81

Are wētā (Orthoptera: Rhaphidophoridae and Anostostomatidae) and sheet-web spiders, *Cambridgea* spp. (Araneae: Desidae), potential indicators of mammalian predators?

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Biography:
After completing a degree this year in Applied Science, Biodiversity Management through NorthTec, Taylor is excited to continue learning and sharing knowledge. Growing up in Christchurch during the earthquakes, Taylor quickly cultivated a deep respect for the Earth and began to focus on how exactly it sustains us by developing a deep interest in wild food and medicine.

Taylor's passion for conservation predominantly revolves around understanding ecological and biological interactions, as well as empowering local communities to connect with and better understand the natural environments that surround them.

Mammalian predators have adverse effects on New Zealand native forest ecosystems by reducing populations of native species. Conspicuous terrestrial arthropods such as wētā (Orthoptera: Rhaphidophoridae, Anostostomatidae) and sheet-web spiders (*Cambridgea* spp.) may have potential value as indicators of mammalian predator effects. To investigate this potential, two sites were selected in the wider Pukenui Forest, Whangarei, New Zealand: Pukenui (predator-controlled) and Whau Valley (no rat or possum control, hereafter no predator control). Pairs of wētā boxes were installed at each of the two sites to count wētā. Between each pair of wētā boxes were three-metre-wide sheet-web spider transects. Each site was sampled twice, once in early autumn and again in early winter. The wētā and sheet-webs were counted, and web areas measured. Mann-Whitney U tests and t-tests were used to analyse statistical differences between the two sites. Although there were few statistically significant differences, counts were generally higher for wētā and spiders at the site with no predator control. However, web areas were larger at the predator-controlled site indicating that mammalian predators may have impacted spider ability to reach maturity at the site with no predator control. There was also evidence of wasp predation on wētā at the predator-controlled site which, together with excess natural shelters available there, may have decreased wētā counts. This study shows there is potential for sheet-web spiders, and possibly wētā as indicators of mammalian predation. However, more research is necessary to clarify the complex ecological interactions operating within the forest habitats.

148

Bryophyte community composition is influenced by moisture, light and lichen abundance in upland forest habitats near the Lewis Pass

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Biography:
Little things such as microbes and bryophytes always fascinated me. After a career of examining blood cells (haematology scientist), I decided to venture out into other fields. I started a new study at Lincoln University in which a field trip to Boyle Village allowed me to explore the wonderful world of bryophytes together with my lecturers and a botanist from Landcare Research. After this trip, I moved on to study endophytes, but bryophytes will always be in my heart.

Bryophytes are key components of many ecosystems, building soil and creating habitats for vascular plants and invertebrates. Hence, knowledge of the environmental factors that influence bryophyte abundance and community composition is crucial to understand the functioning of these ecosystems, but such information is scarce in New Zealand. We investigated the influence of substrate pH, light, moisture, and competition with lichen and vascular plants on bryophyte communities in different habitats near the Boyle Village, Lewis Pass. The effect of tree diameter and aspect on epiphytic communities was also examined. Bryophyte communities in streamside habitats differed from all other habitats, while terrestrial microhabitats in beech and kanuka forests supported different communities. Variation in moisture and light availability were most correlated with these floristic differences. Epiphytic communities seemed most affected by their environment with aspect, canopy cover and lichen abundance being most important to their composition and abundance. The rock communities likely had competition with lichen. No effect from substrate pH was found in this research. Moisture, light and competition were the most influential factors explaining differences in bryophyte communities near the Lewis Pass.

147

Can audio recorders replace traditional bird monitoring methods for bird richness estimates?

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Biography:
Sara has completed diploma in Applied Science at Lincoln University and is currently a post-graduate certificate student at the same institution. She spent last summer recording the sounds of native birds around Christchurch. Her interests span acoustic monitoring, scientific communication and GIS applications in ecology and conservation. During a past life she was a designer and developer and her penchant for making things look pretty and creating compelling visualisations still creep up.

