

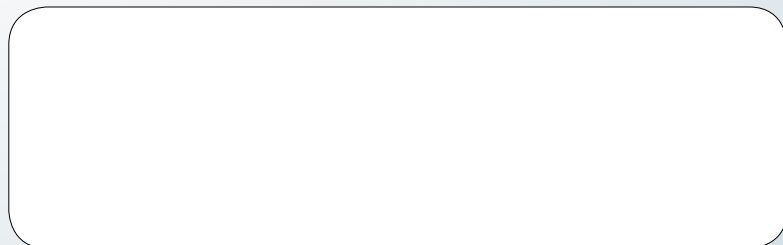


1ST AUSTRALIAN Native Bee CONFERENCE

Integrating beekeeping, crop pollination,
hive products and research

A SATELLITE EVENT OF THE AUSTRALIAN BEE CONGRESS

Program Book



Sunday 01 July 2018 • 8:30 AM – 5 PM

Field trip on Monday 02 July 2018 • 8 AM – 5:30 PM

RACV Royal Pines Resort • Gold Coast • Queensland

The organising committee warmly welcomes beekeepers, farmers, industry leaders and researchers to share knowledge at the first Australian Native Bee Conference, with the aim of discussing issues required to unlock the potential of our native bees, a valuable but under-utilized natural resource.

australiannativebeeconference.com.au

Edited by Tim Heard • Designed by Glenbo

Organising Committee



Tim Heard (chair) Tim is an entomologist who works across disciplines to answer questions such as how to utilize stingless bees for economic purposes. He is an Honorary Associate with the University of Sydney and also runs Sugarbag Bees, which produces stingless bee hives and offers beekeeping, consulting and educational services.



Dr Romina Rader is a Senior Lecturer in Community Ecology at the University of New England, Armidale. Her research interests include the identity and performance of insect pollinators in crops, plant-animal interactions and the response of biodiversity to landscape and environmental change.



Assoc Prof Katja Hogendoorn from the School of Agriculture, Food and Wine, The University of Adelaide is a researcher who specialises in: foraging, nesting, and mating behaviour of solitary and primitively social native bees; taxonomy of native bees; revegetation strategies to enhance the resilience and quality of crop pollination services.



Prof James Cook, is a Professor of Entomology, Hawkesbury Institute for the Environment, Western Sydney University. He leads a research team studying the ecology and behaviour of native bees, focusing mainly on their roles in crop pollination, the floral resources they rely on for food, and their microbial diseases.



Dean Haley is a founding member of the Brisbane Native Beekeepers Club (The BNBC). He is interested in how to propagate and increase hive numbers with the minimum of stress, how to protect against some nasty natural enemies like phorid flies, and how our boxes and management techniques protect our bees in heat and cold.



Dr Ros Gloag is a lecturer in evolutionary biology at the School of Life and Environmental Sciences, the University of Sydney. She researches the behaviour and genetics of bees in Australia, including invasive bees and native stingless bees.

Organising Committee



Prof Helen Wallace is Professor of Agricultural Ecology and Co-Director of the Genecology Research Centre at the University of the Sunshine Coast. Helen's research is focused on the science of plant reproduction and entomology. She has been a bee and pollination researcher for 30 years. Her interests include both theoretical and applied aspects of bee biology, ecology, forestry, horticulture and conservation. Her research projects include topics in landscape ecology, pollination, bee ecology, fruit production, seed dispersal, agroforestry and natural products from plants and bees. She leads large international projects with a team of 15 researchers, including 6 bee researchers, at the University of the Sunshine Coast.



Prof Saul Cunningham is currently Director of the Fenner School for Environment and Society at the Australian National University. Prior to this role he spent 17 years with CSIRO in Canberra. Pollination has been a major theme in his research. He has published papers on the importance of crop pollination to food production in the world's major science journals. His research team has worked on pollination of a range of crops in Australia, including Almonds, Apples, Faba beans and Canola. Along the way he has worked with farming industry groups, local landholder groups, and a wide network of international colleagues with shared interests. He was a contributor to the Intergovernmental Platform for Biodiversity and Ecosystem Services (IPBES) assessment report on Pollination and Food production, 2016.



Ben Oldroyd is a Professor at the University of Sydney, School of Life and Environmental Sciences where he leads the Behaviour and Genetics of Social Insects Laboratory. He and his group are interested in the population genetics and reproductive behaviour of honey bees and stingless bees.

Your volunteers for the day:

Dr Tobias Smith, Lui Lawrence-Rangger, William Arnold, Shannon Close, Kerri Moore, Glenbo Craig

- Website** • australiannativebeeconference.com.au
Social media • Twitter hashtag, use #ANBC2018
 • facebook.com/AustralianNativeBeeConference

Sponsors



Entomological Society of Queensland

Since 1923, the Entomological Society of Queensland has promoted the development of pure and applied entomological research in Australia, particularly in Queensland. Membership is open to anyone interested in Entomology. The Society promotes liaison among entomologists through regular meetings, distributes a News Bulletin to members, provides collection permits and publishes the Australian Entomologist.



Australian Entomological Society

The Australian Entomological Society is a national scientific organisation, which aims to advance and disseminate entomological knowledge in all its aspects. The society does this through a quarterly journal and newsletter, an annual conference, social media and promotion of insect conservation and entomological education. Membership is open to any person interested in insects or related groups.



AgriFutures Australia Program, Securing Pollination for More Productive Agriculture

As part of the Australian Government Department of Agriculture and Water Resources Rural R&D for Profit Program, AgriFutures Australia is supporting Australia's leading bee and pollination researchers to tackle some of the most important questions facing pollination-dependent industries. From assessing pollinator contributions to agricultural and horticultural productivity, re-establishing native vegetation for pollinator food and nesting resources, to future proofing against threats like Varroa, the Securing Pollination for More Productive Agriculture project will help to improve rates of pollination and crop yields.



Behaviour and Genetics of Social Insects Lab, University of Sydney

Our research focusses predominately on social bees, in particular conflict and cooperation on honey bees and multiple aspects of the biology of stingless bees. We provide an exciting and supportive research environment with a focus on whole-organism behaviour, genetics and genomics, supported by excellent technical personnel (beekeepers and molecular biologists) and state-of-the-art technology. <http://sydney.edu.au/science/biology/socialinsects/>

Sponsors



UNE School of Environment and Rural Science, Rader Community Ecology Lab

The Rader Community Ecology Lab (www.raderlab.com) studies community ecology in agroecosystems. Our research currently focuses on crop pollinator identity and ecology, the mechanisms underlying crop pollinator effectiveness and the provision of ecosystem services by biodiverse agricultural Landscapes.



ANU Fenner School of Environment and Society

The Australian National University's Fenner School of Environment and Society provides a forum for the rigorous exploration of diverse ideas, perspectives, and methods of identifying and solving problems at the interface of the natural and social sciences as they apply to the environment and sustainability.



The Healthy Bees Research Team, Hawkesbury Institute for the Environment, Western Sydney University

with

Hort Frontiers Pollination Fund



The project "Stingless bees as effective managed pollinators for Australian horticulture" aims to explore opportunities to protect native bees and honeybees by better understanding which ones contribute to different crops' pollination, and to develop ways to better provide pollinating insects with the right food sources to thrive under different crops and in different seasons.



Genecology, The Centre for Genetics, Ecology & Physiology, University of the Sunshine Coast

The Genecology centre hosts a group of researchers interested in bee ecology, floral diets of bees, pollination and crop production, and biodiscovery of new pharmaceutical compounds from bee products. The group has a special interest in stingless bees, but also works on other native bees and honeybees.

Trade Show

Ten trade tables promote the businesses or interests of the exhibitors, complementing the Australian Native Bee Conference.



Tocal College

Tocal College has a number of study options for people interested in beekeeping. It offers the Certificate III in Beekeeping, a nationally accredited trade level qualification, to students through blended learning. Tocal College has also published a number of specialist publications on bees (including Australian Native Bees) and beekeeping, which will be available to purchase at the conference. We will also be taking expressions of interest to study with Tocal College. Tocal Bookshop: 1800 025 520. Course inquiries: danielle.lloyd-prichard@dpi.nsw.gov.au



Entomological Society of Queensland

The Entomological Society of Queensland, since its inception in 1923, has striven to promote the development of pure and applied entomological research in Australia, particularly in Queensland. The Society promotes liaison among entomologists through regular meetings and the distribution of a News Bulletin to members. Meetings are announced in the News Bulletin, and are normally held on the second Tuesday of each month. Visitors and members are welcome. Membership is open to anyone interested in Entomology. The Society publishes THE AUSTRALIAN ENTOMOLOGIST. This is a refereed, illustrated journal devoted to Entomology in the Australian region, including New Zealand, Papua New Guinea and the islands of the South Western Pacific. The journal is published in four parts annually.

Keeper and Hive

K&H stocks all manner of gifts, clothing and homewares for bee enthusiasts, including an exclusive range designed by native bee illustrator Gina Cranson. Tee shirts, scarves, aprons, artwork and cards, badges and books, garden signs, pewter and glassware – Keeper and Hive source, produce and sell beautiful items that celebrate Australia's native bees and honey bees. NSW based beekeepers Sheila Stokes and Sue Carney operate Keeper and Hive as an online and pop-up event store. They're located at keeperandhive.com and are available to attend community events around NSW. Wholesale enquiries welcome. Contact info@keeperandhive.com or call Sue on 0402 900 645



Trade Show



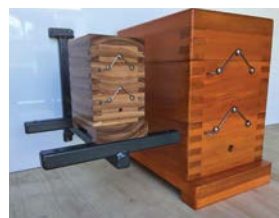
The Australian Native Bee Company

Hi my name is Steve Maginnity and I am the director of The Australian Native Bee Company. We are based on the North Coast of NSW but also have sites on the Mid North Coast. We provide a pollination service, education programs for teachers and presentations for preschool, primary and secondary schools and community groups. We also sell hives, and related products. Check us out at www.tanbc.com.au



Hive Haven

Hive Haven sell native bee honey and native bee hives that have been specifically designed to maintain a stable temperature and enable the harvesting of food grade native honey and cerumen/propolis. We are Ann and Jeff Ross, phone us on 0428 427576 or go to the website www.hivehaven.com.au



Doug's Bees

Doug's Bees is a retirement enterprise of former commercial apiarist, Doug Irvine of Hervey Bay QLD. He will have available quality OATH hives made from QLD Kauri, sturdy steel mounting brackets and for the first time, miniaturised hives (money boxes) made from Budgeroo and Red Gum. Sorry, we don't have a website. Phone is best 0418798131 or email to nirvine54@hotmail.com



Native Beeings Pty Ltd

Native Beeings is an established Australian native bee farming enterprise based in Brisbane. Francois and Mariki are passionate about their bees and are aiming to add value through the extraction of propolis, and assisting farmers with pollination. Email mariki@nativebeeings.com



