **o**nly parasitise spiders. Acrocerids have a fascinating biology, which I will discuss. The **c**apture of specimens is best done by collecting adults as they **e**merge from their spider hosts. Some acrocerid species **r**eadily visit flowers, where they can also be caught. It is my **i**ntention to revise the New Zealand Acroceridae, but this project will have a long **d**uration as I want to sample DNA from each species and examine **a**dults from each of the species. I appeal to my fellow **e**ntomologists to be on the lookout for these wonderful insects.

**How well do we know our talitrid taxonomy? A Northland case study**

Olivier Ball [*1], Richard Webber [2], Lara Shepherd [3]

[1] Department of Applied and Environmental Sciences, NorthTec, Private Bag 9019, Whangarei

[2] Museum of New Zealand Te Papa Tongarewa, P.O. Box 467, Wellington

[3] Museum of New Zealand Te Papa Tongarewa, P.O. Box 467, Wellington; and School of Biological Sciences, Victoria University of Wellington, Kelburn, Wellington

We examined the landhopper (Crustacea: Amphipoda: Talitridae) fauna of Te Paki in the far north of New Zealand using an extensive pitfall trapping study in 2006 – 2009. Six putative species were identified but only one (*Waematau reinga*) could be identified with confidence. A second taxon that is very similar to *W. reinga* was shown to be distinct by DNA analysis. Two further species described from Northland (*W. unuwhao* and *W. muriwhenua*) were also found but required the examination of type material for identification as published descriptions were not sufficiently accurate. Both were widespread and sometimes common despite having been considered rare and possibly extinct. Another two taxa from Te Paki are undescribed, and it is not yet possible to attribute them to genera. Additional collecting in Northland indicated that the distributions of the latter two species range from at least the Three Kings Islands to Whangarei. The three described species of *Waematau* found at Te Paki have been considered endemic to that ecological district, but individuals very similar to two of them (*W. reinga* and *W. unuwhao*) have recently been discovered in other parts of Northland. Lastly, our research has shown that some type material of at least two Northland species had been misidentified and preliminary molecular analyses suggest inconsistencies among New Zealand's current generic groupings. We therefore conclude that despite the considerable efforts of previous taxonomists, knowledge of our talitrid fauna is still at an early stage.

**Discovery of Micropterigidae (jaw-moths) in Western Australia**

George Gibbs [*1]

[1] Victoria University

Thanks to a dedicated little band of sharp-eyed, highly skilled collectors, the discovery of isolated patches of relict archaic moths on the vast Australian continent continues with the addition of three new species of jaw-moth from Southwest Australia. One is a '*Sabatinca*-clade' species, a type previously thought confined to Zealandia, the other two turn out to be two western outliers of the Eastern Australian clade. At the other extreme of their range, both types are represented in New Zealand, together making up our entire fauna of jaw-moths. These discoveries provide interesting taxonomic and phylogenetic challenges. But these are nothing compared to sorting out an acceptable biogeographic explanation for their presence in the far west. It is easy to understand why they have not been found there before – the largest is 3.4mm forewing length. Their habitats, diagnosis and biogeography will be discussed. From what is known of their siblings, the two types will have contrasting larval forms, which should define their habitat requirements – the sabatincoid species will be a herbivore on liverworts; the 'Australian' ones probably detritivores in litter or soil under grasses. Larvae have yet to be found but will undoubtedly be very small and easily overlooked.

**Pyraloid moths of New Zealand: an end to the suffering?**

Robert Hoare [*1]

[1] Landcare Research, Private Bag 92170, Auckland

The superfamily Pyraloidea is very well represented in New Zealand with over 250 species in the two families Crambidae and Pyralidae, including 25% of the world's named species of Scopariinae. Though generally treated as 'microlepidoptera', pyraloids are mostly medium-sized and quite conspicuous moths: many species fly naturally or can be disturbed by day, many come in good numbers to light traps, and several are widespread and extremely abundant. The superfamily contains a number of notorious stored products pests, especially in the family Pyralidae, as well as numerous migratory species of greater or lesser economic importance. Revisionary work on the Crambinae of New Zealand dates back to the work of Gaskin in the 1970s; since this time several new endemic species have been discovered. Other groups have not been revised for many years, and the Scopariinae especially present numerous problems of identification, especially in the alpine zone. Even sturdy entomologists have been driven to distraction. A new online image gallery of New Zealand Pyraloidea boldly aims to help identification of these conspicuous insects. This talk touches on some of the wonders and horrors encountered by the pyraloid student.

**Alpine Assumptions - or how to measure a myth**

Warren Chinn [*1]

[1] Department of Conservation, Science & Technical Group, Level 1, 70 Moorhouse Ave Christchurch 8011 (03) 371 3788 027 630 6577 wchinn@doc.govt.nz

The ‘lost real estate’ model predicts that available habitats on mountains contract in response to climate warming and that organisms will 'track' appropriate conditions. While there have been several well documented cases of latitudinal range expansion with a warming climate, the case for upward tracking in alpine environments is possibly more assumed than true. In New Zealand the possibility of habitat tracking in mountainous lands is ambiguous. Since the late 1800s it was clear that paleo-climate changes had had a significant effect on the landscape via glaciation. Similarly, many plant ecologists have inferred vegetation patterns in response to glacial fluctuations. Direct measurement of range tracking within the alpine biota has proven to be very difficult and uncertain. This project tackles part of the problem by using a snap-shot sampling method of alpine invertebrates. Specific groups are recorded, at set elevations along a north/south axis of the alps. They are then correlated with end of summer snowlines (a proxy for climate), which can be measured across a 40 year data set. An important issue for conservation management in the high country is the incursion of pests and weeds into the alpine zone, and whether or not the alpine biota can survive. Preliminary work has shown changing assemblages of invertebrates with elevation and the presence of alpine taxa where the snowline once existed.

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**What happens when you find a weta in your bathroom!**

Marie McDonald [*1]

[1] Department of Ecology, Lincoln University, PO Box 85084, Lincoln 7647, Canterbury

Eligible for student prize

Prior to 2002 there was limited knowledge of the distribution of cave weta (family Rhaphidophoridae) within the Wakatipu basin. In order to determine whether cave weta were living in the area, fifty four weta motels (artificial dwellings) were placed into selected locations/vegetation around the Wakatipu basin. The motels were placed in 2003 covering a variety of habitats within the basin and were monitored over a six year period. Overall, 45 of 54 motels (83%) had cave weta present at some time over the 6 year period. Three motels never recorded cave weta, one motel recorded cave weta once, a number were lost in landslips and one was destroyed in a fire. Our research shows that cave weta are widespread within the basin and that motels are an effective method for monitoring and sampling cave weta populations.