Bird population monitoring is an important indicator of an ecosystems' health. New emerging technologies, such as audio recorders, have the potential to complement or replace traditional bird monitoring methods, but the effectiveness of these new technologies has not yet been widely tested. In this study we compared how the detection of bird species richness varied between traditional five-minute point counts performed by two observers with different levels of expertise and the Department of Conservation AR4 audio recorder. We also compared the effectiveness of two different audiorecorders available for sale in New Zealand: the Department of Conservation AR4 and the 2040 Bird Monitor. We found no significant difference between the mean number of species detected by the novice observer, expert observer and the AR4 audio recorder. There was a large overlap between the species detected by the three approaches, but each identified unique species. We found a significant difference in the mean number of species detected by the two audio recorders. We were able to detect four times more bird vocalisations and 50% more bird species with the AR4 when compared to the 2040 Bird Monitor. Our results suggest that audio recorders can be used as a complement or replacement of traditional bird monitoring methods, but they also revealed differences between the performance of two audio recorders. We therefore recommend evaluating the performance of audio recorders before deploying them in the field and endorse the use of the Department of Conservation AR4 for studies of shorter duration where the main objective is estimating bird species richness.

158

Community composition and richness of bryophytes varies across stream microhabitats

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Biography:

Originally from the East Coast of the North Island (Gisborne), I am now based in Christchurch at Lincoln University as I finish my final year of study in Conservation Ecology with an additional major of Outdoor Parks and Recreation, and enter my first year of research masters in 2022. I have a passion for the environment and began my endeavour into bryophyte species due to an interest in their richness and composition near streamside habitats.

Bryophytes are important components of stream habitats as they influence key ecological processes. Bryophytes can be useful environmental indicators of water quality, provide key habitat for aquatic and soil organisms, and contribute to the stability of these habitats. Documenting how bryophyte communities vary between stream microhabitats aids our understanding of how stream ecosystems function. However, bryophytes are relatively under-studied in a New Zealand context; thus, little is known about their ecology. Using data collected from the Lewis Pass, Canterbury, we compared the composition and richness of bryophyte communities between creek-bed, creek-bank, creek-side, and forest floor microhabitats. Species composition differed significantly across all microhabitats. Creek-bank microhabitats showed the highest species richness, whereas creek-bed habitats showed the lowest species richness, likely due to the disturbance of the flowing water. Functional traits of bryophyte species, such as plant size, are likely to influence their distribution, composition, and richness in New Zealand stream ecosystems.

90

Context and Implementation of Significant Natural Areas: an opportunity to improve policy settings. A case study within the WCC area

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Biography:
Florence Kelly is a mature MSc student in Ecology and Biodiversity at Victoria University of Wellington and works for Jarvis McDonald Group as a project manager and consultant. Her prior experience includes working for Ecogecko consultants, two University summer research projects focussing on lizards, as well as various other areas in Ecology including pest monitoring, invertebrate monitoring, vegetation surveys, restoration and water quality. She has also worked in the Education sector with a wide range of age groups. Her previous degree is a BSc(Hons) from the University of Otago.

The "maintenance of indigenous biological diversity" is a function of territorial authorities under the Resource Management Act 1991 (RMA). They must exercise their powers recognising and providing for" the fact that "the protection of areas of significant indigenous vegetation and significant habitats of indigenous fauna" is a matter of national importance. Regional policy requires the Wellington City Council (WCC) to "identify and evaluate indigenous ecosystems and habitats with significant indigenous biodiversity values" in its District Plan. These are also referred to as Significant Natural Areas (SNAs). An equivalent requirement would be placed on all councils if the draft National Policy Statement for Indigenous Biodiversity comes into effect.

With a local example of three parcels of land as a case study, we investigate the legal, political, and decision-making context with regard to the rights of landowners and the protection of indigenous biodiversity on private land. New Zealand is undergoing a biodiversity crisis, with, for example, more than 80% of native lizards under threat. On the other hand, some landowners are fearful of any impacts that SNA designation may have on their existing property rights.

Issues explored include the current methodology lending itself to a 'ratcheting down of protection', implementation trade-offs faced by councils, and the lack of integration with other council decision-making processes such as land swaps.

52

Determining the composition of Rattus species in Whangarei: Implications for urban pest management

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Biography:
Dai Morgan is a tutor in the Applied and Environmental Sciences Department at NorthTec in Whangarei.