Australian Native Bee, including Dean Haley and Nick Powell

Dean Haley is based in Brisbane, and operates a stingless bee keeping hobby where he sells a few carbonaria and hockingsi hives. Deans boxes are always in demand, are made out of the highest quality natural timbers and are finished well. His customers are typically families who wish to keep a stylish box of native bees on their porch or patio. Nick Powell runs a website providing free and helpful advice for beginner to expert native bee keepers. Websites www.australiannativebee.com/deans-sales and australiannativebee.com / Email: truebluebees@gmail.com



Trade Show

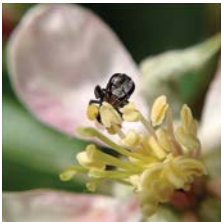


Sugarbag Bees

Sugarbag Bees is an innovative company based in Brisbane Australia which provides stingless bee hives, products, services, advice, information and education resources. Our primary activity is breeding and selling stingless bee hives. We also provide a variety of beekeeping products such as hive boxes, mounts and tools. We offer a range of beekeeping services including splitting or extracting honey from your hive, and hive buyback options. We present workshops and seminars on native bees in Queensland and New South Wales. We partner with universities to conduct pure and applied research on bees. We extend professional advice on crop pollination. We love what we do and feel privileged to spend our lives engaged with wonderful little masterpieces of nature. To share this love, we turn out a range of educational resources including *The Australian Native Bee Book*, a multi award winning and bestselling guide to keeping Australian native stingless bees. www.sugarbag.net

The Healthy Bees Research Team, Western Sydney University

The Healthy Bees Research Team is based in the Hawkesbury Institute for the Environment (<https://www.westernsydney.edu.au/hie>) at Western Sydney University. We conduct research on a wide range of topics relating to bees and pollination. In particular we study insect pollinators, crop pollination, floral resources, climate change, bee diseases and agro-ecosystems. Native bees, and especially stingless bees, are pivotal in our research program. Much of our current work is funded through the Hort Frontiers Pollination Fund (<https://horticulture.com.au/co-investment-fund/pollination-fund/>) and focuses on insect pollinators and pollination in cropping landscapes. This involves several Australian industry and research partners, as well as overseas research links, primarily with India.



Prof James Cook (Project Leader)
Email - james.cook@westernsydney.edu.au
Website - <https://cooksymbiosislab.wordpress.com>
Dr Jasmine Grinyer (Project Manager)
Email - j.grinyer@westernsydney.edu.au
Locked Bag 1797, Penrith 2751, NSW, Australia



Welcome to country smoking ceremony and Native Bee Creation Dance

Max AKA “Kupae” and Moondarewa Inc welcome guest to country with a traditional Smoking Ceremony.

This ceremony will be followed by the premiere of *The Native Bee Creation Dance* by Kupae and Moondarewa Dancers. The Song & Dance Artistic Director is Raymond “Nunka” Walker - Son of Oodgeroo Noonuccal of North Stradbroke Island.

Program of Speakers

TIME	SPEAKER	TOPIC	DURATION
0800	Moondarewa, Kombumerri	Welcome to Country and Native Bee Creation Dance	
0900	Tim Heard	Welcome	5
	Ros Gloag	Session Chair	2
	Tobias Smith	Illustrated key to bees of Australia	10
	James Cook	Native bees, crop pollination and ecosystem management – a research program	10
	Nadine Chapman	Hive movements are changing the genetic structure of the stingless bee (<i>Tetragonula carbonaria</i>)	10
	Francisco Garcia Bulle Bueno	A new technique for estimating landscape-level density of an Australian stingless bee (<i>Tetragonula carbonaria</i>)	10
	Liam Kendall	Pollination efficiency and population genetics of stingless bees (<i>Tetragonula carbonaria</i>) in blueberry orchards	10
	Abu Hassan Jalil	Meliponiculture and Improper Strategies of Stingless Beekeeping in Malaysia	10
	Panel	Q&A	10
1030	Morning Tea		30
1100	James Cook	Session Chair	
	Elisabeth Fung	Association between RNA viruses of Australian native bees and managed honey bees (<i>Apis mellifera</i>)	10
	Bronwyn Roy	Lysinibacillus: A disease of stingless bees?	10
	Helen Wallace	Stingless bees, resin ecology and Cadaghi (<i>Corymbia torelliana</i>): friend or foe?	10
	Wiebke Kämper	Using bumblebee hydrocarbon footprints to assess flower visitation in the field	5
	Nick Powell	Hive Design for Australian native bees	10
	Francois Visser	The role of food supplementation in native bee pollination: From a grower / beekeeper's perspective	5

TIME	SPEAKER	TOPIC	DURATION
	Glenn Otto	The Bee safe, a secure stand for stingless bee hives	5
	Dean Haley	The use of natural insect repellents to prevent infestation by hive syrphid fly and hive phorid fly	5
	Panel	Q&A	10
1230	Lunch		60
1330	Helen Wallace	Session Chair	
	Amelie Vanderstock	Cross-pollinating Community Gardens and Native Bush in Sydney	3
	Chris Cannizzaro	Prescribed burning intensity alters pollinator interactions in the narrow leaved mallee (<i>Eucalyptus cneorifolia</i>) communities of Kangaroo Island	3
	Rachele Wilson	Occupants of bee hotels: preliminary findings from forests and orchards	3
	Brittany Elliot	Identifying the floral diets of native bees and honeybees in heathlands using DNA metabarcoding	3
	James Dorey	Drivers of speciation in <i>Homalictus</i> : past climate cycles provide an alternative to the 'Taxon Cycle' in island biogeography theory	3
	Samantha Redshaw	A new method of marking and tracking stingless bees	3
	Bryony Willcox	Pollinator distribution and efficiency in mango, avocado and macadamia tree crops across three growing regions in Eastern Australia	3
	Ryan Newis	Bees & plant resin: sources, chemistry & bioactivity	3
	Brian Cutting	Efficiency of Australian native bees for pollination of watermelons	3
	Juian Brown	Native bees in space and time	3
	Kit Prendergast	Importance of bushland remnants and honeybee competition for native bees in urban W. Australia	10
	Scott Groom	Effect of native vegetation proximity on native bee diversity in lucerne (<i>Medicago sativa</i>)	10
	Katja Hogendoorn	Diet width of Australian native bees and strategies to enhance crop pollinating species	10
	Panel	Q&A	10

TIME	SPEAKER	TOPIC	DURATION
1500	Afternoon Tea		30
1530	Katja Hogendoorn	Session Chair	
	Chris Fuller	Managing stingless bees in the commercial orchard environment	10
	Lisa Evans	Abundance, distribution, and effect on nut set of managed stingless bees in a macadamia orchard	10
	Romina Rader	Stingless bee and honeybee performance in glasshouses	10
	Mark Hall	Microclimatic conditions in polytunnels used for berry production influence flower visitation by stingless bees (<i>Tetragonula carbonaria</i>)	10
	Simon Tierney	The nascent potential of Australian native bee pollination services	10
	Panel	Q&A or brainstorming of research questions	10
	Sara Leonhardt	Synthesis: trends, themes, directions	10
	Tim Heard	Wrap Up	5
1700	Finish		

MEALS AND REFRESHMENTS

8–9 am, arrival tea and coffee

MORNING TEA

Coffee and tea selection, orange juice and botanical water

Classic traditional scones, lashings of cream and preserves

LUNCH

Green bean and lentil salad with za'atar spiced vinaigrette

Wild rocket leaves, avocado puree, house preserved lemon and parmesan salad

Roasted butternut pumpkin, pepita seeds, cumin and walnut oil salad

Chargrilled chicken, corn and mayonnaise wrap

Cheddar cheese, vine ripened tomatoes and mustard pickle sandwiches

Dessert, orange juice, botanical water, just-brewed coffee and selection of teas.

AFTERNOON TEA

Coffee and tea selection, orange juice and botanical water

Flourless orange almond sesame cake

Speakers

A total of 35 speakers will present, on the day, including 10 speakers who will participate in the exciting Three Minute Thesis event.

All the speakers will form a panel at the end of their session for a Q&A.

The abstract and biography of each presenter follow in order of presentation.

A new, user-friendly key to the Australian bee genera

Smith, T. J.,

University of New England, Armidale, NSW

Researchers without entomological expertise are increasingly working on projects that involve Australian bees. This includes citizen scientists, ecologists, agricultural scientists and urban biodiversity researchers, among others. Key hurdles for non-entomologists new to bee research include limited insect taxonomy training or experience, the difficulty in learning traditional taxonomic keys, and limited access to taxonomists and reference collections.

Australia has over 1600 native bee species, from five families and 63 genera. Family- and genus-level keys exist for Australian bees, but these traditional keys tend to be difficult and time consuming for non-specialists to learn without guidance. An increasingly common approach to bee identifications among non-entomologists are instead quick, potentially superficial identifications of bee specimens using matching with online pictorial resources. However, this approach is sometimes over-relied on for identifications by those new to bees. Matching alone can lead to errors, and does little to help increase the taxonomic skill set of the next generation of bee researchers. Here I give an overview of current systematics of Australian bees, and introduce a new, user-friendly key to all of the Australian bee families and genera, in which all couplets are supported by photos and diagrams to support the descriptions. *The Australian bee genera: An annotated, user friendly key* is designed to be as practical and easy as possible, while maintaining the integrity of this complex task. Making bee keys more user friendly, without losing taxonomic integrity, is vital to encouraging their more widespread use, and character-based learning of groups by new bee researchers. If new bee researchers begin their journey confidently, learning using simple but effective keys, then they may be more likely to build their own identification foundations, rather than continually rely on outsourcing for their taxonomy needs.



Tobias Smith is a bee researcher, educator and stingless bee keeper based on the Gold Coast. As a researcher Tobias is based at the University of New England, where he works as part of the Rader Community Ecology Lab. Tobias's research interests focus on wild bees in agricultural landscapes, crop pollination by native bee species, and native bee diversity and ecology. As an educator Tobias presents

native bee and pollination workshops to community groups and schools, primarily through his business Bee Aware Kids. In addition, Tobias teaches full-day stingless beekeeping training workshops on behalf of Sugarbag Bees. As a beekeeper Tobias keeps about 70 stingless native bee hives around south-east Queensland and northern New South Wales, and helps to manage many more as a stingless beekeeping consultant.

The Australian bee genera An annotated, user-friendly key by Tobias Smith



"As the pre-eminent pollinators the bees bring together flora and fauna, forming an integral component in sustaining natural ecosystems. To understand and protect ecosystems, resources that permit the identification of organisms are vital, particularly those that bridge the gap between professional taxonomists and citizen scientists. Here Tobias Smith has provided a wonderful guide to Australia's mellittological fauna, one that is well illustrated and easy to use. Each couplet is accompanied by photographs or illustrations that guide the user to the proper bee genus. A successful key is one in which any user can reach a proper identification without recourse to the composer of the key. It is fair to say that Tobias Smith has achieved such success with the present work and, as such, this volume is a tremendous resource for amateurs and professionals alike and does justice to the rich and myriad mellittofauna of Australia."

