ANICdotes

The official newsletter of the Australian National Insect Collection

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BANNER: *Graphium macleayanus* image: Biodiversity Heritage Library

The Director's Introduction

David Yeates, Director

Spring is in the air, and our new building is scheduled to be completed in February 2024, so this is the last ANICdotes we will produce in our current building! Preparations for our move are at full throttle, with all curatorial staff working full-time on readying the collection and supervising relocation staff through the decant process. This has meant an enormous clean-up (and clean-out), of non-specimen items such as old records, papers and laboratory equipment that is beyond its useful life. We are digitising many of the paper-and film-based records, and some valuable records and books are being consigned to CSIRO records and the Black Mountain Library. We are also using the opportunity to audit, image, and in many cases obtain DNA sequences from our primary type specimens. This project has just reached the half-way point, with ~10,000 types processed. We are also imaging and databasing all of the 350,000 slide-mounted specimens in the collection. I hope you can get a sense that ANIC is a hive of activity even though we are officially closed for the move to the new building!

This issue contains the very uplifting news that one of our Honorary Fellows, Marianne Horak, was recognised in the King's Honours list this year, but this is muted by the very sad news of Honorary Fellow Ted Edward's passing. Ted was an important part of the development of ANIC for 50 years and it is disappointing that we won't hear his booming laugh in the halls any more, nor be able to rely on his expert curation.

David Yeates

We have a number of new starters beginning as we are moving house; Jollene Fraser joins the curatorial team, Living Li took up a Postdoctoral position with Adam Ślipiński working on Bostrichidae and Ptinidae, Sarah Dunstan began work with the Nematode team, and PhD student Mollie Slater-Baker began her studies in Juanita Rodriguez's lab.

We also bring news of the workshop on Cyst Nematodes delivered by Mike Hodda and Dan Huston and attended by nematologists and plant pathologists from around the country. Staff also began to travel to conferences and workshops, and we have reports on Bonnie Koopmans' and James Nicholls' separate adventures in California, USA, James Bickerstaff's attendance at a phylogenomics workshop in the Czech Republic, and Juanita Rodriguez's travel to the International Society of Hymenopterists Conference in Romania. Juanita is the new President of the ISH, hence this was a very important meeting for her. Keith Bayless and I also attended a workshop in Borneo and the International Congress of Dipterology in Reno, Nevada.

Welcome to Jollene, Sarah, Living (again!), Mollie and Emmanuel

Jollene Fraser

Jollene grew up in Canberra and studied at the University of Canberra, receiving a Bachelor of Environmental Science and a Bachelor of Applied Science (Honours) in 2016. Jollene's Honours thesis was on the smothering effects of metal flocculation from mining activities on freshwater ecosystems. After her Honours, Jollene went on to work as a research assistant at the University of Canberra, doing freshwater larval taxonomy for a variety of research projects. Jollene also worked as a tutor for the Australian River Assessment System (AUSRIVAS) training program in which she taught collection techniques, habitat assessment, and taxonomy workshops for people conducting freshwater bioassessment programs. In 2019, Jollene started her PhD at the University of Canberra. Her PhD topic concerns how the effect of temperature changes along elevational gradients impact the distribution, dispersal, and gene flow of freshwater insect populations at different latitudes. Jollene recently joined ANIC to provide technical support for the Diptera collection.

Jollene has joined the curatorial team, providing technical support to Diptera!

Aside from loving insects, Jollene has a special love for reptiles, and has two bearded dragons and a blue-tongue lizard at home. In her spare time, she enjoys hanging from the ceiling as she teaches aerial circus.

Sarah Dunstan

Sarah Dunstan has recently commenced as a casual Research Projects Technician in the Insect & Nematode Biosecurity Team at ANIC. In her new role she has recently helped with the workshop on Cyst Nematode Identification (article on page 15) and produced fact sheets on exotic pests delivered to the Victorian Department of Energy, Environment & Climate Action.

Sarah says… "I grew up in Madang (PNG) and Ceduna in the Nullarbor Plain (SA), which started my wonder of the natural world, which has led me in many directions. I have worked at The Royal Botanic Gardens Sydney in the Plant Disease Diagnostic Unit, and at Sydney University in the Faculty of Agriculture in Plant Pathology, preparing and maintaining the bacteria, fungal, and nematode collections for class practicals. This was where I was first introduced to the wonderful world of nematodes!

