67th New Zealand Entomological Society Conference

Whanganui,
New Zealand
10–13 April 2018

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Welcome

Tēnā koutou. Welcome to the 67th New Zealand Entomological Society Conference held at the War Memorial Centre, Whanganui. This year's conference is a bit out of the ordinary, away from New Zealand's main hubs. The conference has a full programme of presentations on a diverse range of fascinating and topical areas of entomology. Each day will begin with a plenary talk, which will be followed by talks covering all areas of entomology in New Zealand.

Special thanks are due to our main sponsors: the Ministry for Primary Industries, SCION Research, Landcare Research Manaaki Whenua, Plant and Food Research, and the Whanganui Regional Museum.

We thank you for your attendance with best wishes to you all for an enjoyable, stimulating and productive Conference.

Rudi Schnitzler
Mike Dickison
Organising Committee

Information for Delegates

#EntoNZ

Registration desk

Please contact the registration desk for any information and assistance needed. The registration desk is located in the Stewart Foyer.

Speaker instructions

All speakers are asked to ensure their presentation is loaded before their allocated session time – those for Tuesday will be able to load on Tuesday morning. Your session Chair will make contact with you prior to your presentation, so please provide them with a 2–3 line biography beforehand. With concurrent sessions it is essential the conference run strictly to time, so please rehearse your presentation to ensure it stays within the allocated time.

Eligibility for student prizes: If you believe you are eligible and have not marked this option in your submission form, please notify a member of the organising committee

Oral presentations

- Oral presentations (apart from invited speakers) have 15 minutes, including question time
- Invited speakers have 60 minutes, including question time
- Allow for 12 minutes of speaking time – you will get an indication at the 10 minute mark
- 2–3 minutes of question (only if kept to time)
- We suggest up to 12 slides, depending on content
- Changeover between concurrent sessions during question time

Posters

Posters will be displayed at allocated positions. Velcro, pins, etc will be available to attach posters to boards. Posters must be on view throughout the conference.

Earthquake instructions

In the event of an earthquake: Drop, Cover, Hold. Do not panic – you will be told by designated building wardens if we need to evacuate the building.

Sponsors

Ministry for Primary Industries
Manatū Ahu Matua

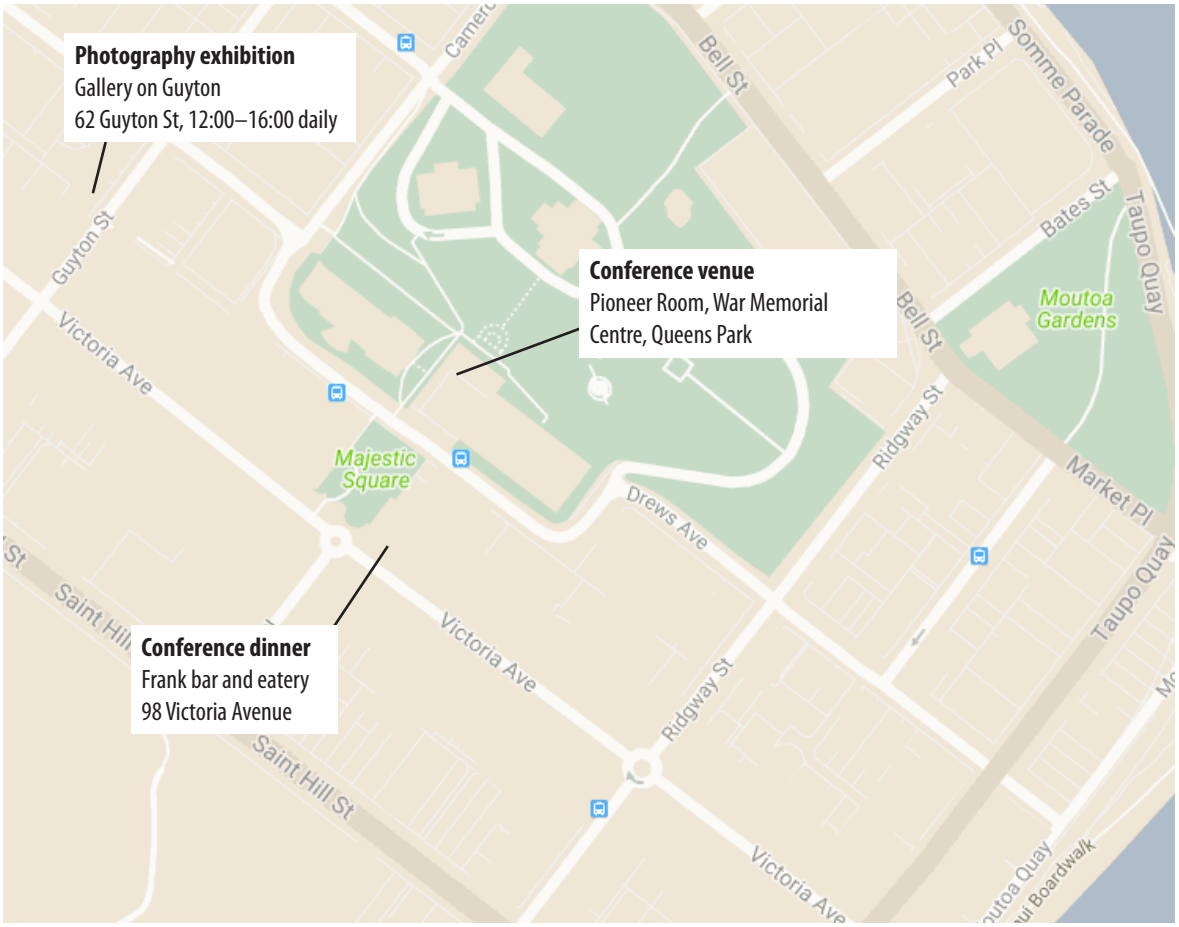
Plant & Food RESEARCH
RANGAHAU AHUMĀRA KAI

Whanganui Regional Museum

SCION
FORESTS ▪ PRODUCTS ▪ INNOVATION

Manaaki Whenua
Landcare Research

Venues



Photography Competition & Exhibition

Wonder of the Insect World

In conjunction with the 67th Entomological Society Conference a photographic competition and exhibition "Wonder of the Insect World" was announced and advertised widely throughout Whanganui. Entries were open to the public. Entomological Society members, their family or partners were excluded. Entrants had to visit the society's website to enter the competition. The competition was intended as an outreach to the community during the time of the conference and to bring the Entomological Society of NZ to the attention of the non-entomological community. Photographs had to be of insects, spiders or any other invertebrates and were limited to 2 entries per photographer. The 20 best entries are being exhibited at the Gallery on Guyton, 62 Guyton Street, Whanganui, from Sunday 8th – Saturday 14th April 2018 daily from 12:00 noon to 4:00 pm. The gallery is a 5-minute walk from the conference centre and we encourage you to visit it during opening hours.