—Michael S. Engel

Senior Curator & University Distinguished Professor
University of Kansas Natural History Museum



The Australian bee genera An annotated, user-friendly key Tobias J. Smith





Native bees and crop pollination in NSW apple orchards

Cook, JM, S. Tierney, A-M. Gilpin, L. Brettell, L. Vella, S.A. Power, R. Spooner-Hart, M. Riegler & P. Rymer

Hawkesbury Institute for the Environment, Western Sydney University, Locked Bag 1797, Penrith NSW 2751.

james.cook@westernsydney.edu.au

Crop pollination is often attributed mainly to honeybees without much (if any) direct evidence. However, other bees and insects are often at least as important and the pollinators of a widespread crop may vary considerably between regions. Native bees may also be crucial to crop pollination if honeybees become limiting due to *Varroa* incursion. We therefore need targeted studies to determine actual pollinators of crops and how they vary geographically. Our team is studying pollinators and pollination in two NSW apple cropping areas in Bilpin (Blue Mountains) and Orange (Central West). In 2017 honeybees were abundant crop flower visitors at all 12 orchards and most growers paid for hives on their farms during crop flowering. However, we also found native bees on crop flowers at all sites. Stingless bees and reed bees were common in Bilpin, as well as some halictid bees. In contrast, there were no stingless or reed bees in Orange, but halictid bees were more common. The other common insect group was hoverflies, found on crop flowers in moderate numbers at all sites. In 2018, we will conduct further surveys, and bagging experiments to test the effects of insect pollinators. We are also monitoring both the local bee community and floral resources in orchards and surrounding habitat plots throughout the year. The main floral resources on-farm are all non-native plants, such as clover, dandelion and *Fumaria*. In Orange, the surrounding habitat is largely paddock and contains essentially the same, weed-dominated assembly of floral resources. However, orchards in Bilpin are mostly bordered by at least some relatively intact bushland and the main floral resources are native plants. Finally, we are also surveying bee diseases at these sites and find that Black Queen Cell Virus is very common in honeybees and also occurs in some native bees.



James Cook

James is interested in insect ecology, behaviour and evolution. He focuses mainly on bees, wasps and ants (Hymenoptera) and their interactions with plants and microbes. In particular he studies insect pollination, ranging from crop pollination to highly specific pollination mutualisms. James is currently Professor of Entomology at the Hawkesbury Institute for the Environment (Western Sydney University), where he leads a research team studying the ecology and behaviour of native bees and other pollinators, focusing mainly on their roles in crop pollination, the floral resources they rely on for food, and their microbial diseases.

Hive movements are changing the genetic structure of the stingless bee (*Tetragonula carbonaria*)

Chapman, N.C. (1), M. Byatt (1), R.D.S. Cocenza (1), L.M. Nguyen (1), T.A. Heard (2), T. Latty (3), & B.P. Oldroyd (1)

1. University of Sydney, Sydney, School of Life and Environmental Sciences, Behaviour and Genetics of Social Insects Lab, Macleay Building A12, Sydney NSW 2006, Australia
2. Sugarbag Bees, 473 Montague Rd, Brisbane, QLD 4101, Australia
3. University of Sydney, School of Life and Environmental Science, Insect Behaviour and Ecology Lab, Heydon Lawrence Building A08, Sydney NSW 2006, Australia

Across the world, the keeping of stingless bees is increasingly popular, providing commercial pollination, high-value honey and a rewarding pass time. The popularity of stingless beekeeping has resulted in large-scale anthropogenic movements of nests, sometimes from outside their native range. Colony movement has the potential to impact local populations via transfer of parasites and pathogens and gene flow across unnaturally large geographic scales. *Tetragonula carbonaria* is the most widespread and commonly kept stingless bee species in Australia. Concerns have been raised that large-scale artificial propagation of *T. carbonaria* colonies by Sydney beekeepers, from a small number of colonies that originated in south-east Queensland, may have two consequences.

First, the managed population may be becoming increasingly inbred. Second, the wild population may be experiencing significant introgression of south-east Queensland genotypes, potentially diluting local adaptations to the Sydney environment and resulting in the loss of local alleles.

Here we show, based on microsatellite and mitochondrial markers, that both the managed and wild Sydney populations are significantly different from the south-east Queensland population. Nonetheless there is evidence that introgression of south-east Queensland alleles is impacting the genetic structure of both wild and managed Sydney populations. The two Sydney populations are indistinguishable, suggesting two-way gene flow in Sydney consistent with expectations of gene flow via male dispersal. All populations have low inbreeding coefficients, suggesting that they are genetically healthy.



Nadine Chapman is a postdoctoral researcher at the University of Sydney with a primary focus on honeybee industry-supported projects.
<http://sydney.edu.au/science/people/nadine.chapman.php>

A new technique for estimating landscape-level density of an Australian stingless bee (*Tetragonula carbonaria*)

Garcia Bulle Bueno, F. (1), T. Latty (1) & R. Gloag (1)

School of Life and Environmental Sciences, University of Sydney, Macleay Building, Camperdown NSW 2006.

The management and control of natural populations of animals requires reliable estimates of population size. In the case of social bees, population size estimates can be used to assess the resilience of pollination services. However, most social bees' nests are highly cryptic and difficult to survey by traditional means. We developed a protocol for estimating the colony density of an important native Australian pollinator, the stingless bee *Tetragonula carbonaria* (Meliponini), which takes advantage of the bees' reproductive behaviour. Stingless bee males gather in congregation areas at predictable locations. If the typical distance that males travel from their natal nests to a congregation area is known, then in combination with genetic analysis of the males, we can estimate the number of colonies in the catchment area. Similar strategies have been implemented successfully for honey bees, but their application in stingless bees requires improved knowledge of the behaviour of stingless bee males. We analysed the genetic composition of *T. carbonaria* male aggregations in North-eastern Australia and matched males to managed colonies located within 10 km of the aggregation.

This dataset sheds light on the distance males fly from natal-nests to aggregations, and on the diversity of colonies that contribute to a drone congregation. It therefore provides the first test of the use of male aggregations to estimate colony density in a stingless bee species.



Francisco Garcia

Francisco recently started his PhD at the University of Sydney and his research project focuses on stingless bee basic biology, reproductive behaviour, management and pollination. His undergraduate education is from the National Autonomous University of Mexico where he conducted a research project on Stimulation of Colony Initiation and Colony Development in the Mexican Bumblebee Species *Bombus ephippiatus*. Francisco's passion for science has taken him to conduct research and volunteer in Europe, United States, Canada, Costa Rica and Mexico.

Stingless bee colony densities within a mass-flowering crop

Kendall, L. K. (1), Gloag, R. (2) and Rader, R. (1)

(1). School of Environmental and Rural Sciences, University of New England, Armidale, NSW

(2). School of Life and Environmental Sciences, University of Sydney, NSW, 2006

Molecular methods represent an important means in which to assess the crop-pollination services provided by native pollinators as well as ensure their conservation. Foraging stingless bees (*Tetragonula carbonaria*) were collected from flowering blueberry (*Vaccinium virgatum*) blocks on the North Coast, NSW in 2016 and 2017. We genotyped collected bees and used sibship analyses to infer shared parentage and estimate colony density for each sampling block. In each block, floral visitation rates by stingless bees were estimated using standardised transects. The landscape composition (proportional area of native vegetation and co-flowering resources) surrounding each sampling block was quantified for the known foraging range of stingless bees. We then analysed the inter-relationships between colony density, landscape composition and floral visitation rates.

Preliminary results of these analyses will be presented. Understanding colony-habitat dynamics within blueberry farms can improve the management of both wild and managed stingless bees for crop-pollination and highlights the need to retain native vegetation amongst agricultural areas.



Originally from New Zealand, **Liam Kendall** is a PhD student investigating how landscape-level processes influence pollination-related ecosystem services under the supervision of Romina Rader and Vesna Gagic (CSIRO). His fascination with plant-animal interactions began during his undergraduate studies and led to him completing a MSc at the University of Auckland where he examined parasitoid wasp communities in native New Zealand forests.

Exploring Failures in Meliponiculture and Improper Strategies of Stingless Beekeeping in Malaysia

Abu Hassan Jalil (1) & Jeffry Iskandar Foo (1) abuhns@gmail.com

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As a newly emerging industry, the maintenance and farming of stingless bees has the potential to be developed as not only a source of income for smallholders but also as a commercially expandable business. This paper explores the factors that may lead to failures and collapses in stingless beekeeping and farming as experienced in some parts of Malaysia. Many breeders, especially those who are just trying out and newly involved in this industry often face some challenges. Competence of Meliponiculture entrepreneurs are low in terms of skills, knowledge and entrepreneurship in the rearing of stingless bees. Lack of consolidated studies or research done on local stingless bee breeding and the bees diversity to be a reference to entrepreneurs. Poor awareness on threats and deterioration of local ecology from careless hive hunters and log fellers. Methods of overcoming these setbacks are suggested herein.

This paper includes a list of valid species and its distribution in Malaysia, indicating the groups that are dependent on Dipterocarp resin. The vulnerability of these peculiar groups is explored with its host trees.

Besides dangerously depleting these valuable trees by hive hunters, the current unsustainable use of the forest resources inevitably leads to habitat alteration and fragmentation, which can lead to species extinction. Considering on-going threats to the biodiversity in the region there are concerns that many of the plants and wildlife species may completely disappear even before they are known.



Abu Hassan Jalil

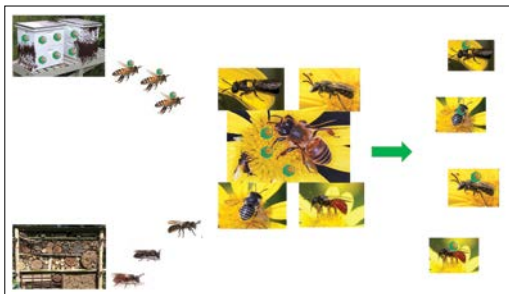
Began Bee culture career as an Apiary Landscaper as early as 1983, Meliponary Landscaping since 2010. Actively involved in Indo-Malayan Meliponine Conservation. Cooperative Director at Koperasi Meliponi KL Bhd 2013 to present. Beescape Consultant and Meliponine Species Behavioral Scrutiny at Malaysian Genome Institute Meliponine Repository and Consultant to numerous Stingless Bee Farms in Malaysia and Brunei. Principal at Akademi Kelulut Malaysia Sdn Bhd (Malaysian Academy of Meliponiculture).

Association between RNA viruses of Australian native bees and managed honey bees (*Apis mellifera*)

Fung, E. (1), K. Hogendoorn (1), K. Hill (2), R. V. Glatz (1)(3)(4)

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Over the last decade, RNA viruses have been associated with population declines of *Apis mellifera* in many areas around the world. The first RNA viruses of bees to be discovered were initially characterised as pathogens of just *A. mellifera* until recent detection in different species of non-*Apis* bees. This raises questions about the origin and direction of transmission of RNA viruses. We collected native bees both co-foraging with *A. mellifera* and foraging in absence of *A. mellifera* in seven geographical regions of South Australia to investigate the RNA viruses shared between co-foraging native bees and European *A. mellifera*, and infer the origin of the RNA viruses carried by Australian native bees. When present, workers of *A. mellifera* were also collected. The probabilities of (a) native bees carrying Black queen cell virus (BQCV) and Sacbrood virus (SBV) and (b) worker *A. mellifera* carrying viruses were significantly higher in areas with beekeeping activities, indicating the maintenance of these viruses through husbandry. Absence of BQCV and SBV in native bees from very dry areas indicate that these viruses were introduced into Australia with *A. mellifera*. These findings add to our understanding on virus epidemiology and may be useful on development of management strategies to reduce prevalence of RNA viruses.