**Invertebrate indicators of restoration success in the Punakaiki ecological restoration project**

Mike Bowie [*1], Stephane Boyer [1], Nick Dickinson [1], Jason Hahner [1], Cathy Mountier [1], Carol Smith [1]

[1] Lincoln University

In any restoration programme there is a need to set measurable goals and restoration practitioners seek simple indicators of restoration success. Establishing when restoration is making a difference or successfully achieved is not always easy to measure. This research based near Punakaiki on the West Coast of the South Island tests several entomological methods for their usefulness in detecting invertebrate species differences along a restoration trajectory. The Punakaiki Coastal Restoration Project (PCRP) is a collaboration between Rio Tinto, Conservation Volunteers New Zealand, Lincoln University and the Department of Conservation to restore the sand plain forest habitat on the Barrytown flats 4 km south of Punakaiki Township. Monitoring at the restoration site is being compared with mature reference sites from Nikau Reserve and unplanted exotic grassland sites nearby. Invertebrates were monitored using pitfall traps, wooden discs, soil sampling, leaf litter, weta motels and light trapping. Carabids, dung beetles and ants collected from pitfall traps were significantly more abundant in mature sites. Snails, weevils, ants, centipedes and spotted worms were only found in leaf litter from mature sites. Earthworms significantly decreased with increasing vegetation age whereas the proportion of endemic worms significantly increased in mature sites.

**Captive rearing of the Nationally Endangered Canterbury Knobbled Weevil (*Hadramphus tuberculatus*)**

Emily Fountain [1], Andrew Pugh [*2], Victoria Smith [3], Ben Wiseman [3], Robert Cruickshank [3], Adrian Paterson [3]

[1] Department of Forestry and Wildlife Ecology, University of Wisconsin-Madison, 1630 Linden Dr, Madison, WI, USA, 53706

[2] SCION, 49 Sala Street, Rotorua, New Zealand, 3046

[3] Department of Ecology, Faculty of Agriculture and Life Sciences, Lincoln University, PO Box 85084, Christchurch, New Zealand 7647

The Canterbury knobbled weevil (*Hadramphus tuberculatus*) was thought extinct, until a single population was rediscovered at Burkes Pass Scenic Reserve, Canterbury, in 2004. Considered nationally endangered by the Department of Conservation, the only known population is vulnerable to extinction from predation, habitat loss, fire and genetic inbreeding. Relying on site-specific conservation of this species is high risk, and alternative methods are required. In this study we captive reared a small sample of Canterbury knobbled weevils to assess this method's viability as a conservation tool. Weevils were reared on *Aciphylla aurea*, *A. dieffenbachii* and *A. subellafellata* in insect rearing cages at ambient temperatures. At the conclusion of this experiment, two progeny adults were recorded, in addition to four larvae, indicating this method could be used to maintain or increase the wild population. Previously unknown information regarding the feeding behaviour of larvae was recorded. Due to the success in a 14 month study with such a small sample size, captive rearing may be an important tool in the conservation of this species.

**Life's a beach then you cry: spiders on marine strandlines (and the pros and cons of intensive sampling)**

Simon Hodge [*1], Mick Whittle [2], Cor Vink [3]

[1] Lincoln University, Canterbury
[2] International Antarctic Centre, Christchurch
[3] Canterbury Museum, Christchurch

Marine strandlines - consisting of deposits of seaweed, driftwood and general flotsam - form a familiar component of shoreline ecosystems. Strandlines provide a habitat for crustaceans, numerous Diptera (including their larvae), Coleoptera and associated predators and parasitoids. Spiders are a frequent, if not abundant, occupant of marine strandlines, though (with the exception of the slater-eating *Dysdera crocata*) little seems to be known of what they actually do there. In an initial attempt to address this knowledge gap, this study examined the relative frequency and seasonal activity of spiders on the sandy beach at New Brighton, Christchurch. Spiders were sampled by hand-searching and sieving of strandline material, with species being recorded as present or absent on each occasion. Although over 300 visits were made to the study site, only 20 species, belonging to ten families, were recorded in total. The spider assemblage was, unsurprisingly, more diverse in the summer months compared to winter and, although the number of species recorded was low, the intensive sampling regime allowed detailed analyses to be performed regarding monthly 'abundance'. Clear relationships between spider occurrence and weather conditions were found when considering monthly average values, but the patterns found using daily data were much more diffuse. The most common species recorded in the survey was the endemic shoreline specialist *Anoteropsis litoralis* (Lycosidae), whereas the second most common was the introduced generalist species *Tenuiphantes tenuis* (Linyphiidae). The invasive 'false katipo', *Steatoda capensis*, was the third most recorded species, whereas no actual katipo, *Latrodectus katipo*, were recorded.

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**Stories about deceit, deception and swindle**

Mariella Herberstein [*1]

[1] Department of Biological Sciences, Macquarie University

Deception involves the manipulation of another individual to the benefit of the deceiver. The victim of deception can be of the same or a completely unrelated species, but will carry a cost from responding to the manipulation. Sometimes, especially in cases of prey deception, the cost is fatal. The complexity of the signals and behavioural manipulation involved in deception is intriguing and often quite intimate. In this talk I will present several superb examples of deception involving spiders and insects (and the occasional orchid). My talk is firmly rooted in natural history and extends into explanations of continental wide patterns of deception.

**Sexual selection in New Zealand sheet-web spiders, *Cambridgea* spp.**

Leilani Walker [*1], Greg Holwell [1], Cor Vink [2]

[1] University of Auckland, Private Bag 92019 Auckland 1142 New Zealand
[2] Canterbury Museum, Christchurch

Eligible for student prize

Sexual selection is a powerful force that generates both great diversity and great exaggeration of traits which influence reproductive success. This is particularly true in the case of male weaponry and genitalia. Weapons are used in physical interactions during contests, but can also function to signal status to rivals, making them key predictors for the outcomes of conflicts between males vying for access to females. Meanwhile, variations in genital morphology can generate differential success in copulation and fertilisation. Sexual selection is likely to be an important driver of diversification among the endemic New Zealand sheet-web spiders, (Stiphidiidae: *Cambridgea* spp.). This remarkable genus includes species with exaggerated chelicerae and species in which males fall into one of two morphs, one morph containing larger males and the other consisting of smaller males that more closely resemble females. Male pedipalp morphology is highly species-specific, but intriguingly, exhibits intraspecific polymorphism in some species. This makes *Cambridgea* an ideal group for studying the varying actions of sexual selection and how it influences weapon and genital evolution and behaviours associated with reproduction. Morphometric analyses will assess within- and between-species variation of traits; behavioural trials will be used to test for any sexually selective advantages of these traits; and a molecular phylogeny will be developed to identify general evolutionary patterns operating on morphological traits in this diverse genus. Pilot data from behavioural observations of the widespread *Cambridgea foliata* fighting will be presented along with preliminary morphometric data for male chelicerae.

**Endogenous and exogenous factors affecting host chemical footprint exploitation by a hymenopterous egg parasitoid**

Maria Cristina Foti [*1], Ezio Peri [2], Stefano Colazza [2]

[1] Bio-Protection Research Centre. Lincoln University, Lincoln 7647, New Zealand; Department of Agricultural and Forest Sciences, Università degli Studi di Palermo, Italy.