The competition was judged by Whanganui local artist Su Hendeles, Curator & Public Programmes Manager of the Sarjeant Gallery Greg Donson, and NZ Birds photographer Ormond Torr. The Entomological Society of NZ kindly made the first prize of $500 available for the best photograph. Landcare Research, SCION Research and Plant and Food Research also kindly agreed to use part of their conference sponsorship to support the photography competition. The response was 44 entrants submitted a total of 74 entries. The prize winner is Tom Miles from Whanganui with a stunning photograph taken in Kewstoke, England of a ruby-tailed wasp.

Field Trip to Bushy Park

Thursday April 12

17:00 **Overnight** trip departs from front of conference venue: car pool

Staying in the visitor bunkhouse within Bushy Park sanctuary, we'll have a BBQ dinner, set up a light trap, and spotlight for invertebrates.

Friday April 13

09:30 **Day** trip departs from front of conference venue: car pool

Meeting with overnight visitors for walks, collecting, birdwatching, and a picnic lunch.

Bushy Park Sanctuary is a mainland island sanctuary, 25 km northwest of Whanganui. It contains 87 ha of predator-fenced forest habitat, one of the few remaining patches of virgin lowland forest in the Whanganui area.

Within the forest are 3.4 km of well-formed walking tracks providing easy all-weather access for visitors. Tree species include mahoe, mamaku, pukatea, rata, and rimu along with numerous ferns and mosses. A feature of the reserve is a large northern rata *Metrosideros robusta* named Ratanui ("Big Rata"). It is estimated to be between 500 and 1000 years old and is 43 m in height with a girth exceeding 11 m.

After the eradication of all mammalian predators but mice, a wide variety of birdlife thrives in the sanctuary. On your visit you will be able to see or hear bellbirds, kereru, North Island robin, saddlebacks, hihi, and moreporks as well as falcon, fantail, grey warblers, pukeko, silvereye, kingfishers, and white-faced heron. The sanctuary is also home to some kiwi.

Entomologically, there are stick insects, giraffe weevils, glowworms, puriri moths, *Mecodema*, and huhu. Mike Dickison at Whanganui Regional Museum has pitfall-trapped beetles and light-trapped moths at Bushy Park for two summers. A 2016 BioBlitz collected the rarely-seen lichen moth *Izatha caustopa*.

As well as the forest, the property also features an Edwardian-era 22-room homestead designed by Charles Tilleard Natusch, a Category One Heritage Building registered with the New Zealand Historic Places Trust. In 1962 G.F. Moore bequeathed Bushy Park to the Royal New Zealand Forest & Bird Protection Society, and in 1995 the Society transferred ownership of the homestead, stables and a surrounding area of 11.7 ha to an independent Trust. The Trust runs Bushy Park in conjunction with Forest and Bird.

Guest Speakers

Vaughn Bell

Vaughn Bell is a Senior Scientist with the New Zealand Institute for Plant & Food Research. Since 2004, he has studied the cosmopolitan mealybugs *Pseudococcus calceolariae* and *P. longispinus* (Hemiptera: Pseudococcidae). In looking at the biology and ecology of both species, Vaughn has further reinforced the pest status of mealybugs as vectors of an economically important viral disease affecting wine production. By studying the inter-relationship between the vine, virus and vectors, his findings contributed to a practical and financially sustainable management strategy. His doctoral thesis, *An integrated strategy for managing Grapevine leafroll-associated virus 3 in red berry cultivars*, contains management recommendations that were communicated to, and widely adopted by, the New Zealand wine sector.

Today, Vaughn describes his long term collaboration with the wine sector where the objective was to better understand leafroll virus and how to manage it. He explains the complications associated with vector mediated disease transmission by cryptic insects that are ubiquitous. Efforts to counter barriers hampering mealybug control include developing synthetic pheromones, and determining the role and importance of biological control. Finally, Vaughn describes new research into the provision of a stable, off-vine habitat capable of supporting mealybugs. His rationale? By reducing grapevine susceptibility to mealybugs there is an opportunity to reduce the influence of leafroll virus and enhance integrated management.

Olly Hills

Olly wrote the book *Cicadas of New Zealand* at the age of 10. He has a particular interest in cicadas, but is interested in all insects, as well as birds, frogs and lizards, and likes to help out with local conservation projects. He loves to read, especially books on insects and birds. His ideal day would be spent finding an Iolanthe cicada, as he hasn't caught one yet. He decided to write his book as there wasn't any comprehensive field guide to New Zealand cicadas, and he was really interested to find out what the different types of cicada he was catching all were.

Mary Morgan-Richards

Mary Morgan-Richards is Professor in Wildlife Evolution at Massey University, Palmerston North. She has been studying wētā for 25 years, using a combination of population genetics, ecology and phylogeographic tools to understand their distribution and evolution. Mary and her postdocs and graduate students have shown how climate and biotic factors interact to limit natural species ranges and reveal how past climate change has resulted in range shifts. Over the years, Mary has worked with a range of endemic invertebrates and has documented the role of hybridization in producing new lineages, and mediating gene flow between distinct populations, as well as integrating data from fossil and living species to understand morphological stasis.

Julia Kaspar

Julia is the new Insect Curator at Te Papa specialising in flies. Before this, she worked in the biosecurity area for the Ministry of Health. She studies the taxonomy and distribution of lower Diptera in New Zealand and the Pacific Islands with a strong focus on biosecurity. With her background of medical and forensic entomology she also investigates odor-host recognition of flies using chemical ecological methods.

Julia studied at the Humboldt-University Berlin and was a member of the Museum of Natural History, Berlin for 15 years where she maintained collections of multiple insect groups and led undergraduate and graduate student courses in zoology, entomology and parasitology for the Humboldt University.

As a Forensic Entomologist in Germany and New Zealand, she sampled in hospitals and provided reports for forensic pathologists, the Police, and the Ministry of Justice.

Julia has a strong interest in outreach and teaching especially on topics such as biosecurity, medical entomology, olfactory physiology and freshwater ecology.

Tuesday 10 April

08:30 **Registration** in foyer of War Memorial Hall

09:15 Welcome by Whanganui Mayor Hamish McDouall in Pioneer Room; notices

Applied Entomology

09:30	Vaughn Bell	Mealybugs in New Zealand vineyards: a case study of applied science working with and for the wine sector
10:30	**Morning tea**	
11:00	Andrew Pugh	Management and control options for a newly invasive paropsine pest in New Zealand
11:15	Huimin Lin	Developing integrated pest management for durable eucalypt insect defoliators in dryland New Zealand
11:30	Samuel Brown	Effects of four fruit species on development of Queensland fruit fly larvae (*Bactrocera tryoni* Diptera: Tephritidae)

Biosecurity and Conservation

11:45	Don Morrison	Invertebrate monitoring relating to predator control: a citizen science project at Ark in the Park, Auckland
12:00	James Haw	Bee aware of what is in your neighbourhood: resin bee *Megachile ustulata* (Hymenoptera: Megachilidae) in Whanganui
12:15	John McLean	Update on the status of the giant willow aphid, *Tuberolachus salignus* (Gmelin), in the Gisborne-East Coast area
12:30	**Lunch**	
13:30	Ching Hai Fan	Prevention of exotic pests of honey bees
13:45	Tara Murray	Exploring tools for use in the management of threatened grasshoppers