Dr. Elisabeth Fung completed her Bachelor of Science in Agronomy at Eduardo Mondlane University in Mozambique. After her degree, she worked directly with Mozambican farmers in order to increase their agriculture production and marketing at the Farmer-to-Farmer Program until she came to Australia to continue her studies. Her Master of Science research investigated the occurrence of RNA viruses in Australian native bees under supervision of Richard Glatz, Katja Hogendoorn and Kelly Hill at the University of Adelaide. She further developed this research program through her PhD to complete the most robust assessment of RNA viruses in Australian native and introduced bees to date. Recently, Elisabeth has been supporting the Sterile Insect Technique program at the South Australia Research and Development Institute (SARDI) to facilitate a reduction in agrichemical use in orchards – a key factor to ensuring pollinator health.

An update on *Lysinibacillus* sp in Australian stingless bees

Roy, B(1), M. Riegler(1), R. N. Spooner-Hart(1) & J.M. Cook(1)

Western Sydney University- Hawkesbury Institute For The Environment -Richmond Campus, NSW.

A brood disease has recently been described in two Australian stingless bee species, and the causative agent identified as *Lysinibacillus sphaericus*. Subsequently, using polymerase chain reaction (PCR), we screened for *L. sphaericus* in worker bees from 50 hives of three species of stingless bees, *Tetragonula carbonaria*, *Tetragonula hockingsi* and *Austroplebeia australis*, from NE NSW and SE QLD. We also took samples from hives displaying behaviours suggestive of a brood disease. The only six hives to test positive for *Lysinibacillus* were those discarding large numbers of larvae.

Our results indicate that *Lysinibacillus* is not readily detected in foraging stingless bees or in healthy brood, and is limited to discarded larvae. Two of the six, sick hives from which *Lysinibacillus* was isolated were *T. hockingsi*, representing the first report of the disease in this species. Using comparisons of their DNA sequences, we found that the bacterial strains obtained from the six hives were identical with each other and also with the original strain reported from *T. carbonaria* in Richmond NSW.

Our results indicate that *Lysinibacillus* is readily detected in obviously sick larvae but not from foraging bees or apparently healthy brood in “sick” hives.”



Bronwen Roy is a PhD candidate at Western Sydney University at the Hawkesbury Institute for the Environment, where she is researching the pathogens particularly viruses that infect our native stingless bees. This includes known honeybee viruses that may be shared across honey and stingless bees, but also involves discovering new viruses that may be specific to stingless bees. Additionally, the research extends to include the bacterium, *Lysinibacillus* which appears to be a major brood pathogen of stingless bees.

Stingless bees, resin ecology and Cadaghi (*Corymbia torelliana*): friend or foe?

H.M. Wallace (1)

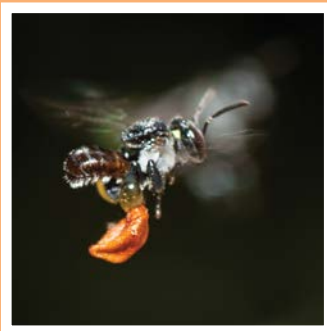
(1) GeneCology Research Centre, University of the Sunshine Coast, Qld

Stingless bees use plant resins to build and defend their nests yet we know very little about the resin sources used by Australian stingless bees. Perhaps the most well-known resin source is cadaghi (*Corymbia torelliana*), a rainforest tree native to Far North Queensland. Stingless bees have an unusual relationship with this tree. Cadaghi produces resin inside its capsules and the bees crawl inside the capsules to collect resin. Seeds get stuck on the bees and they carry both the resin and seeds back to their nest. Bees then throw the seeds away outside their nest, where they germinate and establish. This mutualism is one of only three known cases worldwide of mellitochory, seed dispersal by bees.

At least five species of stingless bees disperse cadaghi in Far North Queensland where cadaghi occurs naturally. Stingless bees can carry seeds long distances, e.g. over 1 km. Cadaghi readily hybridises with other eucalypts in the spotted gum group, and bees are attracted to some of the hybrid capsules. However, hybrid capsules are not hollow and so bees cannot get inside them, unlike the cadaghi capsules. Cadaghi is controversial as it has become a weed outside of its natural range and some stingless beekeepers believe it is harmful to bees. Cadaghi resin is very attractive to stingless bees and the scent emitted from capsules is a complex mixture of mono- and sesqui-terpenes dominated by α -pinene, with lower amounts of β -pinene and limonene. Many of the scents in the resin repel small hive beetle, *Aethina tumida*. The resin also kills some bacteria and fungi that cause human disease. Stingless bee resins show great promise as sources of bioactive substances that can be used for new pharmaceuticals.



Professor Helen Wallace is Professor of Agricultural Ecology and Co-Director of the Genecology Research Centre at the University of the Sunshine Coast. Helen's research is focused on the science of plant reproduction and entomology. She has been a bee and pollination researcher for 30 years. Her interests include both theoretical and applied aspects of bee biology, ecology, forestry, horticulture and conservation. Her research projects include topics in landscape ecology, pollination, bee ecology, fruit production, seed dispersal, agroforestry, and natural products from plants and bees. She is especially interested in the ecology of bees in general, and stingless bees in particular. She leads large international projects with a team of 15 researchers, including 6 bee researchers, at the University of the Sunshine Coast.



Using bumblebee hydrocarbon footprints to assess flower visitation in the field

Kämper, W. (1), Blüthgen, N. (2) & T. Eltz (3)

(1) Genecology Research Centre, University of the Sunshine Coast, Q; (2) Ecological Networks, University of Technology Darmstadt, Germany; (3) Department of Animal Ecology, Evolution and Biodiversity, Ruhr-University Bochum, Germany

Obtaining reliable measurements of the floral resource use of polylectic bees by collecting traditionally recorded visitation data, e.g. census data, requires a considerable amount of time and effort, especially if rare bee species are of interest. Typical designs of ecological studies, however, have multiple replicates and therefore rely on collecting data in a short time frame (e.g. during a certain event like mass flowering of a crop). Otherwise, a too small sampling effort can result in data sets skewed by single observations and zeros. Here, I will introduce a chemistry-based approach, which circumvents the limitations of conventional census data. This approach uses deposits of insect cuticular hydrocarbons (CHCs), so called footprints, on flowers to infer insect flower visitation. While the primary function of CHCs for the insect is to prevent desiccation in terrestrial habitats, they also improve tarsal adhesion on smooth surfaces often resulting in the involuntary deposition of footprints wherever an insect walks. Bumblebees deposit these footprints on the corolla of flowers during foraging, where the substances accumulate in the epicuticular wax. The wax layer of flower epicuticle thus retains a chemical record of pollinator visitation, which due to the species-specificity of footprint chemical composition can be used to assess flower visitation and to reconstruct bumblebee visitor communities. Consequently, the footprint method allows us to measure bumblebee visitation on multiple replicate sites in a short amount of time.

Recently, we showed that the concentration of footprints and thus visitation of bumblebees on bird's-foot trefoil, *Lotus corniculatus*, increased with land-use and grazing intensity while traditionally recorded visitation rates could not show such an effect. Potentially the footprint method could be a useful tool to assess flower visitation in Australian native bees, e.g. the blue-banded bee or carpenter bees.



Wiebke Kämper is a Research Fellow at the University of the Sunshine Coast. She is passionate about pollination biology and agroecology with theoretical and applied interests. Her experience includes investigating how farming practices affect colony performance and plant-pollinator interactions in European bumblebees. During her PhD she implemented a novel-chemistry based method to quantify bumblebee visitation, so called footprints, to assess flower visitation in several grassland plant species. Currently, she is exploring the interactions between pollination (pollen flow; cross-pollination) and the quality of different tree crops such as avocado and macadamia. Quality is measured as size, shelf life and nutritional quality using conventional and advanced sensing methods.

Hive Design for Australian native bees

Nick Powell

nick@australiannativebee.com

My presentation will focus primarily on a brief run through on my discoveries so far on hive design for Australian native bees. This will be explained through discussing my starting hive and the evolution of it. This development included adapting spacing allowances which resulted in larger nests, compression of brood area to allow for optimal splitting, ventilation and further understanding as to how stingless bees build. This was based on observations I have personally made and collaboration between other bee keepers. Other topics that will be included in this presentation include:

- Wall materials for hives - I will explain how different materials can be used to construct hives and their properties.
- Internal dimensions of your hive - Looking at how to work out what will suit the type of bee you have. What happens when you provide a new colony with too much room.
- Methods to propagate from different styles of hives- vertical vs horizontal and new designs. Dividing of brood and why it is so important to the continuation of a colony.
- Demonstrations using empty hives - Showing the placement within hives of brood, honey pots and other elements - this will include demonstrations utilising overseas hive designs.
- Vertical vs horizontal splits - I will discuss which one is better and contemplate what could be used within the agricultural community to rapidly produce more colonies of stingless bees.
- Solitary bee hotels and my observations.



From a very young age **Nick Powell** has had a keen interest in insects of all types. His interest moved specifically to native stingless bees. He created website to share advice in caring for native bees with hobbyists and professionals alike. Combining his skills as a qualified carpenter with his passion for stingless bees has allowed Nick to design and build a number of hives to learn about the life cycle of the stingless bee first-hand. The observations and understandings he shares with other keepers includes native bee hive design, native bee propagation, caring for sick colonies of native bees and pest prevention.

The role of food supplementation in native bee pollination: From a grower / beekeeper's perspective

Visser, F.

Native Beeings Pty Ltd, P O Box 1253, Laidley, 4341.

A number of established horticultural producers have started to introduce native bees as additional pollinators in their crops, in particular for macadamias, avocados, blueberry, citrus, etc. However, farmers are not beekeepers in the first place and the introduction of the bees will need to form part of a practical management system for the crops. One of the main difficulties that growers face is providing the bees with adequate food sources outside the flowering season, especially during dry spells and large mono crop areas. It does not seem practical to translocate the bees, in particular with the hundreds of hives that growers are now having.

A logical solution is to provide the bees with additional food in the form of nectar and pollen supplements, as is being done in the honey bee industry, and also widely for stingless bees in Brazil. Ideally, growers want to locate hives permanently around orchards, with centrally located feeding stations for ease of management. However, the feasibility of feeding stations appears to be very different with *Carbonaria* as opposed to honey bees, in particular in the case of a pollen supplement as we will discuss. It is also impractical to replace it inside the hive from time to time as with honey bees. The presentation will show video material to demonstrate bee behaviour in this regard, as well as potential feeding aids for both supplements that could be implemented as practical solutions.

We will further show feeding behaviour 'results' to provide an indication of the attractiveness and the potential bee conditioning value of food supplementation.



Can the farmer and the bees be happy?