[2] Department of Agricultural and Forest Sciences, Università degli Studi di Palermo, Italy.

Eligible for student prize

During the host location process, parasitoids encounter and explore a great variety of volatile and contact semiochemicals from the host-plant complex. The egg parasitoid *Trissolcus basalis* lands on a plant and can taste chemical footprints left by walking adult hosts, *Nezara viridula*. These cues represent a set of indirect host-related contact kairomones that induce arrestment and motivate searching behaviour, as they drive wasps to an area where there is a high probability of finding hosts but are not able to “promise” the presence of the suitable host stage. Patch time allocation is strongly modified by experience gained during foraging on host traces. When footprint exploitation is not followed by successful oviposition, wasps gradually lose their motivated searching behaviour and move back to a more general host searching behaviour. In this work we investigated the effects of endogenous and exogenous factors that can affect the host location behaviour of *T. basalis*. Trials were recorded and analysed with the aid of a video tracking and motion analysis system. The potential significance of these results in the host location behavior of *T. basalis* is discussed.

**Aboveground endophyte affects root volatile emission and host plant selection of a belowground insect**

Michael Rostás [*1], Michael Cripps [2], Pat Silcock [3]

[1] Bio-Protection Research Centre, Lincoln University
[2] AgResearch Ltd, Christchurch
[3] Department of Food Science, Otago University

1. Plants emit specific blends of volatile organic compounds (VOCs) into the environment that serve as multitrophic, multifunctional signals. Fungi colonising aboveground or belowground plant structures are known to modify such VOC patterns, thereby altering the information content for aboveground insects. Whether aboveground microbes can affect the emission of root volatiles and play a role in the foraging decisions of belowground herbivores remains unresolved. 2. The endophytic fungus *Neotyphodium uncinatum* colonizes the aerial parts of the grass hybrid *Festuca pratensis* x *Lolium perenne* and is responsible for the presence of insect-toxic loline alkaloids in the roots. We investigated whether *N. uncinatum* affects the host location behaviour of the root feeding beetle *Costelytra zealandica* by carrying out belowground olfactometer experiments to assess the gustatory and olfactory choices the larvae. Root volatiles of infected and uninfected plants were analysed by gas chromatography - mass spectrometry (GC-MS) and proton-transfer-reaction mass spectrometry (PTR-MS). 3. Grubs of *C. zealandica* were more attracted to roots from uninfected than from endophyte-harbouring grasses. Likewise, larvae showed a clear feeding preference for uninfected plants.This correlated with lower root VOC production in endophyte-infected grasses but higher carbon dioxide emission. 4. The results show that soil insects can use root volatiles to assess host plant quality and furthermore demonstrate that fungi colonizing aboveground plant parts may influence the behaviour of belowground herbivores.

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**Social bees in New Zealand: foraging interactions and implications for communities**

Jay Iwasaki [*1], Barbara Barratt [2], Alison Mercer [1], Katharine Dickinson [1]

[1] University of Otago
[2] AgResearch

Eligible for student prize

Worldwide, honey bees (*Apis mellifera*) are extensively utilised for their pollination services. Since the 1950s, the mite *Varroa destructor* has caused widespread losses of managed and feral honeybee populations around the world. Until 2000, New Zealand and Australia were the last major beekeeping countries free of *Varroa*, when mites were found near Auckland. The spread throughout New Zealand is on-going while so far Australia remains *Varroa*-free. The effects of *Varroa* on pollinator communities in New Zealand have not been extensively studied. In particular, feral honey bee populations have likely exhibited dramatic losses, and the subsequent community level effects are unknown. If bumblebees (*Bombus* sp.) compete with honey bees, a *Varroa*-induced decline in the number of feral honey bees could potentially enhance the availability of resources for bumble bees resulting in pronounced ecological release. Using a glasshouse at AgResearch Invermay as a flight room, we are examining the effects of competition for resources between honey bees and bumblebees. Preliminary results suggest that conspecifics prefer to forage together on an artificial flower than mixed species. Our autumn experiments will further examine interactions under conditions of varying resource quantities. Future field research will examine the implications of changes in pollinator communities within New Zealand.

**Do New Zealand damselflies exhibit a fast/slow life history dichotomy?**

Tanya Dann [*1]

[1] Department of Zoology, University of Otago, P.O. Box 56, Dunedin 9054

Eligible for student prize

Multiple species of Odonata can co-exist in the same habitat while feeding on the same prey; therefore, to successfully co-exist they require different life history (LH) strategies. One strategy is the fast-slow dichotomy, which has been attributed to the development of predator avoidance or flight response behaviour. A species with a slow LH should have a slower metabolism an differing behavioural responses, it is expected that they will be able to survive longer without food than a species with a fast LH, by reducing movement and energy expenditure. Two species of New Zealand damselfly (*Austrolestes colensonis* and *Xanthocnemis zealandica*) are being used to investigate this life history dichotomy. Larvae of both species were starved to identify the time required for death to occur. Larvae position was recorded daily and notes were made about behavioural responses witnessed. *Xanthocnemis zealandica* survived an average of 87 days and had a preference for sitting on vertical sticks placed in the enclosures. *Austrolestes colensonis* preferred resting on the bottom of the enclosures and survived for a significantly shorter period of time (average 31 days). It was observed that when the surface of the water was disturbed, *A. colensonis* move away from the disturbance while *X. zealandica* flattened its body to the surface it was attached to. This suggests that *A. colensonis* can be considered to have a fast LH and *X. zealandica* to have a slow LH.

**The abundance of *Latrodectus katipo* is affected by vegetation type**

Victoria Smith [*1], Cor Vink [2], Ruedi Nager [3], James Ross [1], Adrian Paterson [1]

[1] Department of Ecology, Lincoln University, Lincoln 7647, Christchurch
[2] Canterbury Museum, Rolleston Avenue, Christchurch 8013
[3] Faculty of Medical, Veterinary and Life Sciences, Graham Kerr Building, University of Glasgow, Scotland

Eligible for student prize

Our study examined the factors affecting the population abundance of *Latrodectus katipo* Powell, 1871, a declining spider species endemic to New Zealand. Comparisons were made of the abundance of *L. katipo* adjacent to two different plant species: the endemic sedge, pingao (*Ficinia spiralis* A. Rich.), and the exotic marram grass (*Ammophila arenaria* (L.) Link). In addition to the effects of marram versus pingao, seasonal effects on *L. katipo* abundance were examined. Using artificial cover objects (ACOs), presence/absence data were collected for *L. katipo*. Sixty ACOs were divided between Golden Bay, and two Canterbury locations, Kaitorete Spit and New Brighton, all areas with historical records of *L. katipo*. Thirty-three ACOs were placed adjacent to marram plants and 27 ACOs were placed adjacent to pingao plants. Kaitorete Spit was the principal study site examined due to the larger *L. katipo* population there. ACOs were checked for *L. katipo* presence every 15 days for two months per season, and for all four seasons at Kaitorete Spit and once per season for three seasons at New Brighton and Golden Bay. No *L. katipo* were found at Golden Bay or New Brighton. A GLMM indicated that finding *L. katipo* under ACOs adjacent to pingao as opposed to marram was between two and three times more probable ($P<0.001$). *Latrodectus katipo* presence was also highest in summer. We conclude that conserving *L. katipo* will involve enhancing the amount of pingao in New Zealand's sand dunes.