Biodiversity and Ecology

14:00	Carl Wardhaugh	On the quest to locate an endemic chrysomelid species for host testing a potential biocontrol agent (*Eadya*) for the eucalyptus tortoise beetle (*Paropsis charybdis*)
14:15	Chris Green	Successful wetapunga recovery programme returns giants to Hauraki Gulf islands
14:30	Mike Dickison	Wikipedia as an entomology outreach tool

15:00 **Afternoon Tea**

15:30 Opportunity to view the photography exhibition at Gallery on Guyton, 62 Guyton St

(15:30 EntSoc NZ Executive Meeting if there is one)

17:00 **Wine and cheese**: Frank Bar & Eatery, 98 Victoria Ave

Wednesday 11 April

08:30	Curators' Meeting	
09:30	Olly Hills	An identification guide for New Zealand cicadas
10:00	**Morning Tea**	
10:30	Mike Dickison (chair)	Discussion: Amateur entomology in NZ; what needs to happen?
11:30	Mary Morgan-Richards	The natural history of tree wētā and diversity of New Zealand cave wētā
12:30	**Lunch**	

Behaviour and Evolution

13:30	Emily Koot	Climate change and New Zealand's alpine grasshoppers (Orthoptera: Acrididae)
13:45	Morgane Merien	The advantages of mating once, many times or not at all: A study of facultative parthenogenesis in female *Clitarchus hookeri* (Phasmatodea)
14:00	Heshani Edirisinghe	Variation in ladybird (Coleoptera: Coccinellidae) activity and anti-predator behaviour
14:15	Cassandra Mark	Multifaceted deception in the North Island lichen moth, *Declana atronivea*
14:30	John Clark	Microcosms, mosquitos and mites: the behaviour of a Platyseiinae Evans, 1957 mite from a freshwater spring in Christchurch.
14:45	Aaron Harmer	'pathtrackr': an R package for video tracking and analysing animal movement
15:00	**Afternoon Tea**	
15:30	Ashley Mortensen	Artificially-reared honey bee larvae express a normal behavioural repertoire as adults
15:45	Adele Parli	Poisonous personalities: does exposure to a vertebrate pesticide bait, brodifacoum, alter the behaviour of Wellington tree weta?
16:00	**Conference Photo**	
16:15	Erin Powell	Physiological costs of bearing weaponry in New Zealand harvestmen (Arachnida, Opiliones)
16:30	Rebecca Le Grice	Directional selection on body size but no apparent survival cost to being large in New Zealand giraffe weevils
16:45	Anne Wignall	Better the devil you know: familiarity reduces contest aggression in spiders

18:30 **Conference Dinner**: Frank Bar & Eatery, 98 Victoria Ave

Thursday 12 April

08:30	**AGM**	
09:30	Julia Kasper	A tour of New Zealand's weird and wonderful Diptera and their scientists
10:30	**Morning Tea**	

Taxonomy and Systematics

11:00	Dave Seldon	"Tidying up some loose ends…"
11:15	Rich Leschen	Phylogenetics of New Zealand weevils
11:30	Samuel Brown	Preliminary insights into the weevil fauna (Coleoptera: Curculionidae) of the Cook Islands
11:45	**Lunch**	
13:00	Prizes and notices	
13:30	President's address: Greg Holwell	

Conference Ends

17:00 **Overnight** Bushy Park field trip departs from outside conference venue

20:00 **Bugs in the Pub**: public entomology event at Frank Bar & Eatery, 98 Victoria Ave

Presentations

Mealybugs in New Zealand vineyards: a case study of applied science working with and for the wine sector

Vaughn Bell (vaughn.bell@plantandfood.co.nz)
D. Maxwell Suckling
Tara Taylor
Lyn Cole
Andrew Twidle*
Nicola Sullivan
Mano Sandanayaka
Gonzalo Avila
Asha Chhagan
Vicky Davis
The New Zealand Institute for Plant & Food Research Ltd

*and School of Chemical Sciences, University of Auckland, New Zealand

In New Zealand vineyards, the citrophilus (*Pseudococcus calceolariae*) and longtailed (*P. longispinus*) mealybugs (Hemiptera: Pseudococcidae) are regarded as important insect pests. As well as contaminating grape bunches, both species transmit (vector) the economically damaging grapevine leafroll associated virus 3 (GLRaV-3). GLRaV-3 negatively alters vine yield and wine quality. With a worldwide distribution, GLRaV-3 is the most important and the most destructive viral disease in New Zealand vineyards. Thus, for a sector aiming to produce high quality wine, this vine/virus/vector association is economically unsustainable in the absence of a robust management plan. We present details of an integrated (multi-tactic) response that has reduced the influence of mealybugs and the spread of GLRaV-3. We also discuss research ideas developed with the sector that are ecologically sustainable and may support an integrated response in future: mealybug synthetic sex pheromones, the use of ground cover plants to separate mealybugs from grapevines, and mealybug biological control.

Management and control options for a newly invasive paropsine pest in New Zealand

Toni Withers
Andrew Pugh (andrew.pugh@scionresearch.com)
Scion, Forest Protection, 49 Sala Street, Whakarewarewa, Rotorua

Tara Murray
Saturo Kuwabara
New Zealand School of Forestry, University of Canterbury, Private Bag 4800, Christchurch 8140

The Australian eucalypt defoliating beetle *Paropsisterna variicollis* (EVB – Eucalyptus Variegated Beetle) was detected in the Hawkes Bay in March 2016. It has since spread quickly to now inhabit much of the eastern and lower North Island. Based on previous studies of paropsine beetles attacking eucalypts in Tasmania, this species is one of the worst the eucalypt growing industry here could have received. EVB damage has now been assessed twice in NZ Drylands Forest Initiative sites where 11 novel eucalypt species are being trialled for their potential in establishing a durable timber industry. Serious damage has been observed, particularly on *Eucalyptus bosistoana*, *E. tricarpa*, and *E. argophloia*. Although *E. camaldulensis* and *E. longifolia* sustained the greatest defoliation, this is being attributed to the Eucalyptus tortoise beetle, *Paropsis charybdis*. Also investigated was whether existing biological control agents present in NZ may be effective in controlling EVB. Unfortunately the only agent quantified, *Enoggera nassaui*, parasitised only 1–3% of EVB egg batches last summer, significantly less than the 75% parasitism it can achieve on *P. charybdis* eggs. Clearly, urgent alternative pest management solutions are needed. Research collaboration with international taxonomists has revealed that there is a specialist larval parasitoid in Australia that could be sufficiently host specific to consider for release in NZ. However, as the parasitoid is univoltine it will not be totally effective against the multiple generations that EVB undergoes in the field. Additional management options, including insecticidal applications in the short term, and breeding for resistant eucalypt genotypes in the long-term, will most likely be required.