Francois Visser is a dedicated and passionate native bee farmer, and his main focus is to assist tree crop growers in introducing and managing stingless bees as pollinators. To this end he has researched and developed pollen and nectar supplements to support the native bees on farm outside the flowering season, if required. Francois has a scientific background and is also a part time researcher with the University of Queensland.

The Bee Safe - a secure enclosure for native bees

Glenn L. Otto

Apiarist & Macadamia Farmer, Gro Mad Plantations PO Box 449 Yandina, QLD 4561

Hive theft of Native Stingless Bees is at an all-time increase and we all have to be more vigilant and implement security measures of our hives. Sharon and I own a small macadamia orchard and have diversified to conduct Tourist Based Camping. Due to the huge number of people we are having coming onto our property to camp, we have had to implement measures to make our Native Stingless Bee hives secure.

The Bee Safe was born and with its very small foot stamp it remarkably has a capacity to hold 24 mother hives and 12 educations. Being a Designer/Builder by profession the Bee Safe is robust to withstand the most determined thief. There is enough room on the shelves of each level to also carry out three educations on each shelf at any one time. Good ventilation is provided to the hives with unobstructed breeze being able to circulate around the hives. If an orchard is spraying, bee hives can be quickly sealed up in one convenient location. Quick to set up hives on an orchard for hired pollination, the bee safe can be made transportable and unloaded with a forklift.

Positioned in the middle of an orchard with a comfortable foraging distance of 200 metres the bees can cover fully cover our 11 hectare property.

To also avoid confusion to the bees with their hives so close, hive fronts are different colours and the hive entrance funnels are a contrasting colour. This wall of colour creates stunning visual appeal. Additionally, to the 24 mother hives and 12 educations, The Bee Safe has a large area at the bottom and under the roof to house Solitary Bee accommodation.



Glenn Otto grew up in Bundaberg, Queensland and is a licensed Designer and Builder by profession. While active in his building career he picked up 7 building awards for projects he both designed and built. Glenn became a macadamia farmer as a career change and he has embraced it with gusto and it was not long before he was keeping both them and Apis.

The use of natural insect repellents to prevent infestation by hive syrphid fly and hive phorid fly

Dean Haley

Australian stingless social bees have few natural enemies, but entire colonies can be decimated in days if attacked by hive syrphid fly (*Ceriana ornata*) or hive phorid fly (*Dohrniphora trigonae*).

Attacks by these fly are exacerbated by artificial management techniques such as splitting colonies. The pests are attracted to odours of broken honey pots and bee stress pheromones. Vulnerable colonies include;

- Newly split colonies, especially if there is spilled honey.
- Transferred colonies, especially with spilled honey.
- Weak colonies with reduced numbers of defending bees.
- Stressed hives attacked by fighting swarms.



There are naturally occurring essential oils such as citronella that interfere with pest species abilities to track odours. A selection of these essential oils were obtained in consultation with an aromatherapist, and tested in a bee yard with more than 50 colonies of carbonaria, hockingsi and australis colonies. Many hive losses and infestations to phorid fly had been observed in this yard with occasional 'swarms' of phorid fly numbering in the thousands. The blend of essential oils seen to have the most effect in preventing phorid fly infestation was later seen to be even more effective against syrphid fly.



Dean Haley

It wasn't until Dean moved to Brisbane that he started to keep these fascinating bees. When not playing with bees, he works full time as a scientist in a Biotech company which is a passion he has followed for more than 20 years in Sydney, Melbourne and Brisbane. Scientific curiosity and interest in these bees has combined for Dean. He has provided help and guidance to several PhD students researching stingless bees as part of their studies. He is a guest blogger on the web site www.australiannativebee.com where they seek to educate potential beekeepers in the best ways to look after their hives. Dean is very interested in the key problems facing our stingless bees today. How to propagate and increase hive numbers with the minimum of stress, how to protect against some nasty natural enemies like phorid flies, and how our boxes and management techniques protect our bees in heat and cold. He is a founding member of the Brisbane Native Beekeepers Club (The BNBeec)

Cross-pollinating Community Gardens and Native Bush in Sydney

Amelie M. Vanderstock, Tanya Latty

School of Life and Environmental Sciences, The University of Sydney, NSW

Conserving native bees in cities involves understanding how they use floral resources across urban habitat types. Community gardens are thought to support pollinators by providing diverse flowers all year-round. Native and regenerated bushland is also assumed to provide food and habitat for native bees. However, we are yet to understand how the location of community gardens and bushland sites can influence native bee biodiversity in an urban context. I studied how connectivity between these two urban green spaces influences native bee communities and the structure of plant-pollinator networks. Specifically, whether community gardens adjoining bushland have greater abundance and diversity of native bees compared with isolated gardens. I also compared the bee biodiversity of isolated bushland sites with those adjoining community gardens. I surveyed 56 sites across Sydney for characteristics including size and floral density. I caught visitors to all flowering species at each site in time-standardized surveys. Using visitation data, I constructed plant-pollinator networks to explore how the interaction between community gardens and bushland sites influences key network metrics. Preliminary evidence suggests that greater species richness and abundance of native bees were found in community gardens compared with bushland sites, regardless of their habitat connectivity.

Density and diversity of flowering plants is likely a more important explanatory factor for native bee biodiversity. Understanding the interactions between cultivated crops and remnant vegetation in the urban matrix is an important contribution to pollination network and food resilience in cities.



Amelie Vanderstock is a PhD candidate in the School of Life and Environmental Sciences at the University of Sydney. She is passionate about urban agriculture, native pollinators and the power of participatory science to build community. She is currently researching the role and resilience of native bees in community gardens and bushland in Sydney.

Prescribed burning intensity alters pollinator interactions in the narrow leaved mallee (*Eucalyptus cneorifolia*) communities of Kangaroo Island

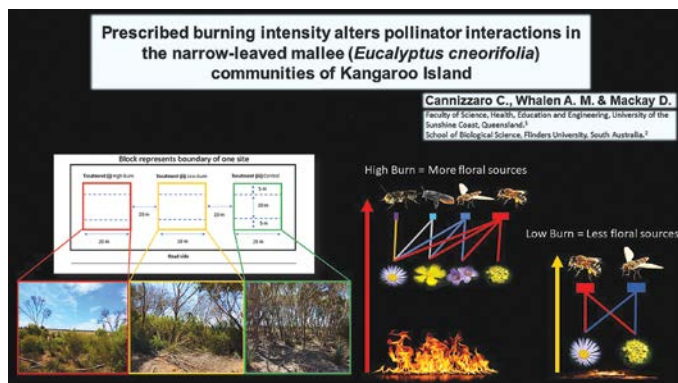
Chris Cannizzaro¹, Duncan Mackay² and Molly Whalen².

Faculty of Science, Health, Education and Engineering, University of the Sunshine Coast, Queensland.¹

School of Biological Science, Flinders University, South Australia.²

Kangaroo Island contains a wide diversity of native bees that are among the many pollinators that play an important role in maintaining biodiversity across the islands ecosystems. Narrow-leaved mallee (*Eucalyptus cneorifolia*) communities are endemic and restricted to the Eastern plains of Kangaroo Island and due to large scale agriculture have become highly fragmented. Biodiversity burns were administered in 2009 by DEWNR as part of the Eastern Plains Fire Trial to 36 sites across eastern Kangaroo Island to regenerate understory vegetation and build biodiversity. In this study we investigate plant-pollinator interactions and pollen loads in 8 sites treated with high intensity or low intensity prescribed burns. The foraging activity of pollinators differed between high intensity treated sites to low intensity treated sites. Generalist native bees visit a broad range of flowers and dominated high intensity sites while hover flies were the major floral visitors in low intensity sites. The results of this research suggest that the intensity of fire-induced

disturbances influences native bee habitat and their presence in ecological communities that require fire for regeneration.



Chris Cannizzaro

Chris's interests are in nutritional ecology and biology of bees. He is currently studying honey bee floral diets exploring how botanical sources of pollen and nectar relate to nutritional quality, medicinal honey and cross pollen movement in avocado orchards. Chris works with subsistence farmers and beekeepers in the highlands of Papua New Guinea and beekeepers of SE QLD, Australia to try and understand the nutritional landscape of bees.

Occupants of bee hotels: preliminary findings from forests and orchards

Wilson, R.S. (1), Shapcott, A. (1), Leonhardt, S. (2), Burwell, C.J. (3,4,5), Fuller, C. (6), Smith, T. (7) & H.M. Wallace (1)

(1) GeneCology Research Centre, University of the Sunshine Coast, Qld; (2) Department of Animal Ecology and Tropical Biology, University of Würzburg; (3) Biodiversity Program, Queensland Museum; (4) Environmental Futures Research Institute, Griffith University, Qld; (5) School of Environment and Science, Griffith University, Qld; (6) Kin Kin Native Bees, Qld; (7) School of Environmental and Rural Science, University of New England, NSW.

Trap nests or “bee hotels” have been used to manage solitary bees since the 1950s in agriculture, research and, more recently, for urban conservation. Various designs are available for different purposes and target species, however, site characteristics such as land use also need to be considered. In this study, we test the performance of a hybrid design of timber and cobb trap nests in macadamia orchards and eucalypt forests around south-east Queensland.

Overall, average occupation rates were similar in orchards and forests, with higher occupation in summer across all nesting substrates. Surprisingly, wasps (62%) were more likely to occupy timber substrates than bees (37%), particularly in orchards. Over 20 species of bee and wasp occupants were identified, including some parasitoid and cleptoparasitic species.

Future research will identify key plants in the pollen diets and nest materials of bee occupants, which can be used to inform targeted approaches to habitat restoration.



Rachele Wilson is a research assistant, PhD student and tutor in the School of Science at the University of the Sunshine Coast and holds a first class Honours degree in land, parks and wildlife management.



Identifying the pollen diets of native bees and honeybees in heathlands using DNA metabarcoding

Elliott, B. (1), Wilson, R. (1), Shapcott, A. (1), Newis, R. (1), Cannizzaro, C. (1), Burwell, C. (3), Smith, T. (4), Keller, A. (2), Leonhardt, S. (2), Kämper, W. (1) & Wallace, H. (1)

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Declines in wild bee populations have been widely reported in the literature for over a decade and there is concern of an impending “global pollinator crisis”. In Australia, there are over 1600 native bee species but declines are difficult to assess due to the lack of data. Honey bees were introduced to Australia in the 1820s, and since then feral populations have established throughout most landscapes. Knowledge on the ecology of both feral honeybees and native bees in Australian landscapes, specifically their foraging behaviour and floral preferences, is limited. Here we report on the diversity and floral preferences of wild bees in coastal heathlands, an endangered ecosystem in Queensland, characterised by mass flowering in late winter and spring. In plots in three different heathland conservation areas, we sampled bees once a week for 10 weeks of the flowering period. We used DNA metabarcoding to compare the floral diets of honey bees and native bees. We recorded 2817 bees in total, including 27 species. *Apis mellifera* was the most common species across all locations, accounting for 42% of all bees observed. Other frequently recorded genera included native eusocial *Tetragonula* (37%), and semi-social *Exoneura* and *Braunsapis* (19.8%). We identified a negative correlation between honeybee abundance and native bee abundance. Our metabarcoding results show significant overlap in the pollen diets of honey bees with stingless bees (0.63) and even more so with *Braunsapis* spp. (0.72), where values close to 0 indicate no niche overlap and values closer to 1 indicate complete niche overlap. The dominance of honeybees in conservation areas is a surprising finding and raises questions about the impact on native bee ecology and the implications for native bee populations and heathland pollination.