**White LED lighting increases the ecological impact of light pollution on flying nocturnal invertebrates irrespective of colour temperature**

Stephen Pawson [*1], Martin Bader [1]

[1] Scion, Ilam, 8041 Christchurch

Recognition of the extent and magnitude of night-time light pollution impacts on natural ecosystems is increasing, with pervasive impacts observed in both nocturnal and diurnal species. Municipal and industrial lighting is on the cusp of a step-change where energy efficient lighting technology is driving a shift from ‘yellow’ high pressure sodium vapour lamps (HPS) to new ‘white’ Light Emitting Diodes (LEDs). We hypothesised that white LEDs would have greater ecological impacts than HPS due to the peak UV/green/blue visual sensitivity of nocturnal invertebrates. Our results confirmed this hypothesis that white LED lights are more attractive to nocturnal flying invertebrates than HPS lamps, although the effect was dependent on temperature (light * temperature, df=42, t=-2.3, P<0.027). We found no evidence that manipulating the colour temperature of white LEDs would minimise the ecological impacts of wide-scale adoption of white LED lights. As such, large-scale adoption of energy efficient white LED lighting for municipal and industrial use is likely to exacerbate ecological impacts and may amplify phytosanitary pest infestations.

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**If you plant the plants, do the invertebrates follow? An assessment of the establishment of indigenous invertebrates in urban forest restoration sites in Christchurch**

Denise Ford [*1]

[1] Lincoln University

Eligible for student prize

The impact of urbanisation on biodiversity can be reduced by the protection and rehabilitation of remnant habitat along with re-vegetation of suitable areas with indigenous plant species. Successful restoration should restore biological functions and the integrity of ecosystems but this is often only evaluated on the success of establishing native plant cover. The hypothesis of “if you build it they will come” is seldom tested. The biodiversity and abundance of terrestrial invertebrates as criteria of success will help to test this hypothesis. My study investigates invertebrate communities in ecological restoration sites within Christchurch. A Malaise trap study done by Richard Toft in 2003 has been repeated in full, this focused on Lepidoptera, Coleoptera and fungus gnats (Diptera: Sciaroidea). Also the Malaise trapping component of studies done at the restoration sites of Travis Wetland (1998) and Styx Mill Conservation Reserve (2007) were repeated. Preliminary results clearly show that the invertebrate community of the old growth forest remnant, Riccarton Bush, is clearly differentiated from nearby gardens. Of the 16 exotic Lepidoptera species recorded only four where found in Riccarton Bush and only one of 19 exotic Coleoptera identified. The sampled restoration sites fall in between gardens and Riccarton Bush in their composition. I am currently testing the hypothesis that invertebrate communities of restoration sites are becoming more like Riccarton Bush over time. The key to the enhancement of native biodiversity in an urban setting is successful restoration projects. Repeating these surveys and the resulting data analysis allows us to determine if the invertebrates do really follow the plants and whether some management readjustment is needed to achieve the outcome of a fully functioning ecosystem.

**The impact of introduced flowering species on alpine plant-pollinator networks in southern New Zealand**

Christa Miller [*1], Katharine Dickinson [1], Barbara Barratt [2], Janice Lord [1]

[1] University of Otago
[2] University of Otago, AgResearch

Eligible for student prize

Introduced and native flowering plants compete not only for abiotic resources, but can also compete for insect pollinators. New Zealand's flora comprises approximately 50% introduced flowering plant species and many have established in alpine and montane areas forming novel communities along with introduced pollinating insects. Although insect pollination in alpine New Zealand is poorly understood, the few studies carried out to date reveal that native alpine New Zealand flowering plants are usually dependent on pollen vectors for successful reproduction. Non-indigenous pollinating insects and flowering species that integrate into native plant-pollinator webs could have a detrimental effect on native alpine plant-pollinator relationships. This study explores the impact of introduced plant and pollinating insect species on native plant-pollinator relationships in alpine southern New Zealand. Observations of insect visits to both native and introduced flowers along an altitudinal gradient were undertaken over the course of two years in addition to experimental flower arrays to compare insect choices between native and introduced flowers. Insect flower visitors were netted and pollen was collected from their bodies. Results indicated that native and introduced insects preferred introduced flowers, particularly *Hypochaeris radicata.* Pollen samples taken from insect flower visitors also confirmed that most insects visited introduced flowers. Such insect preferences for introduced flowers could have an adverse impact on the reproductive success of native flowering species whilst enhancing the spread of weedy non-native species. Conversely, introduced flower species could be supporting increased numbers of native insects.

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**Twenty years of restoration on Motuora; has it delivered for invertebrates?**

Stephen Wallace [*1], Robin Gardner-Gee [2], Jacqueline Beggs [1]

[1] University of Auckland
[2] Plant & Food Research

Eligible for student prize

Island restoration has become increasingly important in New Zealand conservation. In recent years several large-scale re-vegetation projects have aimed to restore native ecosystems on highly modified nearshore islands, such as Motuora Island, Hauraki Gulf. Mostly, such projects assume that controlling weeds and re-planting native vegetation will be enough to restore other components of native ecosystems, such as invertebrates. However, there have been few explicit tests of these restoration assumptions or assessments of restoration success. We assessed invertebrate communities on Motuora Island 10 years ago, and found that most of the beetle species (63%) and almost half of the individual beetles (48%) in 10-year old planted areas were native. Multivariate analyses also showed that the beetle assemblages of planted and unmanaged forest areas consistently grouped together and were clearly different from pasture assemblages. Other taxa such as Amphipoda and Isopoda indicated that restoration had not been as successful in creating a community similar to more mature native forest. This present study re-measures the invertebrate communities at the same locations on Motuora (now 20-years old) to evaluate whether the restoration trajectory has continued to improve for invertebrates.