Developing integrated pest management for durable eucalypt insect defoliators in dryland New Zealand

Eligible for student prize

Huimin Lin (huiminlin2017@gmail.com)
Tara Murray
New Zealand School of Forestry, University of Canterbury, Private Bag 4800, Christchurch 8140

A durable eucalypt industry, which produces naturally durable wood products to replace chemical-treated pine wood products, is being developed in New Zealand. Eucalypt plantations in New Zealand are occupied by a number of exotic insect defoliators and have ongoing risks of new pest incursions. Integrated pest management (IPM) is vital to reduce risks of insect outbreaks and minimise pesticide use that has negative impacts on the environment. A three-year study on durable eucalypt insect defoliators in a dryland plantation has been conducted to, 1) investigate the population dynamics of key defoliators and model the phenology of the most important defoliator *Paropsis charybdis*, 2) assess the impact of insect defoliation on growth of *E. bosistoana*, and 3) detect the between and within eucalypt species variation in insect resistance and tolerance. Results show that 1) *P. charybdis* had one generation in the *E. bosistoana* plantation, and the degree-day model was capable of predicting voltinism with appropriate assumptions, 2) moderate defoliation in spring did not significantly affect growth of *E. bosistoana*, and 3) there was significant variation in insect attack between and within durable eucalypt species. These findings can be integrated into an IPM strategy by facilitating effective pest monitoring and determining control thresholds to minimise pesticide use. Selecting insect resistant or tolerant species or families for future breeding will increase productivity by reducing insect outbreaks.

Effects of four fruit species on development of Queensland fruit fly larvae (*Bactrocera tryoni* Diptera: Tephritidae)

Samuel Brown (xsdjbx@gmail.com)
Lisa Jamieson
Plant and Food Research

The Queensland fruit fly *Bactrocera tryoni* (Froggatt, 1897) is an extremely serious pest of horticultural crops with a very broad host range. The development of Queensland fruit fly larvae on four fruit species – Dwarf Ducasse bananas, Jazz apples, SunGold kiwifruit and Hayward Green kiwifruit – was tracked over two weeks. Fruit were artificially infested with fruit fly eggs, and the fruit held at a constant 26 °C until fruit were assessed by dissection for the numbers of each larval life stage. Larval development was rapid and consistent in bananas, resulting in high numbers of pupae. Development was similarly rapid in both kiwifruit species, but was not as consistent and survival was much reduced. Additionally, SunGold kiwifruit showed a much reduced egg hatch rate, compared with the other fruits. Larval development was slowest in apples, with larvae still present in the fruit over three weeks after infestation. Survival in apples was highly variable, with some fruit showing high survivorship, while others suffered substantial mortality. Differences between fruit can be attributed to particular properties of the fruit species, including chemical and physical properties.

Invertebrate monitoring relating to predator control: a citizen science project at Ark in the Park, Auckland

Don Morrison (don.m.morrison@gmail.com)
Ark in the Park

Ark in the Park is a conservation and restoration project between Forest & Bird and Auckland Council to restore a unique piece of New Zealand rainforest at Cascade Kauri Park, Waitakere Ranges, Auckland. A five-year citizen science project aimed to investigate whether rat control is having a positive effect on the abundance of invertebrates within the park. The research was carried out by a group of conservation project volunteers based at the Ark in the Park in the Waitakere Ranges, and supported by Grace Hall (Landcare Research) and David Seldon (Auckland University). It consisted of counting some easily identifiable invertebrate taxa (e.g., *Mecodema*, beetles, spiders and weta), which were collected three times a year from 72 pitfall traps. Half the pitfall traps were located within the predator-controlled area, and the other half were in similar locations without predator control. Results have showed that there is no significant link between predator control and invertebrate abundance as measured by this monitoring programme. All samples have been stored at Landcare Research, Auckland and are available for further research.

Bee aware of what is in your neighbourhood: resin bee *Megachile ustulata* (Hymenoptera: Megachilidae) in Whanganui

James Haw (james.haw@mpi.govt.nz)
Ministry for Primary Industries. P.O. Box 14018, Christchurch 8544

George Gill
Ministry for Primary Industries. P.O. Box 2526, Wellington 6140

The Ministry for Primary Industries (MPI) were notified of a suspect exotic bee found in Whanganui on 10 January 2018. MPI's Plant Health and Environment Laboratory identified the bee as *Megachile ustulata* (Hymenoptera: Megachilidae). *M. ustulata* is a species of resin bee native to Australia and little is known about the biology of this bee. Five specimens have been found by the notifier. However, it was not known if a locally established population exists or if these individuals arrived in an isolated incident. The details of the MPI investigation is discussed here.

Update on the status of the giant willow aphid, *Tuberolachus salignus* (Gmelin) in the Gisborne–East Coast area

John McLean (jands.mclean@gmail.com)
ApiNZ Science and Research Focus Group

Giant willow aphid (GWA) populations have been monitored monthly on a group of 20 willow trees in the Matokitoki Valley since the last conference. Special attention has been given to monthly sticky band captures of various life stages on two of the trees. In addition, patterns of GWA movements have been observed, especially around fence lines. We have a new insect visitor on our willows in recent months which will be described.

Prevention of exotic pests of honey bees

Qinghai Fan (qinghai.fan@mpi.govt.nz)
Plant Health & Environment Laboratory, Ministry for Primary Industries,
231 Morrin Road, St Johns, Auckland

For the last twenty years New Zealand has been running a surveillance programme on honey bee exotic pests and diseases to provide an early warning of incursions and give assurance the country free from targeted organisms. Every year 350 high risk site samples and more than 300 export samples are collected from both North and South Islands and tested in the Plant Health & Environment Laboratory and Animal Health Laboratory. The visual and microscopic examination and washing methods are applied for the detection of external mites and insects, the thoracic disc method for the detection of the tracheal mite (*Acarapis woodi*), and morphological and morphometric analysis for the detection of Africanised honey bee (*Apis mellifera scutellata*) and its hybrids. Recently real-time PCR assays have been developed for the detection of tracheal mite, small hive beetle (*Aethina tumida*) and Africanised honey bee. The assay for tracheal mite detected down to a 1% incidence level in bees and 1000 copies of the target DNA when using plasmid standards. It has been shown to be reliable when the standard thoracic disc method is used as a backup to screen bees where a positive signal is obtained. The assay for small hive beetle showed high specificity and sensitivity for detecting the beetle, with no cross-reaction with closely related species. A dual-target real-time PCR assay for the rapid identification of Africanised honeybee and its hybrids was optimised and validated against a range of internationally sourced test organisms. These assays provide robust protocols for the detection of target pests of honey bees.

Exploring tools for use in the management of threatened grasshoppers

Tara Murray (tara.murray@canterbury.ac.nz)
School of Forestry, University of Canterbury, Private Bag 4800, Christchurch 8140

Jennifer Schori
School of Biological Sciences, University of Canterbury, Private Bag 4800, Christchurch 8140

Brachaspis robustus is a nationally endangered grasshopper restricted to the braided rivers and associated river terraces of the Mackenzie Basin, South Island, New Zealand. Since 2015 research has been undertaken to develop tools and actions to facilitate the grasshopper's conservation, which can ideally be adapted to benefit conservation of other threatened insect species in the future. Details of the species' biology and ecology have been assessed to determine requirements for captive rearing, translocation and mitigating threats. A translocation method has been devised and successfully trialled. Biologically meaningful methods for monitoring population size and change over time have been developed, and in 2017 these were implemented in a pilot trial across the distribution of the grasshopper. To conserve the species in its current range, or in new sites from which threats have been removed, an understanding of how the grasshoppers utilise and move through their environment is also necessary. Here we present two methods trialled to track grasshopper movement in the wild; traditional radio telemetry with transmitters, and tracking with RFID (radio-frequency identification) tags. Forty-six grasshoppers were tracked between October 2017 and February 2018. We compare the success of each tracking method, their pros and cons as conservation tools, and the data each was able to provide.