Most of the research on rats (*Rattus* spp.) has been conducted in forested habitats where *R. rattus* dominate, and best practice management techniques have largely been developed with this species in mind. Within New Zealand urban areas comparatively less rat management research has been conducted, and while both *R. rattus* and *R. norvegicus* are known to reside in cities, the distribution of each species across different habitat types is largely unknown. Most urban trapping guides, however, suggest using traps that are only National Animal Welfare Advisory Committee (NAWAC) approved for *R. rattus* meaning that welfare standards may be compromised if R. norvegicus are also present. Using Modified Victor Stoat and Rat traps (NAWAC approved for both species), we conducted kill trapping in Whangarei along either urban streams that bisect the city or in forest fragments that are adjacent to it to determine the proportion of each species (our previous research has shown these habitats had high abundances of rats). Along urban streams 85.7% (n=36) of rats were *R. norvegicus* and 14.4% (6) were *R. rattus*. In fragments, 3.4% (2) and 96.6% (56) were R. norvegicus and *R. rattus*, respectively, despite most (85%) of traps in this habitat type being deployed <50m from a stream. Our results suggest that urban rat control guidelines should differ with respect to habitat type and methods that are specifically designed to also target R. norvegicus should be employed in areas along urban waterways to improve welfare standards for this species.

117

Effects of grazing treatments on alpine tall tussock grasslands

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[1]Victoria University of Wellington, Wellington, New Zealand; [2]University of Canterbury, Christchurch, New Zealand; [3]Auckland University of Technology, Auckland, New Zealand

Biography:
Kia ora, I am a student at Victoria University of Wellington, completing my final trimester in a BSc, majoring in ecology and biodiversity. I have a keen interest in community ecology and love investigating the complex interactions that exist within ecosystems. I also have an interest in statistics and finding the most powerful way to analyse data to uncover a biological story and quantify relationships. I really enjoy meeting new people and learning from them. I like to think I have an open mind and am ready to change my stance in the face of new evidence. Ngā mihi.

Since human settlement, South Island tussock grasslands have been progressively modified by burning, livestock grazing, wild mammalian grazing, fertilization, and seed sowing. Changes are more obvious in lower altitude zones but have progressively encroached into alpine tall tussock grasslands. The aim of this study is to assess the impacts of sheep and lagomorph (hares and rabbits) grazing on vascular plant communities. We present data from five sites dominated by tall tussock grasslands in 2009 in the Cass Valley, Canterbury. At each site, three treatments were established: full exclosure, with rabbit netting to prevent access to both sheep and lagomorphs; sheep excluded but open to lagomorphs; open to all grazing. Plant communities have been measured at these sites three times over the past 11 years. We analysed the effect of grazing treatments on species richness and species composition in the alpine tall tussock plant community. Similar to results from six years after exclosures were established, out preliminary results suggest there is no significant impact of either grazing treatment on changes in plant species richness or species composition. Our results suggest that continued maintenance and monitoring of these sites is needed.

155

Effects of stress on singing performance of common mynas

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Biography:
Juliane Gaviraghi Mussoi is a 3rd year PhD candidate from The University of Auckland/ Waipapa Taumata Rau. In her PhD, she is investigating the importance of sleep on avian vocal performance. Her main interests are the ecological and evolutionary factors driving animal behaviour.

In a dynamic environment, birds can be subjected to many sources of stress, such as predation, competition, temperature fluctuations and pollution. When faced with a stressful situation, birds increase the stress hormone corticosterone (CORT) production, affecting how they interact with their environment. Early life stage stress can negatively impact adult birds' survival, reproductive success, and vocal learning. However, little is known about how acute stress in adult birds affects their vocalisations. Birds use vocalisations to attract mates, defend territories and signal to conspecifics. In this study, we investigated how corticosterone levels affect the singing performance of common mynas. We fed 13 captive mynas mealworms injected with different CORT levels over 3 days. Day 1 was a control treatment (no CORT); day 2 was the low CORT treatment (0.5ug/ul); and day 3 was the high CORT treatment (1µg/µl). After each treatment, we recorded the birds' vocalisations. We used generalised linear models to quantify changes in singing duration in response to the treatments over a 1.5hours period. Mynas responded to high CORT by singing for longer in the first 60 minutes following ingestion compared to the control. The birds responded to low CORT by singing slightly less than during the high CORT phase, but not significantly different from control levels. After the first hour, when circulating levels of corticosterone returned to baseline levels, singing duration also went back to normal. These results show that even acute stress can affect how birds communicate, which likely has important consequences for their social interactions.