Fuelled with more questions than answers, I reached out to CSIRO, where Mike Hodda unsurprisingly encouraged me to pursue my interest in all things nematodes. My first project as a volunteer was to work with Dan Huston searching for the elusive nematode *Heterodera graminis*. This species was found throughout the Hunter region of NSW in the 1970's but has largely disappeared. I gladly collected and processed hundreds of soil samples, plant and nematode specimens to support Dan Huston's project on the genus, as well as an associated PhD student's project. I was really amazed at the wider significance of this work given that many farmers, researchers and others would love to make pest nematodes disappear! I was even more amazed to be invited to talk about it at the 2023 Australasian Plant Pathology Society Conference in Adelaide in November.

The *H. graminis* project has allowed me to indulge the desire to travel, meet new people and interact with different

Sarah out sampling for nematodes on Christmas Island

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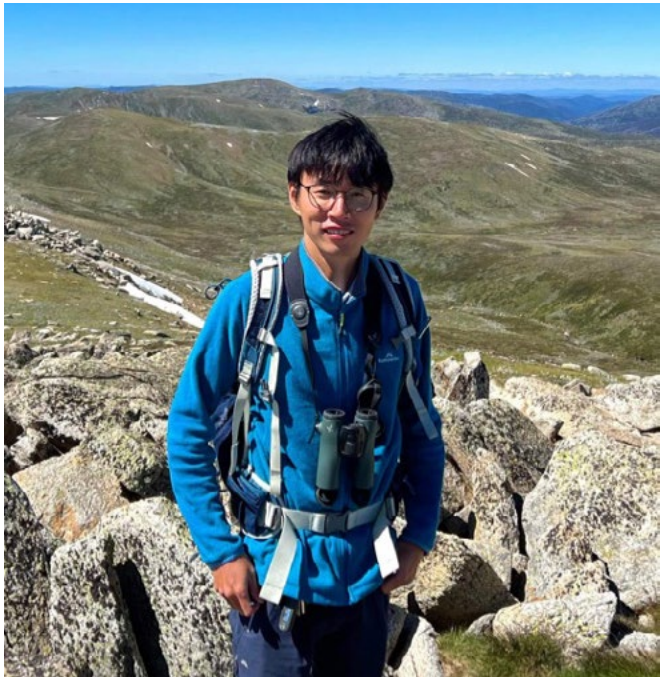
cultures, which have always been integral to my personal and professional life.

I am looking forward to further adventures in nematology at ANIC, perhaps involving the Guava Root-Knot Nematode (*Meloidogyne enterolobii*) in northern Australia or the nematodes from Christmas Island, where I collected samples for identification in 2022."

Living Li

Yun 'Living' Li grew up in the historical 'star city' in central China. He was trained to become a painter and mathematician but ended up in evolutionary biology after embarking on multiple field expeditions during his undergraduate years. He had studied reptiles and birds, but his primary research interest has always been beetles. Living did a MSc at Sun Yat-sen University, studying systematics of net-winged beetles (Lycidae). Later he worked as a research assistant and digital curator of insect collection in the university museum before moving to Canberra in 2019 to do his PhD at ANU (co-supervised by Craig Moritz, Adam Ślipiński and Andreas Zwick). Leveraging genomic and morphometric approaches, his PhD research sought to understand how ecological transitions, climate change, and historical biogeography drive the rapid radiation of darkling beetles (Tenebrionidae). After years of chasing micro-endemic beetles in the Wet Tropics of Queensland, he shifted focus to the adaptive radiation of 'pie-dish' beetles across Australian deserts.

Recently, Living started a Postdoctoral fellowship at ANIC, where he works on the systematics of Australian auger (Bostrichidae) and furniture beetles (Ptinidae: Anobiinae) - small brown beetles that are often destructive agents of timber. Using integrative, cutting-edge approaches, this project aims to provide extensive morphological and genetic resources



Living has joined the Coleoptera team as a postdoc

for efficient species monitoring of these 'badass' beetles in Australian biosecurity activities.

In his spare time, Living enjoys birdwatching, herping and photography (see www.livingecoevo.com), as well as the poetry of Rabindranath Tagore.

Mollie-Rosae Slater-Baker

Mollie Slater-Baker is a PhD candidate from the University of Adelaide, currently investigating the biodiversity and systematics of rogadine parasitoid wasps, also known as "mummy wasps", which are poorly known in Australia (Hymenoptera, Braconidae, Rogadinae). She is working with Juanita Rodriguez as a co-supervisor for her project, and will be visiting ANIC over the next few years to study the collection and obtain genomic data from rogadine wasp specimens for her project.