On the quest to locate an endemic chrysomelid species for host testing a potential biocontrol agent (*Eadya*) for the eucalyptus tortoise beetle (*Paropsis charybdis*)

Carl Wardhaugh (carl.wardhaugh@scionresearch.com)
Andrew Pugh
Scion, 49 Sala Street, Rotorua

Matt Scott
Scion, 10 Kyle Street, Christchurch

Toni Withers
Scion, 49 Sala Street, Rotorua

The endoparasitoid wasp *Eadya* sp. 3 (Braconidae) from Tasmania is being investigated as a potential biocontrol agent for the invasive eucalyptus tortoise beetle (*Paropsis charybdis*; Chrysomelidae). In order to elucidate the potential impact of this wasp on non-target species in New Zealand, we have been undertaking host testing trials with other pest species, beneficial weed biocontrol agents, and native species of chrysomelids at Scion's quaratine facility in Rotorua. Here we report on our expeditions to Kahurangi National Park under DOC permit to locate a native chrysomelid species for host testing against *Eadya*. Our target species was either *Chalcolampa speculifera* or a large species of *Allocharis*. In December 2017 we located relatively large numbers of chrysomelid larvae feeding on the leaves of *Veronica albicans* in the Mt Arthur area. Adult specimens reared from these larvae were identified by Rich Leschen of Landcare Research as *Allocharis* nr. *tarsalis*, and are likely to be an undescribed species. Subsequent searches in the Mt Peel region in January 2018 were also successful in finding what is likely to be the same species on a closely related *Veronica* species. These larvae are black in colour, and feed on the upper sides of leaves during the day. Their feeding damage is quite distinctive and resembles the larvae in shape and colour, which may function as camouflage against visual predators such as birds. Approximately 150 larvae were transported to Rotorua, where they were tested against *Eadya* in a series of trials. The outcomes of those trials are also briefly reported here.

Successful wetapunga recovery programme returns giants to Hauraki Gulf islands

Chris Green (cgreen@doc.govt.nz)
Department of Conservation

Paul Barrett
Butterfly Creek

Ben Goodwin
Auckland Zoo

New Zealand's largest giant weta species, the wetapunga (*Deinacrida heteracantha*), was previously distributed throughout Northland and Auckland regions before undergoing a dramatic decline. Habitat loss and exotic predators resulted in a restricted distribution of just one relict population on Te Hauturu-o-Toi / Little Barrier Island. Wetapunga are flightless, nocturnal, arboreal and browse on a range of broadleaf tree and shrub species. To secure the species a recovery programme aimed to set up additional island populations in the Hauraki Gulf. However, field surveys revealed too few adults to facilitate direct translocations to new sites. Thus, only small numbers were collected to establish captive breeding populations at Butterfly Creek and Auckland Zoo to provide progeny for release. Research during captive rearing revealed a 2–3 year life cycle involving 11 instars. Reared wetapunga were released on Tiritiri Matangi Island and Motuora Island on 3 occasions during 2010–2015 at 3 separate sites on each island. Baited tracking tunnels and visual assessments have verified establishment on both islands.

Wikipedia as an entomology outreach tool

Mike Dickison (giantflightlessbirds@gmail.com)
Whanganui Regional Museum

People looking for information on entomology, from crop pests to threatened species, are overwhelmingly finding it in Wikipedia, the highest-ranked Google result and the fifth-most-visited website in the world. Wikipedia can be edited by anyone, from experts to amateurs, and remains remarkably accurate and resistant to vandalism. As entomologists we're often asked to write popular books, newspaper and magazine articles, and copy for our institution's website, yet none of these have as great an impact as Wikipedia and its companion site for free images Wikimedia Commons. Some organisations like Landcare have realised this, and are releasing their photo libraries under an open Creative Commons license. DOC and Radio NZ have been running a Critter of the Week spot since 2015, featuring endangered and obscure native fauna, often insects. Volunteer Wikipedia editors have been supporting each "critter" with an updated or freshly-created Wikipedia page. In support of the NZ insect playing cards project we ran an "edit-a-thon" in Auckland to create and improve an article for every species featured on the cards. There is potential for many institutions to support a "Wikipedian in residence" who can work with subject experts, institutional collections, and the public to improve coverage of NZ entomology. For this to work, research institutions, museums, and universities need to pay attention to the way they license scientific papers and photographs. Even if unsure about editing Wikipedia directly, researchers can help by making sure publications are openly available, not paywalled, and can leave comments and corrections on the "Talk" page of any Wikipedia article.

An identification guide for New Zealand cicadas

Olly Hills (tara.hills@gmail.com)
Independent researcher

My name is Olly, I'm 11 years old, and I have written a book about New Zealand cicadas. I'll be talking about why I wrote this book, the challenges I faced, some of my research, and a little about New Zealand's 42 different species of cicada.

The natural history of tree wētā and diversity of New Zealand cave wētā

Mary Morgan-Richards (m.morgan-richards@massey.ac.nz)
Massey University, Palmerston North

New Zealand tree wētā *Hemideina* spp. are a common and abundant part of our forest and urban ecosystems. They provide food for numerous insectivores and as arboreal omnivores they eat our forests. Using studies of the Wellington tree wētā *H. crassidens* we now have basic knowledge of their diet, behaviour and life history. Highlights of their natural history will be presented. In contrast, the diversity of New Zealand Rhaphidophoridae is very poorly documented. We have begun to understand the weaknesses of the current taxonomy and the level of species diversity that exists. A radiation of elaborate male reproductive structures suggests sexual selection and reproductive isolation have combined to produce many species rapidly. I will illustrate evidence for this radiation with preliminary genetic data and photos of novel secondary sexual structures.

Climate change and New Zealand's alpine grasshoppers (Orthoptera: Acrididae)

Eligible for student prize

Emily Koot (e.m.koot@massey.ac.nz)
Steve Trewick
Mary Morgan-Richards
Massey University, Palmerston North

Rapid anthropogenic climate change has stimulated interest in climate and the impacts it will have on biodiversity around the globe. Many types of biological outcomes are indicated, including local adaptation and extinction, but on steep environmental gradients population responses are most readily detected. One such system exists among the New Zealand alpine fauna. Among insects, many lineages independently evolved in response to particular local climatic conditions on mountains, and the elevational gradient means that habitat availability and connectivity changes quickly as global climate changes. The specialised New Zealand alpine fauna includes >13 species of short-horn grasshoppers (Orthoptera: Acrididae) that provide an opportunity to explore evolution in light of global changes in climate. By investigating when these species lineages diverged, their ancestral relatives, population genetic structure, and the ecological niche space they inhabit, we can infer how these species have responded to past climate events, and in turn predict how they will respond to future climate change.