86

Historical habitat modification, not the distance from road, determines weed distribution up the Nina Valley track, Lewis Pass

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[1]*Lincoln University, Lincoln, New Zealand*

Biography:
Ruby Ross is a 3rd year Conservation and Ecology student at Lincoln University. She is interested in plant ecology, biogeography and species invasions and focuses on the conservation of New Zealand's biodiversity in the backcountry landscape.

Abstract: It is important to document the patterns, rates, and mechanisms of weed dispersal in New Zealand's backcountry, in order to protect our native flora and fauna from future competition. We surveyed the 9 km Nina Valley track in the Lewis Pass for all naturalised vascular species, in February 2021. Our 775 observations contained 28 naturalised species. Most were long-naturalised pasture contaminant species, reflecting the early European use of the valley for pastoral farming. None were woody species and none were escaped garden ornamental species. The three most abundant species, accounting for 46% of observations, were the pasture grasses *Agrostis capillaris*, *Holcus lanatus*, and *Anthoxanthum odoratum*. This was followed by *Pilosella officinarum, Mycelis muralis, Prunella vulgaris*, and *Hypochaeris radicata*, together accounting for a further 23% of observations. There was no obvious effect of distance from road on species abundance or richness. However, there was a strong correlation between open grassy sites and species richness. Dense forest canopy provided a barrier to most species; those in forests were either on forest edges or disturbed wet and shady habitats (for example, *Ranunculus repens*). While human activity likely directly vectors plant propagules, our results suggest that it is habitat disturbance that drives the distribution of naturalised species along these backcountry tracks. The relatively weed free status of the Nina Valley is encouraging, but likely reflects the historical land use and remoteness of the location. It should not be grounds for complacency, as many, more invasive, forest weeds are approaching in the wider landscape.

110

How do canopy gaps influence ground-dwelling invertebrates in beech forests of New Zealand.

Miss Maryanne walker[1], Jon Sullivan[1], Tim Curran[1], Mike Bowie[1]
[1]*Lincoln University, Lincoln, New Zealand*

Biography:
I was born and raised in Nelson New Zealand. Spending much of my childhood at the Nelson Lakes sparked an interest in the natural environment.

In 2019 I started studying agriculture at Lincoln University but within a year and a half, I found my passion for ecology, specifically entomology, and changed to a degree of conservation and ecology at Lincoln University. My future career aspirations are to complete a Masters degree at Lincoln University, researching entomology in the New Zealand ecosystem.

Canopy is an important part of the forest structure and canopy gaps can greatly affect many environmental factors on the forest floor below. Changes in the microclimate have a large influence on the composition of many taxonomic groups, such as invertebrates. Invertebrate abundance, RTU richness and species composition can all vary following changes to microclimate due to canopy gaps, and a knowledge of these changes can be used to measure the regeneration of a forest after a disturbance. This study looked at ground-dwelling invertebrates in the Boyle River terrace beech forest collected in pitfall traps in pre-existing gaps and nearby closed forest. Total invertebrate abundance and RTU richness showed a negative relationship with canopy openness, with higher total abundance and RTU richness in the closed canopy sites. Spiders were the only invertebrate order to show a significant relationship with canopy openness, with the highest spider abundance in the closed canopy sites. This study will contribute to fill the gaps in knowledge about how ground dwelling invertebrates are affected by canopy gaps in Beech forests of New Zealand.

143

Improving hedgehog (*Erinaceus europaeus*) control tools: relative attractiveness of potential lures.

Brittany Graham[1], Patrick Garvey[2], Chris Jones[2], James James[1]
[1]*Lincoln University, Lincoln, New Zealand,* [2]*Manaaki Whenua – Landcare Research, Lincoln, New Zealand*

Biography:
Brittany Graham is PhD student at Lincoln University. Recently upgrading her Master's degree to a PhD, she has received funding from Predator Free 2050 under the Capability Development funding as part of the Government's Jobs for Nature Programme.