Mollie grew up all over Australia, living on a boat before finally settling down in Adelaide to complete her studies. She has always had a fascination with biology, and is particularly interested in nature's weird and wonderful morphology. She completed a BSc and Honours degrees in Science at The University of Adelaide, throughout which she developed a love for taxonomy and insect diversity, and completed several projects on the taxonomy and systematics of parasitoid wasps.

In her free time, Mollie enjoys gardening, drawing, and drinking tea! She also balances a love of science with a love of fiction, and enjoys games, movies and creating sci-fi and fantasy-themed artwork.

Mollie with some of her wasp specimens

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Emmanuel Arriaga-Varela

Emmanuel is currently working on the systematics of Endomychidae and allied families, collectively known as 'handsome fungus beetles', as part of his postdoctoral research project in the Museum and Institute of Zoology, Polish Academy of Sciences. He received his Bachelor's and Master's degrees in Mexico with works focused on the faunistics and taxonomy of Endomychidae in Mexico and neighbouring areas. Afterwards he moved to the Czech Republic, where he was awarded his PhD in Zoology by the Charles University in Prague. The main goal of his doctoral thesis was the reconstruction of the phylogeny and biogeography of a tribe of terrestrial water scavenger beetles (Hydrophilidae: Megasternini) based on genetic information.

Emmanuel's visit was delayed by COVID, but now that he's made it here, he will be working on the systematics of Endomychidae and allied families.

After the completion of his PhD, Emmanuel did a postdoctoral stint at the Universidad de Guadalajara (Mexico) working on diverse projects aimed at the documentation of the diversity and taxonomy of saproxylophagous beetles in Mexico.

Emmanuel is a visiting scientist among a cluster of those delayed by COVID; thanks to a joint grant from CSIRO and the Polish Academy of Sciences he is working in ANIC with Adam Ślipiński and Hermes Escalona. His current postdoctoral project integrates genomic information with morphology of extant and extinct organisms to gain a better idea of the evolution of Endomychidae. This is an interesting group of beetles for which different phylogenetic hypotheses have been proposed based on morphology or genetic information, and different lineages have been given family status. Disentangling the evolution of this group is key to understanding the evolutionary success of their closest relatives, the ladybird beetles (Coccinellidae), one of the most diverse and important groups in Coleoptera.

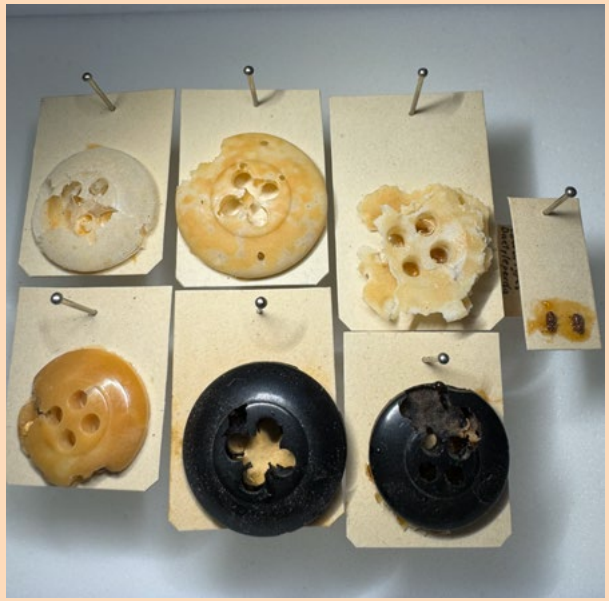
Bark beetles (Curculionidae: Scolytinae) are tiny weevils lacking rostrums

CREATURE FEATURE

Coccotrypes dactyliperda, the Date-seed Borer, is a typical Scolytinae bark beetle and, like many other species in this subfamily, is reliant on host tree tissues to complete its life history. As the common name suggests, *C. dactyliperda* is a common pest on date palm seeds. However, it has another name indicating an unexpected host: the Button Beetle. Members of this species have been found to bore into clothing buttons made from palm seed products, as can be seen below.