**Picking on the weakest or feasting on the fittest? Contradicting the long-standing belief that *Hylastes ater* prefers stressed seedlings**

Stephanie Sopow [*1], Martin Bader [1], Eckehard Brockerhoff [2]

[1] Scion (New Zealand Forest Research Institute), Private Bag 3020, Rotorua 3046
[2] Scion (New Zealand Forest Research Institute), PO Box 23297, Christchurch 8050

Plant stress from causes such as drought is thought to increase the susceptibility of plants to herbivore attack and damage. Although this forms the basis of the widely-cited plant stress hypothesis, there are few cases where this has been tested thoroughly. We used the interaction between *Pinus radiata* seedlings and an invasive pine bark beetle, *Hylastes ater*, as a model system to test this. Experimentally induced pre-planting stress and systemic insecticide application were used to determine the role of stress in seedling susceptibility to attack and the severity of beetle-induced damage. Contrary to expectations based on the plant-stress hypothesis, twice as many unstressed seedlings were attacked than stressed seedlings. However, unstressed seedlings were much less likely to experience sustained bark beetle feeding resulting in girdling than stressed seedlings, which could be attributed to differences in resin production. Our findings make a valid contribution to the plant-stress hypothesis by highlighting the distinction between insect attack and resulting damage, and further emphasise the importance of maximising seedling vigour to ensure the resilience of planted forests.

**Abundance and ecological impact of Australian redback spiders (*Latrodectus hasseltii*) in the Cromwell Chafer Beetle Nature Reserve**

Stacey Bryan [*1]

[1] University of Otago, PO Box 56, Dunedin 9054

Eligible for student prize

Australian redback spiders (*Latrodectus hasseltii*) are an internationally invasive species that pose a threat to human health and the survival of native species in New Zealand. They were initially recorded in Central Otago, South Island, in 1981 and have since established populations there and in New Plymouth in the North Island. In 2012, multiple incidences of predation of Cromwell chafer beetles (*Prondontria lewisii*) by redback spiders were observed within the Cromwell Chafer Beetle Nature Reserve. This raised concern over the impact the spiders were having on the Cromwell chafer beetle population, which is already threatened by limited distribution and degradation of habitat. This study was designed to investigate the abundance of redback spiders within the reserve and the impact they were having on the reserve community. Strip transects were run the length of the reserve to attain an initial population estimate. Half of the identified webs were monitored for five weeks for prey, occupants and condition, before strip transects were repeated to gauge how the distribution and abundance of the population had changed. Forty corrugated iron artificial cover objects were also placed 25 m from the reserve perimeter to sample the redback spider population beyond reserve boundaries. Redback spiders were recorded predating 27 species in total; nine of which were native. The latter included over 340 Cromwell chafer beetles. Five sub-adult McCann's skinks (*Oligosoma maccanni*) were also found in webs, which is the first recorded predation of skinks by redback spiders in New Zealand. Evidence of prey storing behaviour was displayed by adult female spiders with egg sacs and corrugated iron artificial cover objects were shown to be effective for sampling redback spider presence. The potential for a biological control for redback spiders by using virgin female pheromones to attract males is discussed.

**Assessing the dispersal ability of the bark beetle *Hylurgus ligniperda* and the wood borer *Arhopalus ferus*, two key quarantine insect pest of *Pinus radiata***

Nicolas Meurisse [*1], Jessica Kerr [2], Stephen Pawson [2], Andrew Pugh [1]

[1] Scion, 49 Sala Street, 3046 Rotorua, NZ
[2] Scion, Ilam, 8041 Christchurch, NZ

*Hylurgus ligniperda* (Coleoptera: Curculionidae: Scolytinae) and *Arhopalus ferus* (Coleoptera: Cerambycidae: Aseminae) are two of the most common species associated with *Pinus radiata* logs in New Zealand. Both species utilise *P. radiata* as a dominant host, are found throughout major *Pinus* growing regions, exist in high abundance, and are attracted to recently dead or dying trees, these two species can be classified as pests of high quarantine significance for New Zealand log exports. A new approach to phytosanitary treatments for such pests of high quarantine significance has been proposed, where treatments are only applied when ecologically-based assessments of phytosanitary risk indicate there is a quarantine risk. Using estimates of local abundance, along with information on developmental biology, specific risk models can be developed to determine where and when each species is likely to be present. Quantifying the dispersal capabilities of these key individual pest species will allow modelling how far the infestation risk envelope spreads beyond a source population (spatial modelling). Quantifying immediate weather conditions (e.g. threshold temperatures) that trigger flight activity will allow to determine the seasonal occurrence (phenology) of the dispersal and reproductive stage, i.e. mature adults (temporal modelling).

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**Stepping beyond the evidence base, or the uncomfortable process of prioritising invasive species for policy and management**

Melodie McGeoch [*1]

[1] School of Biological Sciences, Monash University, Melbourne, VIC 3800, Australia

Global targets for invasive species emphasise the importance of prioritising invasive species for effective biosecurity policy and management. However, equally important is prioritising areas most at risk to invasion and those of greatest conservation or production value. It is this third dimension, i.e. area, that provides the information on the context of the problem and the type and size of impact that forms the basis of prioitisation. Ensuring the strategic allocation of resources to managing the problem must therefore include integrating information on species, pathways and areas into risk assessments and prioritisation exercises. This means collating and making sense of vast quantities of information, dealing with information and capacity gaps, which can be substantial, and incorporating diverse and shifting stakeholder values. Systematic integration of science evidence, expert judgement and stakeholder values presents a way forward that is flexible, pragmatic and repeatable. As such it meets scientific criteria for robust monitoring of trends in invasion and the effectiveness of their management. Using examples and data on global and Antarctic trends in invasions and their impacts, I'll illustrate the importance of context (area) in the prioritisation process and the importance of the evidence base for decision making.

**Auckland City of Incursions: Where the show never stops**

Alan Flynn [*1]

[1] Ministry for Primary Industries, PO Box 2095, Auckland 1140

Not surprisingly for a large city, Auckland features significantly as a locality for records of New to New Zealand organisms. Auckland's airport and sea port process large volumes of passenger and commodity traffic, there is a high density of facilities receiving containerised imports, it is home to the International Mail Centre and numerous private vessels arrive from Australia, neighbouring Pacific islands and further afield. In the last 32 years there have been approximately 170 new insect records reported to the Ministry, 94 (55%) from Auckland. This is an average of three per year. This presentation reviews an historical selection of these insect incursions, discusses similarities and lessons learnt.

**Giant Willow Aphid - a new aphid on willows in New Zealand**

Disna Gunawardana [*1], Alan Flynn [1], Heather Pearson [2], Stephanie Sopow [3]

[1] Ministry for Primary Industries, PO Box 2095, Auckland
[2] Ministry for Primary Industries, PO Box 14018, Christchurch
[3] SCION (New Zealand Forest Research Institute), Private Bag 3020, Rotorua 3046

Giant Willow Aphid, *Tuberolachnus salignus* (Hemiptera: Aphididae) was first detected in Central Auckland in late December 2013 on crack willow. At the same time it was reported from Northland and picked up in MPI's High Risk Site Surveillance programme in South East Auckland. One of the largest aphid species, its hosts are various species of Salicaceae, willow (*Salix* spp.) and poplar (*Populus* spp.). Although its distribution is almost cosmopolitan wherever willows are grown, this is the first record in Australasia. Since its first detection in Auckland, *T. salignus* has been reported from both North and South Islands. New Zealand host records include *Salix alba* varieties, *S. fragilis*, *S. matsudana*, *S. humboldtiana*, *S. caprea*, *S. babylonica* and *Populus nigra*. Giant willow aphid forms dense colonies on the trunk and branches of hosts and can adversely impact the growth of trees. Colonies can produce large amounts of honeydew that attracts honeydew feeders such as ants and wasps. As this aphid is a recent arrival, understanding its behaviour in a new environment, host preference and management options are key areas that require study. Its biology, potential pest status, current distribution and hosts in New Zealand will be presented.