Brittany Elliot has completed an Environmental Science degree with a Plant Ecology minor at the University of the Sunshine Coast. She has a strong interest in research and is currently an honours student at USC, studying the floral diets of bees in the heathlands of SEQ using DNA metabarcoding. She has been volunteering since she was 16 for various catchment care groups and zoos and whilst completing her undergraduate studies worked as a zookeeper at Wildlife HQ. She is currently the Qld Frog Society Sunshine Coast coordinator. Brittany loves everything from frogs, birds, fungi and insects, but especially bees with her favourite being *Xylocopa*. When she is not at uni, she can be found out herping, bushwalking with a camera in hand and occasionally scuba diving off Mooloolaba.



Drivers of speciation in *Homalictus*: past climate cycles provide an alternative to the 'Taxon Cycle' in island biogeography theory

Dorey, J.B. (1), M. Stevens (2, 3), M. Lee (1,2) & M.I. Schwarz (1)

(1) College of Science and Engineering, Flinders University, GPO Box 2100, SA 5001, Adelaide, Australia; (2) South Australian Museum, GPO Box 234, SA 5001, Adelaide, Australia; (3) School of Pharmacy and Medical Sciences, University of South Australia, SA 5001, Adelaide, Australia.

The theory of island biogeography remains an active area of research that has been used to explore how biodiversity arises and is maintained in a variety of island systems. An important parameter of island biogeography is topographic complexity, which is thought to increase available ecological niches that can be exploited through adaptive radiation, but its role in providing climatic refugia in tropical insular systems has not been well explored. Recent studies have indicated that tropical ectotherms are often thermal specialists with low tolerance for changing climates.

Using a combination of mtDNA sequences and adult morphology we have shown remarkable species diversity in an endemic monophyletic Fijian *Homalictus* bee clade, most species of which are restricted to highlands. Our phylogenetic analyses provided little evidence for gradual extensions of elevational niches, such as predicted by the 'taxon cycle' hypothesis, and instead suggest that elevational niches are conserved across most speciation events.

Our results indicate that cool-adapted tropical ectotherms could have retreated into highland refugia during interglacial warming periods, promoting allopatric speciation. This indicates an important role for niche conservation, as an alternative to adaptive radiation, as a driver of speciation in tropical insular systems. Future research will examine highland Australian tropical, subtropical and temperate *Homalictus* to determine the drivers of speciation along this climatic gradient using phylogenetic analyses with both mtDNA and nuclear DNA.



James Dorey is driven by a love of nature that was first instilled in him when growing up in the Northern Rivers, amongst the rainforest regenerated by his father. This provided James with an environment rich in plant and animal life to explore. James studied ecology, zoology and genetics at The University of Queensland and Flinders University and still photographs the new bee that he finds. James continues to study new and exciting things about bee ecology and evolution.

A new method of marking and tracking stingless bees

Redshaw, S. (1), F. Visser (2)

(1) Redshaw Native Bees, redshawnb@gmail.com (2) University of Queensland, Gatton, Q 4343

Interest in Stingless bees as alternate pollinators of macadamias is on the rise. In comparison to the European honey bee, little is understood about how we should manage Stingless bee populations within commercial orchards to optimise pollination needs. In addition, tracking foraging behaviour on a mass scale comes with several difficulties due to the small size of the bees.

This preliminary study explores the potential of a new, minimally invasive marking device for use on Stingless bees which was trialled across three Australian macadamia orchards. Results showed that the marking device was an effective, inexpensive method of uniquely mass marking stingless bees from multiple hive locations. Florescent powders applied to the foraging bees through the marking device were found in locations where the stingless bees had been foraging. The foraging behaviour from this study was spatially mapped and showed that bees will forage at all aspects from the hive, with the average foraging range found to be less than that found in other studies (43.5m - 69.5m), a result of the maximum area inspected being 100m. Based on the spatial findings of this study, the device provided baseline results and a new tracking method that could further be used to understand:

- How Stingless bees behave within orchards;
- How Stingless bees behave when additional resources are available to them e.g. buffer vegetation or neighbouring orchards/crops; and
- The need to have an optimal foraging range overlap to promote effective pollinator coverage.



Samantha Redshaw is the owner and operator of Redshaw Native Bees and is based in Gladstone, Queensland. Before starting Redshaw Native Bees, Samantha gained her undergraduate degree in Environmental Management (Natural Systems and Wildlife) with the University of Queensland and worked as an environmental consultant in Central Queensland. After finding her passion of Australia's native bees, Samantha went on to complete a Master of Agricultural Science (Plant Protection) at the University of Queensland, supervisors: Francois Visser and Robyn Cave. Since this time Samantha has worked closely with council, conservation and community groups, schools and hobbyists to spread the passion for native bees.

Pollinator distribution and efficiency in mango, avocado and macadamia tree crops across three growing regions in Eastern Australia

Willcox, B.K. (1), A.J. Robson (2), B.G. Howlett (2) V. Potdevin (3), M.J. Meyzonnier (1) & R. Rader (1)

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Pollination services, delivered by insect pollinators, are important to two-thirds of Australia's horticultural and agricultural crops. Along with managed honey bees, unmanaged insects including native bees, flies and beetles are important providers of pollination services. In this study, we used field surveys (sites $n = 42$) and single visit deposition experiments to assess species distribution, shared species and pollinator efficiency across three Australian tree crops avocado, macadamia and mango in different years (2014 – 2017). Surveys were conducted across three separate growing regions including Bundaberg, Queensland where all three crops are grown, the Tristate region (SA, VIC, NSW) for avocado and Mareeba, Queensland for mango. We found distinct pollinator community compositions across different crops and growing regions.

In mango orchards in Mareeba, the native bee *Tetragonula carbonaria* was the most frequently observed pollinator in both years of surveys, it was also the most efficient when mean pollen deposition was considered. We also observed this species in avocado and mango orchards in Bundaberg, Queensland, interestingly it was less commonly observed in macadamia orchards in this region.



Bryony Wilcox is a current PhD candidate at the University of New England. Her research is focused on understanding and optimising pollination services in tree crop production and exploring how advanced technologies, such as remote sensing, can assist in this process.



Bees and plant resin: sources, chemistry and bioactivity

Newis, R (1), H. Wallace (1), P. Brooks (1), B. Kaluza (2), T. Heard (3), S. Leonhardt (2)

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Resin is an important, though understudied resource for many bee species, particularly stingless bees. Resins from many plant groups are collected and used by stingless bees in nest construction and for chemical and biological defence. Stingless bee nest resins (cerumen) also show great promise as natural sources of bioactivity that can be used for medicinal applications. However surprisingly little is known about the sources and chemistry of resins used by bees. Our research investigated the impact that plant diversity within different landscapes (gardens, forests, macadamia plantations) has on the chemical diversity found within stingless bee nest resins, and how this impacts their ability to repel a common stingless bee pest, the small hive beetle (*Aethina tumida*). Landscapes with higher plant diversity (urban gardens), had significantly higher chemical diversity within stingless bee nest resin, while low diversity macadamia plantations showed the least chemical diversity within nest resins. These results indicate that plant diversity within a landscape is a key driver impacting the chemical diversity found in stingless bee nest resins. Interestingly however, no significant difference in repellent ability was observed between resins from the study landscapes, suggesting that stingless bees can obtain sufficient repellent compounds from even low diversity landscapes. Our current research is focused on investigating the plant origin of resins collected by the stingless species *Tetragonula carbonaria* using cutting-edge DNA metabarcoding techniques. At present the knowledge of resins foraged on by this species and other Australian stingless bees is limited to field observations by researchers and bee keepers. We are also investigating and comparing the chemical composition and bioactivity of these resins. This research will contribute knowledge to the understudied area of stingless bee resin foraging ecology, and will also potentially identify resins and new bioactive compounds with the ability to inhibit the growth of harmful human pathogens.



Ryan Newis is a PhD candidate at the University of the Sunshine Coast. His current research focus is the interaction between stingless bees and plant resins and the potential medicinal applications of plant resins. When not in the lab or field he can be found chasing mountains or waterfalls.

Efficiency of Australian native bees for pollination of watermelons

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Watermelon production is generally thought to be heavily dependent on honey bees for pollination. However, studies in North America have demonstrated that some groups of unmanaged, native bees are more efficient pollinators of these crops than managed bees are. We have assessed the abundance, and single-visit pollen deposition of a range of flower-visiting insects, including native bees, on farms in three major watermelon growing regions: Lakeland (Far North Queensland), Gumlu, and Chinchilla. Here we report initial results for pollinator efficiency and effectiveness of several groups of native bees in these regions.



Brian Cutting is an entomologist with Plant & Food Research, based in Brisbane. Brian's primary research interests involve developing new tools and approaches to managing pollination in production ecosystems. This work has involved research in a variety of cropping systems including avocado, blueberry, melons, kiwifruit and seed crops. Brian has developed a keen interest in photography, his photos are frequently used to demonstrate pollination, ecosystem services, and science.

Native bees in space and time

Brown, J. (1) & Cunningham, S. (1)