This isn't the only case of bark beetles have been found in items that aren't trees. Members of the genus *Cnestus* have been found to bore tunnels in unexpected items, *Cnestus solidus* in common garden hoses and *Cnestus mutilatus* sometimes attacking jerry cans in the United States, possibly attracted to the ethanol. Next time you're out looking for bark beetles, perhaps forests aren't the only place worth examining!

Card-mounted beetles to right of buttons for scale



James Bickerstaff

A message from the ANIC Collection Manager

Federica Turco

This contribution to ANICdotes is a message to all our friends who have been waiting patiently for updates on the critical and big projects we are currently undertaking, such as the implementation of a new Collection Management System (Specify) and particularly the preparations towards a full relocation of ANIC into the new building, which is coming up beautifully on the Black Mountain site.

All of us are amazed every day at the progress we see in the construction works by Hindmarsh. Now we can finally see many of the features that we've been planning and working on for many years. We've been able to walk through most of the three floors and even the fourth level, where the plant equipment is planned to go. For all of us who were able to go through the building, it has been a very exciting experience!

In ANIC we have been working tirelessly to plan the final details of the building and collection cabinetry and preparing our nearly 23,000 drawers and hundreds of thousands of vials, jars and slides, not to mention reprints, books and equipment for the move. Hereby I wish to celebrate the two teams with which I'm working more closely on this large project: the ANIC Curatorial and Relocation teams. We were fortunate to have received exceptional support from our Business Unit (NCMI, National Collections and Marine Infrastructure) and in particular from Toni Moate, NCMI Director, and Lisa Burns, NCMI Research Operations Manager. Such support has taken various forms, including extra funding for relocation that has allowed us to recruit a dedicated team lead by an extraordinary Relocation Manager, Lauren Curless.

These two teams are working harmoniously together to prepare the collections, and I am pleased to say that we are travelling on time as we have plans to relocate ANIC into the new building over the greater part of 2024. The ANIC Curatorial Team is now working on a careful plan for the relocation of our pinned collection drawers into the new building in a way that will allow us to decompress our collections and expand them in the years to come. The Relocation Team are instead leading packing trials, to find the most appropriate and safest method to transport our varied collections uphill on the Black Mountain site into the new collections building.

We are tired and excited in equal amounts, and we look forward to being able to soon show you our new building and—even more importantly—to host you in the years to come and facilitate your work on our collections in our new purpose-built facility, where collections, curation and research will be deeply and physically integrated with one another.

Members of the ANIC Curatorial and Relocation teams.
Front row L–R:
Jaime Florez
Bonnie Koopmans
Sandra Zwick
Karen May
Federica Turco
Olivia Evangelista
Lauren Curless

Back row L–R:
You Ning Su
Lauren Ashman
Jollene Fraser
Stuart Lay
Lingzi Zhou
Alberto Venchi
Debbie Jennings
Joshua Coates
Thekla Pleines
David Yuan
Alex Chen

Absent:
Manda Khudhir

Tribute to Ted Edwards (1945–2023)

Marianne Horak

I would like to pay tribute to Ted as an outstanding, inspiring scientist but also a cherished and incredibly loyal friend. In the last years I came to see him as my Australian brother.

I have been working with Ted for over 40 years. After Ebbe Nielsen's untimely death, when I had to take over the Lepidoptera group, Ted's support became absolutely vital. I had a Ph.D., which qualified me for the job, but I totally lacked the overall required knowledge of the Australian fauna. Ted had all that knowledge! But rather than being disheartened that somebody so unskilled was in charge, he categorically supported me from day one. Consequently, I have always made it clear to everybody that Ted and I ran the Lepidoptera group together. I know that without his support I would have failed miserably and returned to Europe.

Ted at Kin Kin, Queensland in 2007. Photo by Marianne Horak

For a generation Ted simply personified Australian Lepidoptera. His lifelong interest, prompted in childhood by his dad and supported by a phenomenal memory, meant that he was a walking encyclopaedia. With an Australian moth fauna of over 22,000 species, about as many as species of flowering plants, he could tell you that a certain little moth on the sheet was the first male found of this unnamed species. And he would go on to tell you where the female was collected three years ago. Given his photographic recall of the vast collection, he knew exactly what was valuable on a light sheet and should be caught. Field work with Ted, as long as one was prepared to put in the hard yards, was inspiring. His knowledge didn't by any means stop at moths, it ranged from geology over botany to zoology, and it covered Australia from Cape York to Tasmania. The long road trips from Canberra to wherever we went collecting were an education in themselves. One of the highlights I well remember forever was Ted calmly coaxing me to overtake my first road train in a 4-wheel drive with trailer.