**Response to the detection of Queensland fruit fly in Whangarei January 2014**

Sherly George [1], Dave Voice [2], Diane Jones [2], Disna Gunawardana [1], Shaun Bennett [1], Therese Oliver [1], Alan Flynn [*1]

[1] Ministry for Primary Industries, PO Box 2095, Auckland 1140
[2] Ministry for Primary Industries, PO Box 14018, Christchurch 8544

The Ministry for Primary Industries operates a national surveillance programme to detect fruit flies. In January 2014, a single male Queensland fruit fly (*Bactrocera tryoni*) was detected in a Whangarei cue lure trap. MPI initiated a response to this detection to determine if a population was present. A field laboratory was set up at Whangarei with containment capability within 24 hours of a response declaration. MPI led the response, working closely with AsureQuality who managed the field operations. This presentation gives an overview of the entomology function in this response.

**Processionary moths: particular life-history traits determine significant forestry and public health issues**

Nicolas Meurisse [*1], Lisa Berndt [1], Eckehard Brockerhoff [2], Hervé Jactel [3], Toni Withers [1]

[1] Scion, 49 Sala Street, 3046 Rotorua, NZ
[2] Scion, Ilam, 8041 Christchurch, NZ
[3] INRA, 49 Route d'Arcachon, 33612 Cestas, France

The genus *Thaumetopoea* Hübner (Lepidoptera: Notodontidae: Thaumetopoeinae) includes a dozen species commonly known as processionary moths. Most species are distributed on the southern range of the Western Palaearctic region (i.e. the Mediterranean Basin), but a few are adapted to cold conditions of high mountains (e.g. in the Alps) and high latitude (i.e. up to the Baltic Sea Basin). The larvae feed on trees and shrubs of resin-rich families such as Pinaceae (pine, cedar), Anacardiaceae (pistachio, sumac), and Cistaceae, with the exception of one species feeding on Fagaceae (oak). Unusual high increases of populations – denoted as mass gradations – are occasionally observed in some species, then becoming serious pests for forestry or ornamental trees. The larvae share a very peculiar defence system, consisting of urticating setae they may release when disturbed. These setae can cause severe allergic reactions, and become a nuisance to both humans and domestic animals. We summarise here information on the life history of the most common species in the genus *Thaumetopea* and discuss it in regards to lepidopteran relatives sharing key ecological characteristics (such as foraging patterns and defence strategies). Recent findings regarding phenological and distributional responses to climate change will also be discussed.

**Combining lures for multiple unwanted Lepidoptera to improve the efficiency of pest detection and surveillance**

Eckehard Brockerhoff [*1], Max Suckling [2], Lloyd Stringer [2], Manuela Branco [3], Massimo Faccoli [4], Hervé Jactel [5], Mark Kimberley [6], Victor Mastro [7], Kimiko Okabe [8], Alain Roques [9], Andrew Twidle [2]

[1] Scion, PO Box 29237, Christchurch, New Zealand
[2] Plant and Food Research, Lincoln
[3] Technical University of Lisbon, Portugal
[4] University of Padua, Italy
[5] INRA, Pierroton, France
[6] Scion, Rotorua, New Zealand
[7] US Department of Agriculture, Buzzards Bay, MA, USA
[8] Forestry and Forest Products Research Institute, Tsukuba, Japan
[9] INRA, Orléans, France

Trapping for surveillance of unwanted invasive species using pheromones and other attractants is conducted in New Zealand and other countries. This can contribute to the early detection of new incursions and provide valuable information for response programmes. In New Zealand, a substantial surveillance is directed at gypsy moth, *Lymantria dispar*, and related species of *Lymantria*, which are important defoliators in forests and urban areas overseas. We tested whether traps can be baited for multiple unwanted species to increase the scope of surveillance and improve cost-effectiveness, without loss of trap sensitivity and detectability of each of the target species. We chose four potential forest and urban lepidopteran pest species that are present in Europe and other countries but not (yet) in New Zealand: gypsy moth (*Lymantria dispar*), fall webworm (*Hyphantria cunea*), pine processionary moth (*Thaumetopoea pityocampa*), and European pine shoot moth (*Rhyacionia buoliana*). Traps with single lures and all possible species combinations were deployed in France, Portugal, Italy and Japan, with up to four lures per trap. There was only limited interference, apparently due to trap saturation, but no evidence for interspecific repellency among lures for these species. To assess what factors may be important in species compatibility/suitability for multiple-species trapping, we combined our results and those of previous studies conducted by the United States Department of Agriculture. For 75 combinations of pheromones, tested singly or in combination, ca. 20% showed no effect on trap catch for any of the species tested. In other cases, one or both species showed an apparent reduction in trap catch. However, for most combinations, trap sensitivity is likely to be sufficient for detection purposes. Our results indicated that the outlook is promising for combining lures in a single trap to improve the range of exotic pests under surveillance, at little additional cost.

**Lucid key to Theridiidae spiders of biosecurity importance to New Zealand**

Milen Marinov [*1], Cor Vink [2], Diane Jones [1], Lalith Kumarasinghe [3]

[1] Ministry for Primary Industries, PO Box 14018, Christchurch 8544
[2] Canterbury Museum, Rolleston Avenue, Christchurch
[3] Ministry for Primary Industries, PO Box 2095, Auckland 1140

Spiders of the family Theridiidae, commonly known as cobweb spiders or comb-footed spiders, are one of the most diverse groups with over 2,200 species worldwide. They are also one of the most species-rich families in New Zealand. So far only 41 species from 15 genera have been described, however, there may be up to 200 species in New Zealand. Many species were described more than 100 years ago and are not recognisable based on their original descriptions. Most of the New Zealand Theridiidae fauna is native (some endemic to genus level), but the majority of species found around human modified environments are introduced species from Australia and other parts of the world. Theridiidae are some of the most commonly intercepted invertebrates according to the New Zealand border inspection database. They account for 27% of all spider interceptions, so are considered of high biosecurity importance. A Lucid Key to Theridiidae Spiders of Biosecurity Importance to New Zealand has been produced and features will be shown and discussed. This key includes introduced and native theridiid species commonly associated with the human environment, species that have been intercepted at the border, widely-distributed foreign species and species found overseas that are a likely biosecurity threat. We have tried to avoid specialist morphological terms in order to make the key accessible to many users.