The advantages of mating once, many times or not at all: A study of facultative parthenogenesis in female *Clitarchus hookeri* (Phasmatodea)

Eligible for student prize

Morgane Merien (morganemerien@gmail.com)
Greg Holwell
University of Auckland

Facultative parthenogenesis is a mode of reproduction whereby females can reproduce either sexually or asexually through parthenogenesis. Species that are known facultative parthenogens represent important models to explore the costs and benefits of different reproductive modes. Sexual and asexual reproduction can incur both relative costs and benefits. Moreover, the number of mates or of copulations can have direct and indirect effects on female fitness. This study investigates the relative costs and benefits of parthenogenesis, monoandry and polyandry in a New Zealand facultative parthenogenetic species, the common stick insect *Clitarchus hookeri*. The specific aims were to assess whether mating had an effect on survival and reproductive output. I compared female *C. hookeri* who mated once, three times or not at all. Overall, mating treatment had an effect on the lifespan of females and the average number of eggs laid. Furthermore, sex is costly for females. I found that parthenogenesis is a better mode of reproduction for female *C. hookeri*, in terms of survival and reproductive output. Parthenogenetic females lived longer and laid more eggs than females in other reproductive mode treatments. Out of the sexual treatments, polyandrous had a higher egg-laying rate and offspring viability. However, monoandrous females had a higher survival than polyandrous females. This study demonstrates that the advantages and costs of various reproductive modes greatly depends on the species, its ecological context and its life history strategy.

Variation in ladybird (Coleoptera: Coccinellidae) activity and anti-predator behaviour

Eligible for student prize

Heshani Edirisinghe (heshanim.edirisinghe@gmail.com)
Institute of Natural and Mathematical Sciences, College of Sciences, Massey University, Auckland

Richard Leschen
Landcare Research, New Zealand Arthropod Collection, Private Bag 92170, Auckland

James Dale
Anne Wignall
Institute of Natural and Mathematical Sciences, College of Sciences, Massey University, Auckland

Traits associated with the establishment of populations of introduced species are a major focus of ecologists and conservation biologists. Species with greater levels of phenotypic variation are predicted to be more likely to establish in novel environments, but there is currently limited and conflicting evidence for this. Furthermore, there are very few studies that have investigated phenotypic variation in fitness related traits, to identify functionally important traits that influence the establishment of introduced populations. Variation in predator escape and avoidance behaviour is an important factor that facilitates the survival of introduced populations. Ladybird beetles (Coleoptera: Coccinellidae) are an excellent system to study the effect of phenotypic variation on establishment success as they are being introduced and established around the world as biological control agents and some of the introduced species are invasive. In this study, we compared variation in general activity and flight initiation distances of four ladybird species in a controlled setting. Video recordings of the activity of ladybirds were taken before and after a simulated predator approach. Videos were scored in R using 'pathtrackR' and analysed using generalised linear mixed effects models. We predicted that species with the widest geographic distribution have the greatest variation in escape behaviour as populations with high levels of variation in behaviour are expected to be more likely to establish in a new habitat compared to species with low levels of variation.

Multifaceted deception in the North Island lichen moth, *Declana atronivea*

Eligible for student prize

Cassandra Mark (cmar167@aucklanduni.ac.nz)
Greg Holwell
University of Auckland

James O'Hanlon
University of New England

Predation places significant selection pressures on prey taxa and many species have evolved various behavioural, chemical, and/or morphological defensive mechanisms in response to these pressures. While some mechanisms such as secondary chemical defences and warning displays are important for post-detection survival, other defences, such as camouflage, allow prey to avoid detection or recognition in the first place. Camouflage can be achieved through several different mechanisms, including background matching, disruptive colouration, and masquerade. The former two encompass strategies that prevent detection: in background matching, the colouration and patterning of the animal are indistinguishable from the background, thereby allowing it to blend in and remain undetected by predators; conversely, disruptive colouration utilises high-contrast markings to obscure the animals outline, thereby preventing predators from detecting its true shape. Slightly removed from the former two is masquerade; rather than preventing detection, the purpose of masquerade is to inhibit recognition through misclassification as an object of no value. The North Island lichen moth, *Declana atronivea*, presents a fascinating system for investigating camouflage as a defensive mechanism. Not only do the adults possess forewing colouration and patterning that allows them to be disguised amongst lichen, but the caterpillars display two different behaviours that allow them to be misclassified as inedible objects: in one instance, the caterpillars can extend their rigid body to resemble a dead twig, and in the other, they can curl up and look like a bird dropping. These descriptions are based only on human observations however, and there is no current scientific evidence that validates the value of such traits as anti-predation strategies. I therefore aim to investigate the effective multi-faceted camouflage of this species using a combination of image analysis, predation experiments, behavioural observations, and computer modelling.

Microcosms, mosquitos and mites: the behaviour of a Platyseiinae Evans, 1957 mite from a freshwater spring in Christchurch

John Clark (acari1948@gmail.com)

All active instars of an unnamed species of Platyseiinae Evans, 1957 (Acari; Mesostigmata; Blattiscociidae) consumed freshly killed mosquito larvae in microcosms on a daily basis from February 5 – March 15. Early instar larval mosquitos were sometimes captured, killed and consumed by the mites. Other prey included crustaceans and nematodes. The mite could be placed in *Platyseius* Berlese, 1916, but has a broadly fused ventrianal and dorsal sheild. Aspects of the mite's taxonomy and biology is presented in videos, illustrations and photos. Highlighted are the water-surface habits of the mite, its agility and the presence of a dorsal detritus mass. Mites used the short, sharp setae of the J, Z, S, R and JV series as a fork to lift detritus which was then moved forward onto the mite's dorsum with the 4th pair of legs. Mating rituals, social interactions and egg-laying were observed. The mite was collected in the Thistledown freshwater springs, Christchurch.

‘pathtrackr’: an R package for video tracking and analysing animal movement

Aaron Harmer (a.harmer@massey.ac.nz)
Daniel Thomas
Institute of Natural and Mathematical Sciences, Massey University, Auckland

Techniques for visualising and analysing animal movement patterns are widely used in behavioural studies. While commercial options exist for analysing animal movement via video, the cost of these is often prohibitive. To meet the need for an efficient and cost-effective video tracking and analysis tool, we have developed the ‘pathtrackr’ package for the open-source programming environment R. The ‘pathtrackr’ package allows for an automated and consolidated workflow, from video input to statistical output, of an animal’s movement. The tracking functions work across a variety of visual contexts, including heterogenous backgrounds and variable lighting, can deal with localised background movement, and do not need training like many other solutions. We also include diagnostic tools in the package for troubleshooting. Future updates will include the ability to track multiple animals simultaneously. In this talk we will demonstrate the practical applications of ‘pathtrackr’. Version 1.2.2 of the ‘pathtrackr’ package is available on github (https://github.com/aharmer/pathtrackr).