Ted checking out Andy Williams' wonderful sun-moth collection. Photo by Marianne Horak

Ted's scientific legacy will last for generations. There is his huge footprint in the ANIC Lepidoptera collection with all the material he collected, and 50 years of his curation. The Checklist of the Australian Lepidoptera is now the basis for any work on Australian Lepidoptera, along with the Zoological Catalogue of Australian Butterflies and his many taxonomic revisions and biological studies. Since his 'retirement' Ted co-authored two excellent field guides on moths, A Guide to Australian Moths with Paul Zborowski and Moths in the ACT with Glenn Cocking and Suzi Bond, both very attractive and accessible to everybody yet full of new scientific information. Ted's guiding hand and quality control for Len Willan's baby, the Australian Moths Online website, was crucial to open up ANIC Lepidoptera to what we now call 'citizen scientists' and to attract a whole new cohort of dedicated lepidopterists. And last but not least we now have Ted's Tales where we can hear his voice as long as we can read.

Ted's generosity in sharing his vast knowledge and helping everybody with advice and support was legendary. Just about every publication on Australian Lepidoptera in the last 30 years profited from Ted's input through information or review. If Ted could find no fault in one's manuscript, one could safely submit it!

The wider world DID recognize Ted's exceptional dedication and achievements. In 2007 Paul Zborowski and Ted received the Whitley award for A Guide to Australian Moths. In 2012 Ted was made a Member of the Order of Australia, and in 2016 he received the 'Nobel Prize' in the lepidopterists' world, the Karl Jordan Medal of the Lepidopterists' Society.

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Passionate people are not always easy. Ted was strong-willed and had very firm convictions, and he did not suffer fools gladly. So if you did something Ted thought foolish…

Ted was happiest in the field, collecting, but again, there was total commitment and no second could be wasted. The stories are legend, and I well remember Ebbe's report from his first and highly successful field trip with Ted to WA: at some stage Ted realised he was carrying a box of beer for Ebbe from the car to the tent and promptly dropped it, proclaiming that he would not carry beer on a field trip for anybody. I believe Ebbe got his own back by collecting all Ted's clobber and stuffing it into a washing machine at the next laundry.

Ted loved Australian nature beyond anything and never really had the urge to go elsewhere, but I eventually coaxed him to New Zealand and then New Caledonia, which whetted his appetite for travel abroad. As a thank-you for opening my eyes to the marvels of Australia during our many field trips, I wanted to show Ted the European alps in flower, a childhood memory of mine and one of the biological wonders. He agreed that some cities had to be included. What was envisaged as a treat for Ted turned out to be very much a shared pleasure as Ted had read up on European history and we both enjoyed the same things, in particular Early Renaissance art. Some guidelines were agreed before we left, like no Weet-Bix in the hotel room for breakfast at an ungodly hour. Ted's photos showed me later just how well he had used the time from dawn to when we met for croissant and coffee—pardon, hot chocolate—at 9am. This trip really confirmed that I had found myself a second brother!

Thank you, Ted, for being there when needed for over 40 years! You will live in our memories, in the collection and in your books!

Visiting a bouquiniste in Paris. Photo by Marianne Horak

2015 Karl Jordan Medal awarded to Ted Edwards for his contributions towards the understanding of Australian Lepidoptera. Photo by You Ning Su

Ted in the field chasing coppers, Namadgi National Park, ACT, 2021. Photo by Michael Braby

Congratulations Marianne, Member of the Order of Australia!

David Yeates

This year's King's Birthday Honours list brought special recognition for one of our affiliates who has had a tremendous impact on the Australian National Insect Collection.

Dr Marianne Horak was appointed as an Officer (AO) in the General Division of the Order of Australia for distinguished service to entomology, to taxonomic and phylogenetic research, and to philanthropic endeavours. Marianne is a stellar example of a woman making excellent contributions in Australian science that are recognised globally, and is a role model for others to follow.

Marianne has worked at CSIRO for nearly 40 years, including as an Honorary Fellow since 2010. Her appointment as an AO recognises her outstanding scientific research on Australia's moth fauna, dedication to fostering the careers of others, and philanthropy. Marianne's contributions have led to a better understanding of insect biodiversity and pest management. Her research has shed light on unique aspects of Australia's Lepidoptera fauna, such as the moths that cause the distinctive scribbles on eucalypt trees and those that feed on koala dung. She has received prestigious awards that recognise the significance and impact of her research. Marianne established the Australian Lepidoptera Research Endowment (ALRE) to support the research of professional or amateur entomologists. She also organises meetings to support younger entomologists and non-professionals, demonstrating her commitment to collaboration and knowledge-sharing.