**Antennal morphology and mate location in the Springbok Mantis, *Miomantis caffra***

Cassandra Mark [*1], Greg Holwell [1], Stuart Parsons [1]

[1] The University of Auckland, Private Bag 92019, Auckland 1142, New Zealand

Eligible for student prize

Mate location in insects relies on a suite of different sensory cues and modalities. For the transmission of mate location information over longer distances, insects primarily exploit chemical or acoustic signals, whereas close-range communication, particularly that involved in courtship, often utilises visual or tactile signals. Within groups of insects that employ scramble competition as their mating systems, it is predicted that there will be particularly strong selection on mate searching ability and the use of these signals. Such a mating system is characterised by males effectively racing one another to gain access to females, and thus males that are more efficient at using these signals to locate a mate should, in theory, achieve higher mating success. Praying mantids are particularly useful systems for investigating the dynamics of mate location and sensory mechanisms in this context. They exhibit intense scramble competition and use multiple sensory modes for mate location, with airborne chemicals (sex pheromones released by the female) and visual cues being used for long- and short-range location, respectively. The detection of airborne chemicals by males is mediated by the antennae, which are endowed with various chemoreceptors, or sensilla. The type, distribution, and density of sensilla along the antennae may provide important information regarding the ability of males to detect and process sensory information relating to mate location. We thus hypothesise that there may be a link between male antennal morphology and mate location; that antennal morphology itself may be under sexual selection. Our research will investigate this notion in the Springbok mantis, *Miomantis caffra*, using attraction studies and controlled races to determine the mate location ability of individual males. We will then characterise the antennae of individuals using Scanning and Transmission Electron Microscopy to quantify a link between antennal morphology and mate location in this species.

**Courtship in Caves: Mating and fighting behaviours of the Waitomo cave weta**

Joanna Mackisack [*1], Greg Holwell [1]

[1] School of Biological Sciences, University of Auckland, Auckland, New Zealand

Eligible for student prize

Weta are a well recognised national icon, and the focus of an increasing amount of research. Native cave weta of the family Rhaphidophoridae are notable for their long legs, with males appearing to have the most impressive body size to hind leg ratio. Preliminary data from study in the Mangapohue and Weir caves of Waitomo support the prediction that longer hind legs are sexually selected for in males, while anecdotal evidence suggests that these are used during male-male combat in the acquisition and defence of mates. In studying the mating behaviour of the cave weta my thesis will 1) seek to understand the population structure and movements of the Waitomo cave weta, and 2) to ovserve and quanitfy variation in sexual behaviour, specifically focusing on mating and male competition and 3) to determine if variation in male mating and competitive success relates to body morphology. To address these aims, adult cave weta were individually marked, and a range of morphological traits measured, allowing subsequent observation of known individuals and their relative mating and competitive success. Focal observations and population surveys will allow determination of the individuals that experience most success in mating and fighting, and how this relates to their morphology. Weta form an important part of our cave and forest fauna and the Rhaphidophoridae are the most basal family of the Ensifera (crickets). Therefore, understanding of their mating behaviour may shed light on the evolution of mating behaviour in the Orthoptera as a whole, and contribute to our knowledge of the behavioural ecology of this poorly studied group.

**All's fair in love and war? Lifetime mating success in New Zealand giraffe weevils (*Lasiorhynchus barbicornis*)**

Rebecca Le Grice [*1], Chrissie Painting [1], Greg Holwell [1]

[1] School of Biological Sciences, The University of Auckland, Private Bag 92019, Auckland Mail Centre, Auckland 1142, New Zealand

Eligible for student prize

Exaggerated traits such as elaborate ornaments and weaponry evolve in animal populations under the influence of sexual selection. These traits are used (almost exclusively by males) to compete for and gain access to mates. However, reproductive success is not weighted entirely on a single mating opportunity, but varies throughout an individual's lifetime. Consequently, lifetime reproductive success is a more definitive measure of an individual's fitness, revealing any trade-offs during their life history. The New Zealand giraffe weevil (*Lasiorhynchus barbicornis*) provides an ideal study subject for the investigation of reproductive success in the field. Males bear an elongated rostrum used as a weapon in male-male contests over females. Furthermore, extreme variation in male body size potentially influences lifetime reproductive success, through its effect on individual lifespan and use of alternative reproductive tactics in a population. Together these factors create a fascinating framework for the investigation of lifetime reproductive success. This study investigates mating success as a proxy for lifetime reproductive success using mark and recapture observational studies in the field to determine the effect of age and body size on individual reproductive success. Lifetime reproductive success is challenging to study, especially in wild populations, where information is extremely scant. This research focus aims to contribute to our understanding of the reproductive ecology of wild animal populations and draw a clearer picture of the way in which sexual selection drives trait exaggeration in the giraffe weevil.

**Gypsy moth: less welcome than the in-laws**

Belinda Gresham [*1], Stephanie Sopow [1], Rory MacLellan [2], Kerry King [3]

[1] Scion (New Zealand Forest Research Institute), Private Bag 3020, Rotorua 3046
[2] Ministry for Primary Industries, PO Box 2526, Wellington 6140
[3] AsureQuality, PO Box 644, Invercargill 9840

Gypsy moth (*Lymantria dispar*) is a serious forest pest, causing considerable economic losses in many parts of the world. It is not present in New Zealand, but is a frequent interception (usually as eggs) at the country's ports of entry. In response to the risk of gypsy moth establishing in New Zealand, a national surveillance programme was initiated in 1992. AsureQuality delivers this programme for the Ministry for Primary Industries, with Scion as a partner providing the diagnostics component. To date, only one adult gypsy moth has been trapped (in Hamilton, March 2003). This find triggered an intensive eradication programme after which no further gypsy moths were found. An overview of gypsy moth including biology, distribution, potential risk and future directions for surveillance in New Zealand will be presented.

**Quantification of the pest penetration depth of two wood boring pests in *Pinus radiata* over time at various temperatures: A guide for new phytosanitary treatments**

Cecilia Romo [*1], Stephen Pawson [1], Belinda Gresham [2], Liam Wright [2]

[1] Scion, Forestry Building, Forestry Road, Ilam, Christchurch, 8041
[2] Scion, 49 Sala Street, Rotorua, 3010

The larval boring depth of two wood-boring species, *Arhopalus ferus* and *Prionoplus reticularis*, was assessed to determine the penetration required by alternative quarantine treatments to effectively control phytosanitary pests. This knowledge ensures that applied treatments reach a depth that is sufficient to ensure the phytosanitary requirements of trading partners are met. Also, insect boring depth is important as it has a significant impact on the relative costs associated with administering some treatments. The rate of insect boring may vary with temperature, therefore, boring depth was examined across a range of temperatures, which are indicative of the range of average daily temperatures these pests are exposed to at forested sites around New Zealand. We destructively sampled infested logs at regular time intervals to examine the penetration profile for both species over time, under a range of temperatures. We found that both wood-boring species have significantly different boring profiles and the rate of boring was greatly affected by temperature. Furthermore, these results have sparked interest in understanding the relationship between ambient temperatures and inside wood temperatures - to explore how temperature varies at different depths within a log. We also plan to examine how differences in micro-climatic conditions affect inner log temperatures, which may directly influence the development and wood-boring potential of xylophagous larvae.