(1) The Australian National University, Acton, ACT, 2601

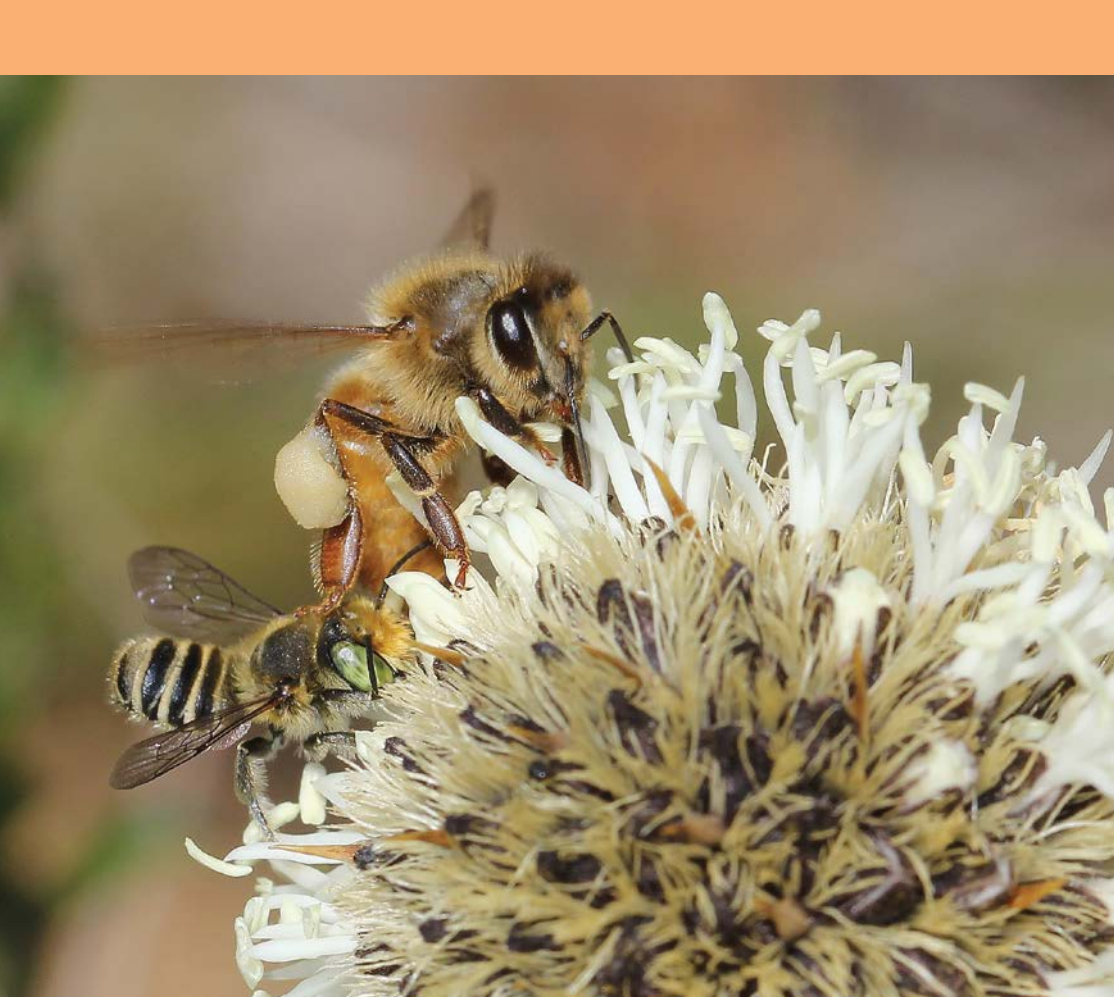
Knowledge of the spatial and temporal distributions of native bees is essential to their conservation and management in agricultural landscapes. Bee surveys were conducted from late winter 2017 to early summer 2018 at 14 sites across the Yarra Valley, VIC, including apple orchards, berry farms, and native vegetation.

Bees were surveyed using two techniques, blue-vane bee traps and observations of visitation to crop, weed, and native flowers. Different bee taxa were associated with different land cover types, time periods, and flower species. The conservation and management implications of these findings are discussed.



Julian Brown completed his PhD investigating fire effects on pollinators and pollination in the heathy woodlands of western Victoria in 2016.

He is currently a post-doctoral research fellow at the Fenner School of Environment and Society in the Australian National University, investigating native insects as crop pollinators and their responses to farm management and landscape patterns.



Importance of bushland remnants and honeybee competition for native bees in urban Western Australia

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With urbanisation expanding, remnant bushland is under threat; it is therefore crucial to determine the value of bushland remnants for native bees, and whether residential gardens also serve as quality habitat. The European honeybee is common throughout most of Australia, including in cities, with concerns that it is adversely impacting native bees. In the urbanised region of the southwest Western Australian biodiversity hotspot, the role of gardens versus bushland fragments in supporting diversity and abundance of native bees, and the potential for honeybees to outcompete native bees, was investigated.

Seven residential gardens and seven bushland remnants were surveyed monthly (Nov – Feb 2016/2017), recording honeybee abundance, native bee abundance and species richness, foraging behaviour, and nesting success using bee hotels. Native bees were significantly more abundant in bushland than residential gardens, whereas honeybee abundance did not differ between habitats. Native bee species richness was significantly higher in bushland sites, which also hosted more unique species. In contrast to native bee censuses, nesting parameters did not differ between habitats, except for male offspring body size being greater at bushland sites. Consistent with the honeybee competition hypothesis, there was a trend for native bee taxa with higher resource overlap with honeybees to have lower abundances. However, contrary to the competition hypothesis, native bee abundance was unrelated to honeybee abundance in bushland remnants and trended towards being positively associated with honeybees in residential gardens.

Moreover, native bee species richness was positively associated with honeybee abundance, and bee hotel occupancy and bee nesting success were unrelated to honeybee abundance. Foraging patterns over the day likewise provided little support for competition. We conclude there is minimal evidence that honeybees outcompete native bees, and although residential gardens host native bees, bushland remnants appear indispensable for conserving the full suite of native bees in urban areas.

Kit Prendergast is a young native bee researcher from Western Australia. She is currently doing a PhD at Curtin University, under a Forrest Scholarship, an international scholarship of which only three entrants are awarded with per year. Her thesis is the “Determinants of native bee assemblages in urban habitat fragments in the southwest Australian biodiversity hotspot and interactions between honeybees (*Apis mellifera*) and native plant-pollinator communities.”

Kit has a passion for the natural world and gets a real buzz when going out in the field to conduct native bee surveys. Her surveys have underscored the incredible diversity of Australia’s native bees that occur within the urban milieu of the southwest Western Australian biodiversity hotspot. Kit aspires for her research to lead to science-based actions for conserving thriving native bee assemblages.

Effect of native vegetation proximity on native bee diversity in lucerne (*Medicago sativa*)

Groom, S.V.C (1), J. Iwasaki (1), E. Williamson (1) & K. Hogendoorn (1)

(1) School of Agriculture, Food and Wine, The University of Adelaide, SA 5005

Managed honeybees (*Apis mellifera*) meet the majority of pollination requirements in Australian agriculture. However, a considerable and typically underappreciated proportion of this requirement is often provided by unmanaged pollinators. The impending arrival of the parasitic mite *Varroa destructor* threatens much of the pollination provided by these wild populations, predominantly through the loss of feral honeybee colonies. Small colony sizes and densities of native pollinators can impede their ability to replace feral honeybees entirely but supporting strong and diverse communities likely limits the severity of pollination loss. Ensuring a healthy pollinator community requires resources for a diversity of life histories that also encourage species' presence within crops.



Here we look to investigate how the proximity of native vegetation influences the abundance and diversity of non-*Apis* species within a lucerne (*Medicago sativa*) seed production area of southeast South Australia. Lucerne seed is a near hundred-million dollar, pollination-dependent industry with strong ties to both livestock and dairy industries when sown for pasture. We find that the presence of native vegetation has a significant impact on the diversity of native pollinators within the crop, particularly when that native vegetation is integrated (i.e. scattered *Eucalyptus*). Our results demonstrate value in retaining existing vegetation for mitigating a proportion of pollination lost with feral honeybees, but also benefits to initiatives to revegetate and diversify agricultural production landscapes.



Scott Groom

Scott's research experience has focussed near-exclusively on native bees and their utility for addressing questions across multiple disciplines. During his doctorate at Flinders University he investigated the genetic diversity of bee faunas of Pacific archipelagos and his subsequent postdoctoral fellowship at Kyoto University in Japan saw him exploring gene expression patterns across castes of a socially polymorphic bee. More recently at the University of Adelaide, Scott has been looking at the contributions native bees make to Australian agriculture and how we might secure these services.

Diet width of Australian native bees and strategies to enhance crop pollinating species

Hogendoorn K. (1), Leijds R. (2)

(1) The University of Adelaide, School of Agriculture, Food and Wine, Adelaide SA 5005; (2) South Australian Museum, North Terrace Adelaide SA 5000

Australia has a distinctive flora and a bee fauna of about 1700 described species.

Michener (1965) suggested that more than 50 % of Australian native bee species never visit introduced plants. If true, this has implications for (a) the identity of the native bee species that visit introduced pollination dependent crops; (b) the conservation of Australian native bees. Here we investigate (a) whether Michener's contention is supported by data, and (b) whether the species that specialise on Australian native plants are relatively over-represented among the older Australian bee taxa (Gondwanan relics).

A large database of visitation records shows that Michener was right. Colonisation histories of taxonomic groups show that older bee taxa specialise more often on Australian native plants, while recent arrivals often include introduced crops and weeds in their diet. However, the latter result is confounded by differences in the lifecycle, because species that maintain adults over a long period of the year are more likely to be both colonists and generalists. These findings imply that the maintenance of viable populations of crop pollinating bees in Australia requires the presence of a range of pollen and nectar sources during and outside of crop flowering times. Hence, smart development of the strategies to support crop pollinating species could assist with the conservation of the species with a pure native Australian diet.



Katja Hogendoorn is a senior research associate at the School of Agriculture, Food and Wine of the University of Adelaide. Katja has worked on various aspects of the ecology, evolution and behaviour of native bees and honey bees for more than 30 years. In 2004, she decided to apply her broad knowledge of bees to provide real-world solutions for crop pollination and bee conservation. Katja currently leads a large collaborative project between South Australian researchers, primary industries, governmental organisations and NGOs to design and establish habitat for crop pollinators around lucerne, apple/pear, canola, and almond crops. The project is supported through funding from the Australian Government Department of Agriculture and Water Resources as part of its Rural R&D for Profit Programme. She is also participant in the CRC for honey bee products.

Managing stingless bees in the commercial orchard environment

Fuller, C. - Kin Kin Native Bees



Native stingless bees are increasingly being used for pollination in commercial crops with macadamia being a prime example. Recent research has shown stingless bees are very efficient pollinators of macadamia and their promotion has led to strong demand for hives. There are a number of stingless beekeepers offering pollination services, traditionally bringing the hives into the orchards during the pollination period. There are also a lot of growers starting to build up their own numbers of stingless bee colonies and keeping the hives 'on farm' permanently. There can be a number of hazards to hives in either scenario.

A lot of crops can incur significant losses if they are attacked by insect pests during their flowering period. In macadamia there are a number of pests such as Macadamia Flower Caterpillar *Cryptoblabes hemigypsa*, Felted Coccid *Eriococcus ironsidei*, Macadamia lacebug *Ulonemia* sp. and Flower Thrips *Scitothrips* sp. with some of them capable of inflicting 90-100% crop loss if not detected and left unchecked. Some pests at certain levels can be dealt with using beneficial insect releases and others by using 'soft chemicals' such as Methoxyfenozide, but often, to stop crop loss, heavier agricultural chemicals with the potential to harm bees are required to be used pre flower or even during open flowering when bees can often be on farm. Acephate, Diazinon, Methidathion and Trichlorfon could all potentially be used around flowering time and often in combination with fungicides such as Carbendazim or Pyraclostrobin. Some management techniques such as hive placement, time of spraying and chemical selection can assist in minimising the hazards to bees in this situation.

As more hives are being kept on farm year round, permanent hive stands with multiple hives on them are being developed. Native bees can be susceptible to extreme heat as we saw in January 2014 when many hives were lost when temperatures were above 40°C for a number of days. These stands often need to be in exposed areas to be within flight range of the target crop so a wide roof offering good sun protection is required. As these stands may often be quite some distance from natural stands of bushland, artificial feeding may need to be employed for hives staying on farm year round. The planting of alternate forage for the bees should also be investigated to provide a nectar and pollen source for times outside of macadamia flowering.