Dr Horak was born and educated in Switzerland, completing her PhD at the Swiss Federal Institute of Technology (ETH), Zurich, in 1983. She was awarded a Visiting Research Fellowship at CSIRO Entomology (1983-1985) and a CSIRO Postdoctoral Fellowship (1986-1988), and subsequently was appointed as CSIRO Research Scientist from 1988 until her retirement in 2010. Dr Horak has been a CSIRO Honorary Fellow in ANIC since her retirement.

Dr Horak's research has mostly focussed on the small moths belonging to the families Pyralidae and Tortricidae that cause economic damage in horticulture, and their harmless relatives, in order that we can diagnose the pest species accurately. The caterpillars (larvae) of these moths consume the growing tips and flower buds of plants, stunting their growth and reducing economic yields. Examples include the Macadamia Nut Borer, Cedar-tip Moth and the Light Brown Apple Moth. Knowledge of the species identities, biology, host plant preferences and natural enemies is important to establish management strategies for these pests.

Dr Horak's research has also shed light on unusual aspects of our uniquely Australian Lepidoptera fauna, such as those species that cause the scribbles on scribbly bark gum trees, and species that feed on koala dung. Coprophagy, or feeding on dung, is common in flies and beetles, but a rare phenomenon in the moths. In 1994 Marianne and colleague Dr Ian Common, described as new to science four species of moths that had been found feeding in the dung of marsupials in south eastern Australia. Three distinct species were found feeding in koala dung and another one in the dung of brush-tailed possums. Relatives of these species feed on eucalypt leaf litter and it is likely that the dung-feeding life style evolved from a leaf-litter-feeding habit.

One of the most iconic and evocative features of the eucalypt trees in south-eastern Australia are the "scribbles", the long, narrow, zig-zag, dark-brown markings on the bark of several smooth-barked species. This bush artistry has made its way into the poetry of Judith Wright and the illustrations of May Gibb's *Snugglepot and Cuddlepie*. The cause of these markings was a mystery for many years, but eventually they were discovered to be the feeding scars of tiny moth caterpillars chewing their way between the layers of bark. When the bark is shed annually, the feeding scars are exposed as scribbles. In 2012 Dr Horak led a study to further understand the diversity and evolution of these moths and their behaviour. The scribbles occur on 11 species of eucalypt, and many different species of closely related moths are involved. Each moth species produces a slightly different signature track, and Dr Horak's team described eight more species of moth and discovered that the tiny insect involved has a unique feeding strategy, and relatives in other Southern Hemisphere

Marianne with a drawer of *Statherotis* (Tortricidae: Olethreutinae: Olethreutini), a member of the moth group on which she published her award-winning monograph (*Olethreutine Moths of Australia*).

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continents, evolving in isolation since the supercontinent Gondwana broke apart.

Marianne has produced extensive taxonomic monographs that establish the framework for classifying groups at the genus level, the most significant of these being her masterful treatment of the *Olethreutine Moths of Australia (Tortricidae)* in 2006, occupying over 500 printed pages. This revisionary research establishes the nomenclature, anatomical characteristics and distribution of 90 genera occurring in Australia and Asia, and it provides the framework for future research on the species of the subfamily. This book was published to global acclaim, and Marianne won the inaugural J.O. Westwood Medal of the Royal Entomological Society for it in 2008. The Westwood medal is awarded to the best and most comprehensive taxonomic publication on a group of insects produced globally and is bestowed at a ceremony in London. CSIRO and the Australian National Insect Collection benefited from the significant international prestige of this award.

Dr Horak's scientific contributions were again recognised internationally when she won the Karl Jordan Medal of the International Lepidopterist's Society in 2019. The award is in recognition of outstanding original research in lepidopterology with particular emphasis on the fields of morphology, taxonomy, zoogeography and natural history. This prestigious and globally significant medal was first awarded in 1973, and Dr Horak is the first female recipient.