**A comparative survey of the aquatic invertebrate fauna of Hauturu - Little Barrier Island**

Lyn Wade [*1], Stephen Pohe [2], Olivier Ball [3]

[1] Northtec/Unitec
[2] Canterbury University
[3] Northtec

Eligible for student prize

Hauturu-Little Barrier Island in New Zealand's Hauraki Gulf is a conservation jewel. Its numerous streams are largely ephemeral, rapidly transforming from raging torrents to isolated pools. The freshwater biota must be adapted to this disturbance regime in order to persist on the island. Very little is known about the island's aquatic invertebrates. In August 1963, M.J. Winterbourn conducted a survey of benthic aquatic fauna in four of the streams on Hauturu. This was repeated in 2014, with the addition of light trapping for adult stages. Our aims were; 1. generate a current inventory of the species present in the surveyed streams, 2. compare the species found in 2014 with those found by Winterbourn, and 3. examine community differences as a function of catchment and measured environmental variables. Initial results indicate that stream communities have changed little over the past fifty years. In total, 33 macroinvertebrate taxa from 12 orders were recorded from benthic samples. Mayflies (Ephemeroptera) were the most numerically common and species-rich taxon. Nine mayfly species were recorded from the benthic samples; the most abundant of which were *Zephlebia borealis, Arachnocolus phillipsi* and *Isothraulus abditus*. The latter is notable as it is infrequently found on the mainland. A further five species of mayfly were detected by light trapping. In total, at least six species of mayfly (*Mauiulus luma, I. abditus, Z. spectabilis, A. phillipsi, Ichthybotus hudsoni* and *Neozephlebia scita*), and one species of caddisfly (*Oxyethira* sp.) not recorded in the Winterbourn survey, were found in 2014. Initial results indicate some differences in communities between catchments, though the environmental factors responsible are yet to be identified.

**The structure of global invasive species assemblages and their relationship to regional habitat variables: Converting scientifically relevant data into decision relevant information**

Mariona Roige [*1]

[1] Bioprotection Research Centre, Lincoln University

Eligible for student prize

Biological invasions continue to intensify in response to globalisation and climate change. To protect biodiversity in indigenous and managed ecosystems, to protect human and animal health, and to fulfil international trade obligations, biosecurity agencies require effective policy decisions based on robust science. The overall aim of my research is to develop methods to help biosecurity risk assessors to address two important questions regarding new invasive species: 1) which species out of a large list of potential invaders are more likely to establish if they arrive in the target region? 2) can species that pose the greatest risk be identified? The answers to these questions help prioritise policy and resources. In previous studies, self-organising maps (SOMs) and other artificial intelligence approaches, along with some ecological principles have been used to successfully filter large amounts of information regarding the known global distribution of insect, plant pathogen, as well as virus and bacterial species for risk assessment. The computational intelligence approaches used are essentially clustering algorithms that are able to handle large amounts of high dimensional noisy data. However, many issues remain. The most important of which is to determine the best methods for clustering high dimensional data. Additionally, there is opportunity to combine information about climate and host plant with the distributional data to improve predictions. Comparative studies will be carried out involving the application of computational intelligence and ecological principles for greater prioritisation and preparedness to prevent impact of dangerous invasive species.

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**Matching invasive species to invaded environments using climate, habitat and phylogeny**

Marona Rovira Capdevila [*1]

[1] Bio-Protection Research Centre Lincoln University PO Box 85084 Lincoln University Lincoln 7647 Canterbury New Zealand

Eligible for student prize

To be better prepared and to assist with the prevention of new species establishing in new regions, some means of predicting those that have highest risk is required. The overall aim of this research is to develop new methods that will help improve the risk assessment of invasive herbivorous insects that threaten New Zealand's native flora. The naturalisation or the establishment success of new species is determined by how it responds to the new abiotic and biotic constraints or opportunities in a new environment. Previous research has indicated that when well-known climatic and biotic constraints are accounted for, there may be other signals in metadata about potential invaders that can indicate risk of alien species to native flora in particular. Following that research, the importance of biogeography for risk assessment of the potential impact of non-indigenous herbivorous insects and plant pathogens in natural ecosystems, will be investigated. Second, the potential for phylogenetic affinities analysis of insect species and plant pathogens to give useful predictions to evaluate the relative impacts on individual hosts and ecological systems, will be determined. Third, the potential for the existence of predictive patterns among generalist and specialist invasive herbivorous insects will be evaluated. Finally, a synthesis of the new knowledge gained from biogeographic matching, phylogenetic affinities analysis and generalist-specialist analysis will be carried out to improve the risk analysis for invasive species.

**Public enquiries as a result of the recent Queensland Fruit Fly response in Whangarei**

Olwyn Green [*1]

[1] Ministry for Primary Industries, PO Box 2095, Auckland 1140

Publicity surrounding the Queensland Fruit Fly *(Bactrocera tryoni)* response in Whangarei in January/February this year resulted in the usual increased number of public enquiries and public submissions to MPI. The enquiries are analysed where identifications were possible. It is shown that lay-people particularly notice any flying insect with yellow markings “like the one on TV”, but a few surprises in the form of introduced Tephritidae were nearer to the mark.

**Biological control effect of the Green Lacewing, *Chrysoperla nipponensis* (Neuroptera: Chrysopidae) against *Pseudococcus comstocki*, the major scale insect pest of pear orchards in South Korea**

Young-Su Lee [*1], Gu-Hyun Jung [1], Hyun-Ju Lee [1], Myoung-Jun Jang [1], Young-Cheul Ju [1], Hee-Dong Kim [1], Eun-Hye Ham [2]

[1] Environmental Agricultural Research Division, Gyeonggi Agricultural Research and Extension Services, Hwasung 445-784, South Korea
[2] Institute for Bioresources research, Osangkinsect Co., Ltd. South Korea

Scale insect pests, especially *P. comstocki*, are major pests of pear orchards in South Korea. The green lacewing, *Chrysoperla nipponensis* is one of the native natural predators being widely distributed in South Korea. We investigate the predation ability of *C. nipponensis* against the several insect pests in the laboratory, and the control effect of *C. nipponensis* against the *P. comstocki* on pears under orchard conditions from 2011 to 2013. *Chrysoperla nipponensis* goes through complete metamorphosis and the developmental time of larva takes 25.6 days (20±1°C, 60~70%, 16L:8D). These larva are particularly effective at controlling scale insects and can consume 440.2 *P. comstocki* nymphs in their larval stages. *Chrysoperla nipponensis* showed about 80% control of *P. comstocki* in pear orchards, when 90 larvae of *C. nipponensis* had been added to each pear tree over three times at 10 days intervals from the early May to the early July. Controlling the scale insect can lead to increases of yields and quality of pears.