Chris Fuller is the owner and director of Kin Kin Native Bees. Chris gained his interest in Australian native bees while working for over 20 years as an entomology and IPM (Integrated Pest Management) consultant to the macadamia industry on the Sunshine Coast. Early in his career he identified how abundant the stingless bees were on certain orchards and started investigating the importance of native bees as macadamia pollinators. This, in conjunction with the decline in feral honeybees in bush surrounding the orchards, prompted him to start building and propagating hives of native stingless bees and now offers a commercial pollination service to help growers maximise crop yields. Chris's interest now also include the education of macadamia growers in the use of stingless bees and also the safer use of agricultural chemicals when bees are 'on farm'.

Abundance, distribution, and effect on nut set of managed stingless bees in a macadamia orchard

L J Evans (1), L Jesson (2), S F J Read (3), B T Cutting (1), T Gayrard (4), M Jammes (4), R Roumier (4), B G Howlett (3)

(1) Plant & Food Research, c/ Queensland University of Technology, Gardens Point Campus, Brisbane 4000, (2) The New Zealand Institute for Plant & Food Research, Havelock North 4157, New Zealand, (3) The New Zealand Institute for Plant & Food Research, Christchurch 8140, New Zealand

(4) Agrocampus Ouest, France

Stingless bees (*Tetragonula carbonaria*) are thought to be effective pollinators of macadamia (*Macadamia integrifolia*); moving pollen between flowers while they forage. Introducing managed stingless bee hives into macadamia orchards is likely to increase the number of stingless bee visits to macadamia flowers, however, there is a lack of published information regarding the optimal number and arrangement of hives for pollination. In a 4-hectare block in Bundaberg, Queensland, we assessed the relationship between hive placement, bee numbers on flowers, and nut set, for stingless bees and also honey bees (*Apis mellifera*)



– commonly used for macadamia pollination. We found that distance-from-colony affected the number of both bee species on trees. This was particularly true of stingless bees, which occurred in higher numbers in close proximity (0 to 100 m away) to managed colonies. However, final nut set was not predicted by bee numbers on flowers, but rather an interaction between floral display size (open racemes) and total racemes (open, finished, and buds). These data suggest that in this orchard, plant nutrient resource allocation, rather than pollination, may have been the limiting factor for nut production. Our results provide a starting point for identifying appropriate placement patterns and stocking rates of stingless bee hives for macadamia pollination.

Lisa Evans

Dr. Lisa Evans is an early-career biologist with a special interest in behaviour and ecology of social hymenoptera. Her work with Plant and Food Research's Pollination & Apiculture team involves quantifying the pollination contributions of flower visiting insects in a wide range of agricultural systems as well as improving and diversifying pollination practices. She is based in Brisbane in support of Hort Innovation funded research quantifying honey bee dependence of several Australian crops, including macadamia, melons, blueberries, and papaya.

Stingless bee and honeybee performance in glasshouses

Romina Rader

University of New England, Armidale, Australia

Stingless bees are well-known Australian flower visitors in many parts of temperate, subtropical and tropical Australia. Given their distribution in warmer climates, it is no surprise that they have been trialled as glasshouse pollinators in Australia and elsewhere. Here we describe the preliminary results of a research trial whereby stingless bee and honeybee colonies were introduced into a commercial glasshouse to pollinate raspberry plants. We recorded visitation rates and behaviour in response to temperature, UV light and humidity across the duration of the trial. Stingless bees and honeybees were frequent flower visitors. Stingless bees were recorded collecting nectar and pollen. We discuss the conditions required for the effective management of stingless bees and honeybees in glasshouse conditions to promote pollination services.



Romina Rader is a Senior Lecturer in Community Ecology at the University of New England, Armidale.

Her research interests include the identity and performance of insect pollinators in crops, plant-animal interactions and the response of biodiversity to landscape and environmental change.

Microclimatic conditions in polytunnels used for berry production influence flower visitation by stingless bees (*Tetragonula carbonaria*)

Hall, M. (1), M. Rocchetti (2), D. Wright (2) & R. Rader (1)

(1) School of Environmental and Rural Science, University of New England, Armidale, NSW 2350. (2) Costagroup, Corindi Berry Farm, Corindi NSW 2456

Wild stingless bees provide an unpaid service to crop pollination worldwide, and their commercial use is growing rapidly in Australia. Many species forage effectively under enclosed conditions, so with pollinator declines worldwide, and increasing risks to managed honeybees (*Apis mellifera*), stingless bees provide good alternatives for commercial pollination. However a recent study of one stingless bee species in Brazil found a critical thermal limit for their use in enclosed environments. Similar climatic effects on Australian stingless bee species must be understood before they can be more widely used in commercial production, and to ensure the health of wild populations visiting enclosed crops. We surveyed multiple open-ended polyethylene growing tunnels (polytunnels) within a commercial berry farm in northern NSW. The number of stingless bee visits to flowers was recorded within a defined area at 1-minute intervals at multiple points along the length of each tunnel. Climatic conditions were also recorded at 12 points along the length of each tunnel across the survey timeframe: temperature, relative humidity, wind speed, white light and UV light. We found a greater number of flower visits by stingless bees at the ends of tunnels, and less frequent visits to flowers toward the middle of tunnels. This reduction in flower visitation correlated with changes in climatic conditions within the tunnels. These results can be used to inform the foraging ecology of stingless bees and appropriate design of polytunnels to improve foraging conditions for wild and managed stingless bees. This will aid a growing and vital service to crop production.



Mark Hall is a junior research fellow at the University of New England in Armidale, NSW. His current research focusses on the effectiveness of stingless and other bees on managed raspberry crops. During his PhD, he tested the influence of semi-natural habitats (such as roadside and streamside vegetation) on native bee species across large agricultural landscapes in north-central Victoria. He is keen to understand the ecology and behaviour of native pollinators in order to achieve conservation and pollination outcomes, particularly in collaboration with farmers, industry representatives and policy makers. He would also love to see and identify all of Australia's amazing bee fauna.

The nascent potential of Australian native bee pollination services

Tierney, S.M. (1), L.E. Brettell (1), O.M. Bernauer (1), L.A. Vella (1), R. Spooner-Hart (1) & J.M. Cook (1)

(1) Hawkesbury Institute for the Environment, Western Sydney University, NSW

Managed colonies of the European honey bee (*Apis mellifera*) are the most commonly employed pollination vector in horticultural settings globally, which has led to dependence on a single species for roughly one-third of the average human diet. Owing to its geological history, Australia possesses a unique bee fauna of approximately 2,000 species that have evolved alongside our native flora (predominantly from the myrtle family), however, little is known about the potential role that our native bees provide to food production. In-depth knowledge of the ecosystem services provided by native bees is also limited and improved understanding of their natural history is imperative to strategic management of these currently undervalued natural resources. Such information becomes increasingly important given current threats to Australia's apiculture industry from parasites (Varroa mite) and other unqualified factors affecting *Apis* health (colony collapse disorder). Our research team aims to assess the pollination potential of native bees on apple crops in a quantifiable manner across two distinct environmental matrices: a region where orchards are surrounded by pristine bushland (Blue Mountains, NSW), and one where vegetation-clearing has left sporadic remnants of native bush (Central West, NSW). We want to know which native bee species visit flowers of apples (Pink Lady & Granny Smith), and more importantly which species are effective pollinators. Apples in our study areas are visited by a variety of native bees, including meliponine stingless bees (*Tetragonula*), allodapine reed bees (*Exoneura*) and halictid sweat bees (*Lasioglossum*). We are undertaking detailed observations of behaviours on flowers and developing experiments to determine the efficacy of pollination by these native bees. These broad-scale studies will be augmented by in-depth investigations of nesting biology and population ecology (including genetic structure) of select groups - beginning with a case study of *Exoneura* reed bees.



Please note:
Simon's Field photo
is on following page

Simon Tierney is an Evolutionary Ecologist who aims to understand the interplay between organisms, their environment and their genes, with a particular focus on social insect organisation, photic niche shifts and pollination. His PhD investigated allodapine bees that can switch between solitary and social lifestyles (Flinders University), and he then undertook a series of postdocs exploring halictine bees that are similarly social, but unusual in their habit of nocturnal foraging (Smithsonian Tropical Research Institute, Panama). This led to projects exploring the molecular evolution of vision genes in bees, and regressive evolution of eyes in blind beetles (University of Adelaide). He is currently involved in a multi-disciplinary project aimed at understanding and safeguarding the pollination services provided by Australian bees (Hawkesbury Institute for the Environment, Western Sydney University).



Synthesis: trends, themes, directions

S. Leonhardt

Department of Animal Ecology and Tropical Biology, University of Würzburg, 97074 Würzburg, Germany

Dr Sara Leonhardt currently holds a research group leader position at the department of Animal Ecology and Tropical Biology at the University of Würzburg, Germany. Sara completed her PhD with the group on Plant-Animal Interactions of Prof. Nico Blüthgen, and has further conducted research projects at the Duke University in Durham (USA), the Leuphana University of Lüneburg and the University of the Sunshine Coast (Australia). Sara's research has been published in 24 peer-reviewed journals (37 publications), public blogs and one book chapter and has presented at more than 23 congresses.

Sara's research addresses evolutionary, behavioral/sensory and ecological aspects of resource exploitation by social bees (i.e. honeybees, bumblebees and stingless bees) in both temperate and tropical regions. She is particularly interested in the functional role of biodiversity, particularly resource and chemical diversity, in plant-bee interactions. One of Sara's major research fields investigates the role of resin/propolis for social bee health.



Dr Sara Leonhardt

Field Trip - 02 July 2018

Australian Native Bee Conference - Itinerary and information sheet

0800	Meet at RACV Royal Pines Resort Transport will depart promptly at 0830.
0830-0845	Travel RACV Royal Pines Resort to first stop
0845 to 1100	Exhibition of hive designs Visit to a bee yard to observe hive designs. The beeyard is not currently in use, but is an historic one previously operated by the Rosser family for several generations. Location is at Gold Coast Regional Botanic Gardens, Benowa, Gold Coast, only 3 km from Royal Pines.
1100 – 1150	Travel to Tropical Fruit World for lunch
1150- 1230	Lunch Tropical Fruit World pre-ordered lunch (included in ticket).
1230-1330	Travel to Farm at Newrybar, NSW
1330-1600	Visit stingless bees on macadamia farm The farmer, Ken Dorey, will talk about his coastal plains macadamia farm at Newrybar. We will visit a macadamia farm to observe a hive shelter, a structure for communal housing of hives. If the weather is reasonable (above 19°C) we will split some hives. We will discuss placement and management of hives on farms. Note, depending on weather and coach size, a steep walk of 1.5 km may be required from the road to and from the farm site. Limited numbers of people who are unable to manage this walk can be ferried by small vehicle.
1600-1730	Travel back to RACV Royal Pines Resort

Price	Price is \$90 (plus booking fee). To buy your ticket, please go to the Registration page and follow the same prompts to register for the conference itself. If you have already bought a conference ticket, then you can buy a field trip ticket. If not, please first buy the appropriate conference ticket (Full, Student or Pensioner) and then buy the field trip ticket.
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australiannativebeeconference.com.au

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