In retirement Dr Horak has focussed on philanthropic activities, establishing a fund to support the research of professional or amateur entomologists: the Australian Lepidoptera Research Endowment (ALRE). Her work here includes contributing significant personal financial resources to establish the endowment fund, establishing a Scientific Advisory Committee and encouraging other philanthropists to also contribute to the fund, managed by the Perpetual Foundation. The fund provides resources to support taxonomic and phylogenetic research on Australian lepidoptera by both professional and amateur entomologists. The ALRE began distributing research grants in 2016 and does so each year.

Marianne speaking at the 2015 ANIC moth weekend

CREATURE FEATURE

It's easy to see why *Ctenomorpha gargantua* (Phasmatidae) was given its name - she even gets her own drawer! This is Australia's longest stick insect species, and currently thought to be the third-longest globally, with females measuring up to 56.5cm. Compare the shorter, more slender males (bottom right).

Searching for gall wasps across the Pacific

James Nicholls

James Nicholls abandoned his usual haunts of the ANIC molecular laboratories to attend the 8th International Plant Gall symposium in Chico, California, during the second week of July. At the conference he gave several talks on the taxonomy and life-history evolution of cynipid oak gall wasps, a group of Hymenoptera that induce galls on oaks and their close relatives, and he also gave a presentation on the collection genomics work being developed at ANIC. Attendees at the conference represented more than 12 different countries, with presentations on a wide variety of topics, including the taxonomy of varied groups of gall-inducing insects, using galling insects for biocontrol, the molecular basis of gall induction, and co-evolutionary interactions among gall inducers, their plant hosts and their natural enemies.

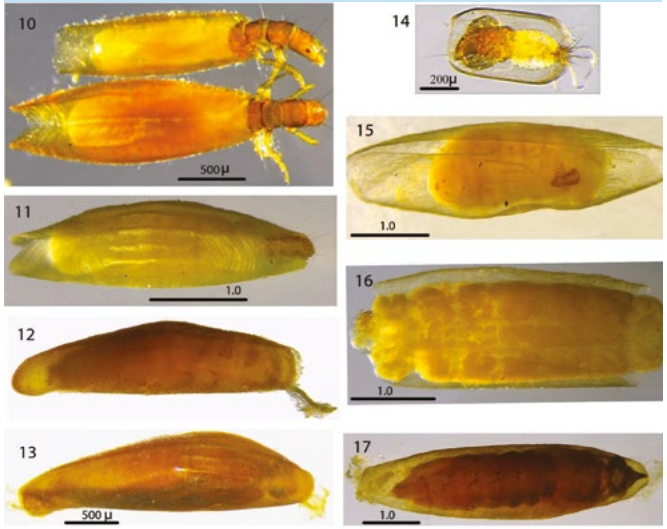
James also took the opportunity of being on the other side of the Pacific to visit some long-term collaborators in northern California, which included the chance to do some searching for cynipid galls on several endemic oak and near-oak species, each of which has its own unique set of gall wasp species. The highlight was re-discovering multiple examples of the subterranean galls induced on suckers of Tanoak (*Notholithocarpus densiflorus*) by the wasp *Andricus mendocinensis*, a species described from two adults dissected out of a single gall found in 1917 and not mentioned in the scientific literature since then. In addition, great fun was had collecting cynipid galls from Deer Oak (*Quercus sadleriana*), a species of relictual oak lineage found globally only in two locations: far-northern California and the Caucasus mountains (running between the Black and Caspian Seas).

A lurking cryptid: James collecting galls in a thicket of Deer Oak (*Quercus sadleriana*), an understory shrub in the pine forests of far northern California.

Unearthing the subterranean galls of *Andricus mendocinensis* at the base of a Tanoak tree.
Inset: The gall itself, with larval cells visible on the surface.

CADDISFLY CURIOSITIES

In early August, Alice Wells spent a few more hours in the Australian Museum, Sydney, looking through the McGraths Flat fossil caddisfly collection and photographing specimens for measurements. While most of the larvae and pupae appear to be referable to a single species, the project with Michael Frese (University of Canberra) and Matt McCurry (Australian Museum) became a little more complicated when she identified several small pupae of what is surely a different species.



In at least several extant *Orthotrichia* species, the final-instar larvae are parasitic of other caddisflies. Note the grossly swollen abdomen, tiny head and thorax, and very thin transparent case of one of these parasitic species on the right, as compared with the form of the 'normal' species on the left.