Artificially-reared honey bee larvae express a normal behavioural repertoire as adults

Ashley Mortensen (ashley.mortensen@plantandfood.co.nz)
Plant & Food Research

James Ellis
University of Florida

Cooperative behaviours observed in social insects are often regarded as simple instinctual responses to positive and negative feedback. However, learning and cognition have been demonstrated in some behaviours within eusocial colonies. We have utilized the dramatic differences in environment between natural and artificial rearing systems of honey bee, *Apis mellifera* L., larvae to explore the extent to which developmental environment may affect adult honey bee behaviour. During natural development in a hive, honey bee larvae interact extensively with nurse bees, whereas social interactions are almost eliminated when honey bee larvae are reared artificially in the laboratory. Naturally- and artificially-reared adult honey bees were introduced into an observation hive and observed twice daily for 28 days. Artificially-reared bees engaged in every behaviour in which naturally-reared bees engaged including: attending the queen, ventilation, guarding, attending a waggle dance, performing a waggle dance, and foraging. These observations highlight that artificially-reared bees are capable of performing a myriad of honey bee behaviours. Additionally, there was not a detectable effect of rearing environment on the mean age at which bees were observed conducting specific age related behaviours, suggesting that artificially reared bees are responding appropriately to colony level cues that coordinate task allocation within age-related polyethism. However, we did observe a statistically detectable reduction in lifespan of bees that were reared artificially compared to bees that had been reared naturally. Our results indicate that rearing environment may not have pronounced impact on the likelihood that adult bees will perform a task. However, we only detected execution of each task and did not assess the quality of that task execution. Furthermore, these data do not address questions regarding collective behaviours that emerge at the colony level such as brood and/or honey production, swarming, or nest construction.

Eligible for student prize

Poisonous personalities: does exposure to a vertebrate pesticide bait, brodifacoum, alter the behaviour of Wellington tree weta?

Adele Parli (parad601@student.otago.ac.nz)
Anne Besson
University of Otago

Priscilla Wehi
Landcare Research

Sheri Johnson
University of Otago

Vertebrate pesticide baits are commonly used in New Zealand to control introduced mammalian predators, primarily to protect endemic avian species. Consumption of these baits by non-target species including birds and invertebrates has been observed in a number of studies. In weta, an endemic orthopteran and known consumer of the bait, limited studies suggest that pesticides do not significantly affect mortality. However, no studies have investigated whether the baits alter behaviour of these insects. We tested whether consumption of a widely dispersed pesticide, brodifacoum, influences behavioural aspects of Wellington tree weta, *Hemideina crassidens*. A sample of 34 *H. crassidens* were collected from weta motels stationed in Wellington; 17 were placed in a control group, fed on a diet of apples, cat food and leaves, and 17 in a treatment group, fed on the same diet supplemented with brodifacoum bait pellets. Using video recordings and Ethovision behavioural quantification software, differences in activity (distance travelled, velocity of movement and exploratory range), refuge-seeking behaviour (number and duration of refuge visits, and urgency to seek refuge), aggression (response to facial probe) and emergence (whether the weta had emerged from their refuge at three points of the day) between the two groups were measured. Behavioural assays were repeated at four evenly spaced intervals over forty days in order to test for cumulative effects of bait exposure. We anticipate that our study will provide important insight into how pesticide baits might influence the natural behaviour of weta, as traits like activity, emergence and aggression undoubtedly influence foraging, mating, competitive interactions and anti-predator responses.

Physiological costs of bearing weaponry in New Zealand harvestmen (Arachnida, Opiliones)

Eligible for student prize

Erin Powell (epow209@aucklanduni.ac.nz)
Chrissie Painting
Greg Holwell
Tony Hickey
University of Auckland, 3a Symonds Street, Auckland Central 1010

Across animal taxa, many males brandish exaggerated structures which are used in male-male competition to secure access to mates. Within a single species, male weapons may exhibit variation in size and shape. To explain the evolution and maintenance of weapon polymorphism, studies have focused on exploring the morphological and behavioural fitness costs and compensatory traits that allow males to bear the most extreme weapons, yet few have attempted to quantify the costs of bearing exaggerated weaponry utilising a physiological approach. We predicted that differences in metabolic processes (indicating aerobic or anaerobic respiration) would reflect morphological differences and accompanying behavioural strategies (fighting style). Males of the harvestmen *Forsteropsalis pureora* bear exaggerated chelicerae which vary in size and shape, forming three discrete morphs. Using this uniquely trimorphic species, we tested for differences between male morphs using multiple physiological approaches. A combination of respirometry, assays of metabolic enzyme activity, and treadmill performance have provided insight into the relative physiological costs involved with bearing extreme weapons. Our comprehensive approach reveals physiological costs of bearing weaponry rarely considered in the pursuit to understand the evolution of exaggerated structures.

Eligible for student prize

Directional selection on body size but no apparent survival cost to being large in New Zealand giraffe weevils

Rebecca Le Grice (rleg010@aucklanduni.ac.nz)
University of Auckland, 3a Symonds Street, Auckland Central 1010

Gabriela Tezanos-Pinto
Massey University

Pierre de Villemereuil
Greg Holwell
Christina Painting
University of Auckland, 3a Symonds Street, Auckland Central 1010

To reproduce is the ultimate aim for an individual during their lifespan. When an individual's reproductive success relies on winning fights to secure mating opportunities, larger body size and weaponry are typically advantageous. However, sexual selection can be extremely complex, and over an animal's life history the opportunity to reproduce is influenced by many different elements including environmental conditions, competition, and lifespan. In this study we investigated a wild population of giraffe weevils (*Lasiorhynchus barbicornis*) which exhibit enormous intra- and intersexual size variation. In addition, males bear an elongated rostrum used as a weapon to fight other males for access to females. However, males also employ alternative reproductive tactics where smaller males will choose to try and mate with females using sneaking behaviour rather than fighting. We investigated sexual selection in a wild population by tracking individual males and females daily over two 30-day periods to measure long-term mating success. Using capture-mark-recapture analyses we also assessed how both survival and recapture probabilities vary with sex and body size for giraffe weevils using longitudinal datasets collected over three breeding seasons at coarse (weekly) and fine (daily) sampling intervals. Finally, we considered whether there was any evidence for size assortative mating. Our overall findings provide evidence for direction selection on body size in both sexes. Most interestingly, we found no apparent survival trade-off to greater body size. Larger males mate more often and have a higher survival probability, suggesting an accumulation of mating success benefits to bigger individuals. Finally, we found evidence of size assortative mating. All males choose to mate with bigger and probably more fecund females, but larger and more competitive males mate with larger females more often, furthering their potential reproductive success.

Better the devil you know: familiarity reduces contest aggression in spiders

Anne Wignall (a.e.wignall@massey.ac.nz)
Alex Burton
Aaron Harmer
Institute of Natural and Mathematical Sciences, Massey University, Albany, Auckland 0745

Animals fight over mates, social rank, food and territories. However, fighting takes energy and is dangerous. Therefore, we expect individuals to be less aggressive toward familiar than unfamiliar individuals as familiar individuals have established dominance rank. Many species follow this pattern of aggression (called the 'dear enemy effect'), with research effort concentrating on vertebrates. The dear enemy effect prevents unnecessary fighting but requires complex cognitive processes, including accurate risk assessment, individual recognition and memory. We decided to test the dear enemy effect in daddy-long-legs spiders (*Pholcus phalangioides*) – highly aggressive spiders with small brains. We placed spiders into paired training boxes to familiarise for three days. The boxes allowed passive flow of chemical cues between the spiders, but no physical contact. On the fourth day, spiders were placed into either a 'familiar' or 'unfamiliar' contest treatment. Familiar spiders were placed in staged contests with their training partner. Unfamiliar spiders were placed in staged contests with a spider that they were not trained with. We filmed interactions for one hour and checked spiders for cannibalism and position the following morning. Familiarity had no effect on whether or not a contest occurred, but contests were more violent between unfamiliar individuals. This indicates that spiders are capable of complex cognitive processing to reduce the risk of injury or death during contests.