Invasive hedgehogs are a major ecological pest in New Zealand, and account for native biodiversity loss through predation and resource competition. Lures are essential for attracting pests to control devices such as traps or bait stations, so identifying attractive lures for hedgehogs may increase control success. Here we compared, by observation, hedgehog responses to a range of both standard and novel food-based and social lures. Nine lures were tested: egg, dried salmon, mayonnaise, female hedgehog odour, male hedgehog odour, ferret odour, peanut butter, rabbit meat and huhu grubs as well as a combination of rabbit and ferret odour. A significant interaction between treatment and gender was shown; male hedgehogs preferred peanut butter, rabbit meat and dried salmon compared to the non-treatment control. For females, peanut butter and dried salmon were preferred compared to the control. The rabbit and ferret odour combination influenced 90-95% of hedgehogs to enter a cage trap with and entrance hole of 80x80mm (equivalent to the DOC250 trap aperture). These results are encouraging for improving the control of hedgehogs, and more targeted, species-specific control programs can now be undertaken.

29

Ship-borne commensal rats and mice as pre-colonial historians of New Zealand

Prof Carolyn King[1]
[1]*University of Waikato, Hamilton, New Zealand*

Biography:
Life-long (50 years) researcher on the ecology and history of invasive mustelids and rodents. DSIR Ecology Division 1971-77; University of Waikato 1995-2018. Continuing as Adjunct Professor, author and supporter of community conservation groups.

Three species of European commensal rodents have adapted to feeding, breeding and travelling around the world with humans. They have reached almost every corner of the world inhabited by people, but not all at the same time. House mice Mus musculus and Norway rats Rattus norvegicus both originated in Asia, and spread from there along with people to western Europe. House mice were present in Britain by the Iron Age, and Norway rats by the mid 1700s. Both got there in time to accompany the eighteenth-century explorers, traders and emigrants of the European diaspora. Both have invaded New Zealand many times since Cook's first visit in 1769. Ship rats *Rattus rattus* followed roughly the same routes, but did not arrive here until almost a century later.

Commensal rodents were easily carried by European and American ships among cargo, livestock and immigrants to Australia, and thence to New Zealand. They still confirm in their genomes the known shipping movements in the southwestern Pacific during the late 18th and early 19th centuries. They also record evidence of other, undocumented routes, which are invisible to archival records, largely because they were illegal at the time. This paper reports the results of a study of historical remains of rodents preserved near Sydney's first port, at The Rocks, Sydney. The distributions of Norway rats and house mice in Sydney compared with New Zealand both confirm a hitherto unknown short but important clandestine connection with China over about 20 years after 1800.

103

Will kauri survive: Resilience of ancient kauri populations to the modern world

Mr Toby Elliott[1], Associate Professor Peter Bellingham[1,2], Professor George Perry[1], Associate Professor Bruce Burns[1]
[1]*The University of Auckland, Auckland, New Zealand,* [2]*Manaaki Whenua – Landcare Research, Lincoln, New Zealand*

Biography:
Toby is a PhD student at the University of Auckland that is currently working with Kauri and Kauri Dieback. He did his undergraduate degree in 2015 at Auckland University before completing an internship in Costa Rica. After that he completed a PgDipSci at Auckland University, focussing on plant ecology. He then did his Masters from 2019 to 2020 which focussed on the Kauri Line, a floristic boundary which coincides with the southern limits of Kauri and a group of other species. In this thesis he looked at the strength of this boundary and potential reasons behind its formation.

Kauri (*Agathis australis*) is one of New Zealand's most notable tree species. However, its small remnant populations are at risk from multiple agents, the most pressing being *Phytophthora agathidicida*, causing kauri dieback. The exact threat this disease presents to kauri at a population level, and how kauri dieback might interact with climate change to influence kauri's long-term survival is largely unknown.

This study will analyse these interactions by creating population models of kauri stands with and without *P. agathidicida* to assess its role on kauri population dynamics. Also under assessment will be the role of climate, both spatially and temporally with climate change, on the population dynamics of kauri populations. The focus will be on the interacting roles of climatic change and *P. agathidicida* on kauri population dynamics. Additionally, the role of disturbances, both presently and under future climates in kauri forests, will be assessed. Analysis of other species in healthy and diseased stands will be undertaken to understand what species are likely to replace collapsing A. australis stands in the future. This research will aid in the prioritisation of kauri stands for management, based on the threats that they are likely exposed to and will highlight the threat that *P. agathidicida* poses to these important trees.