A tour of New Zealand's weird and wonderful Diptera and their scientists

Julia Kaspar (julia.kasper@tepapa.govt.nz)
Te Papa

If people hear "New Zealand" and "flies", 90% would think "Bugger, this summer the sandflies were really bad!" (Some would even go "I need to go fly fishing with my mates again.") Though very interesting, Simuliidae (and handcrafted midge hooks) are definitely not all New Zealand has to offer when it comes to Diptera. Often disfavoured, many fly species are indeed a nuisance, as their larvae feed on crops or plant roots, others feed on blood or poo and may transmit nasty diseases. On the other hand it is often ignored that Diptera are very important pollinators and a healthy ecosystem cannot be imagined without them. Besides, flies have the most amazing life histories and shapes, especially in New Zealand, and many species are ideal candidates for biocontrol. Diptera have their place in Maori mythology and entomologists have collected, described and studied them since the *Endeavour*'s arrival in New Zealand. Their extraordinary work shall be acknowledged in this presentation. Nevertheless, there are so many gaps in our knowledge about endemic species, so our increasing workload in the fields of biosecurity and conservation is sometimes overwhelming. In other words there is heaps to do and wonderful research projects are waiting. Let's roll up our sleeves!

"Tidying up some loose ends…"

Eligible for student prize

Dave Seldon (d.seldon@auckland.ac.nz)
University of Auckland, School of Biological Sciences, Private Bag 92019, Auckland 1142

Mecodema (Carabidae: Broscini: Nothobroscina) is a hyper-diverse endemic New Zealand genus with species spread throughout the two main islands, as well as many offshore islands. Using specimens from a number of private and institutional collections, plus new specimens acquired by extensive pitfall trapping, we describe / redescribe the North Island *Mecodema* species. Species descriptions were composed using 126 morphological characters, which include external structures, as well as both male and female internal structures. There are four new combinations: *Mecodema antarctica* (Brullea), *Mecodema aberrans, Mecodema moniliferum* and *Mecodema tibiale* (*Metaglymma*); we synonymise *M. occiputale* under *M. curvidens*, and *M. sulcatum* under *M. oblongum*. We describe 25 new species, 13 of which are found in Northland and Auckland regions, while six are described from Hawke's Bay / East Cape regions. This research increases the total number of described *Mecodema* species to 103, and will give a modern taxonomic framework to complete the revision of the South Island species.

Phylogenetics of New Zealand weevils

Richard Leschen (leschenr@landcareresearch.co.nz)
Talia Brav-Cubitt
Thomas Buckley
Landcare Research, Auckland

Sam Brown
Plant & Food, Auckland

Steve Davis
American Museum of Natural History, New York

Folks may be familiar with New Zealand species like the giraffe weevil *Lasiorhynchus barbicornis* Lacordaire (Brentidae), speargrass weevils (*Hadrampus* Broun) and a number of the strange cryptically coloured genera of Eugnomini. But these icons are just a small part of the New Zealand fauna, which contains approximately 1200 described species placed in 243 genera. There are many lesser-known groups that are equally attractive or bizarre that have not been fully revised or are completely understudied. Suffice to say, weevils require a hard taxonomic look so that their composition and phylogenetic relationships are better understood. One tiny litter dwelling weevil that's been bounced about is the enigmatic *Geochus* Broun, a genus that has been placed within several groups (Enteminae (Brachyderini), Cyclominae, Curculionini (Cryptoplini, Diabathrariini, Geochini, and Ramphini), and Molytinae (Cryptorhynchini, Phryxini)). We examine the phylogenetic relationships of New Zealand weevils based on COI and 28s from exemplars of most genera to determine their phylogenetic placements within a regional sampling as a backbone to further research leading to a full revision of the fauna.

Preliminary insights into the weevil fauna (Coleoptera: Curculionidae) of the Cook Islands

Samuel Brown (xsdjbx@gmail.com)
2/503 Richardson Rd, Mt Roskill, Auckland

The Cook Islands occupy an important geographic position in the South Pacific for evaluating biogeographic hypotheses. However, the insect fauna of this archipelago has received little attention, with only sporadic collections resulting in few publications. As part of an effort to document the weevil fauna of the islands, I visited four of the islands of the Southern group of the Cook Islands in March–May 2017: Rarotonga, Mitiaro, Atiu and Mangaia. Insects were primarily collected by beating and litter sampling, with other techniques such as pitfall traps and light sheets used sporadically. The collections obtained from this expedition have resulted in a total of 70 species of weevil. These were dominated by the Cossoninae, representing 21 species. Most species appear to have biogeographic connections with Tahiti or the Austral Islands, with little evidence for connections to Samoa or Niue.

Poster

Refuge or opportunity? Mosquitoes in some forest remnants: Bushy Park (Whanganui) and Keebles Bush, Himatangi Bush, Round Bush (Manawatu)

Mary McIntyre (mary.mcintyre@otago.ac.nz)
University of Otago, Wellington

Lowland forest in the Whanganui-Manawatu area is largely reduced to small remnant patches on farmland. A survey of mosquito species at the Bushy Park Sanctuary was initially undertaken as part of a 'BioBlitz' in Feb & Mar 2016, then repeated in 2017. Findings are compared with similar surveys using the same methods (overnight CO_2-baited light trapping, ovipots) & seasonal time-frame (Feb–Mar) at three Manawatu remnant sites (Keebles Bush, Himatangi Bush, Round Bush) in 2010. Trapping counts at Bushy Park were low (max/trap.night 7 c.f. Manawatu sites 210) in both years, despite mild humid conditions. Two endemic species were dominant at all sites and up to three others present, but there is evidence of decline or benefit from habitat fragmentation according to species. Two widespread introduced species were also present, typically near the forest edge. Notable at all sites was occurrence of the Australian species *Aedes notoscriptus* around visitor entry areas. Exclusion of pest mammals by a perimeter fence at Bushy Park may also have some influence, since these night-active hosts are not available inside the sanctuary. Furthermore, the fence, as intended, has greatly enhanced forest bird populations of both local and translocated indigenous species. The presence of both the bird-biting introduced mosquito vector *Culex quinquefasciatus* & endemic co-vector *Culex pervigilans* of the recently introduced avian malaria parasite and avian pox virus highlight a need for vigilance. Apparent absence of the endemic swampland *Coquilletidia* spp. from Bushy Park may relate to relatively recent restoration of the wetland area from farmland. A perspective on fragmentation effects is provided by recent survey data from two large old growth forest sites (Totara Reserve, Manawatu and Wainuiomata Water Catchment, Rimutaka).

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