Aquatic Insect Workshop at Gunung Mulu National Park, Sarawak, Borneo

David Yeates and Keith Bayless

David Yeates and Keith Bayless were invited to participate in a workshop planning a forthcoming book focused on the identification of the freshwater invertebrates of Southeastern Asia and Subtropical China, to be published by Academic Press. The book is edited by Catherine Yule, Professor of Ecology at the University of the Sunshine Coast, QLD, and Professor Jim Thorpe, Senior Scientist at the Kansas Biological Survey in the USA. As the book chapters will be authored by researchers around the world, this workshop was convened to discuss the scope and focus of the book, coordinate the responsibilities of researchers and students, plan the format and execution, and offer practical demonstration training. Some other notable attendees included John C. Morse, Robert Sites, Shen-Horn Yen, and Hongqu Tang.

The workshop was held in Gunung Mulu National Park in Borneo (Sarawak, Malaysia) as there are research and teaching facilities, the accommodations are updated and comfortable, and the cuisine is remarkable.

Gunung Mulu National Park is a World Heritage site and well-known to international travellers due to its extensive areas of karst limestone leading into enormous caves. These caves are home to vast and species-rich bat communities, as featured in David Attenborough documentaries. The area around the caves is lush Dipterocarp rainforest, a haven for biologists, and the park includes mountains surpassing 2,000 metres in altitude. Accessibility is straightforward by road and regular daily air transport. Situated just 4° north of the equator, we found Mulu's hot, humid year-round climate - including regular afternoon downpours - to be a significant contrast to Canberra winter!

Prof. Yule has extensive experience in the aquatic ecology of Malaysian peat swamp habitats, which, along with the mountain streams and caves, support high levels of endemic aquatic invertebrate diversity in Mulu. Stepping off the well-tended elevated wooden and rope walkways was often a mucky misadventure, however. One afternoon we joined other visitors to the park and walked to Deer Cave at sunset to see the emergence of millions of bats from the mouth of the

A mating pair of *Tiriza leucotella* Walker, 1864 (Lecithoceridae)

Greg Curler and Robert Sites (USA) demonstrating aquatic sampling methods

Example of limestone nodules and peat swamp in treacherous juxtaposition

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cave. On the floor of the cave we also saw the bizarre wingless, blind, bat-associated earwig *Arixenia* (Arixeniidae).

During the workshop we met the editors, many of the other chapter authors, and Malaysian students to discuss the book and ongoing research projects. We resolved pressing issues including how to treat disputed geographic regions and which provinces of China to include, balancing both political and biogeographical considerations. The authors discussed areas for coordination and collaboration. Yule and Thorpe demonstrated methods for studying microscopic crustaceans and encouraged the development of critical identification resources for studying community ecology of threatened ecosystems. Armed with detailed knowledge of the requirements for each chapter, we are now ready to prepare them for editing. We expect the publication of the book in 2025 to galvanise the taxonomy and ecology of aquatic insects in Southeast Asia.

Sauteed paku jungle fern, a local delicacy gathered nearby and served in the café

Český Krumlov Workshop on Genomics

James Bickerstaff

In May 2023, the annual Workshop on Genomics was once again held in the idyllic southern Bohemian town of Český Krumlov, Czechia. The workshop has been held in Český Krumlov for over a decade, and locals have begun naming the participants 'molekulos'. Almost 80 participants from across the globe, including James Bickerstaff, descended upon the UNESCO World Heritage site for two weeks to develop skills in managing and analysing genomic sequencing data. Select topics included alignment, variant calling, genome assembly, genome annotation, pangenomics, comparative genomics, phylogenomics, transcriptomics, metagenomics, population genomics and many other -genomics! Days consisted of three three-hour workshop sessions, interspersed with breaks during which attendees could explore the town or meet with the workshop faculty to dive deeper into specific topics. Whilst the workshop timetable was rather intense, adventuring around the 800-year-old town and engaging with its long history kept us refreshed and sane.

The Workshop on Genomics, and its spin-off Workshop on Phylogenomics, will be held again in January 2024 in Český Krumlov. I can highly recommend these workshops if you're working with genome sequence data. Not only is the content riveting but the connections you make could lead to future collaborations.

Many many tiny people involved in the workshop! If you squint, James is in the back left zone

10th International Society of Hymenopterists Congress

Juanita Rodriguez

In July 2023, I traveled to Romania to attend the congress of the International Society of Hymenopterists. This event held a unique significance for me, as it was my inaugural congress in the role of president-elect for the society. Our gathering took place at the Alexandru Ioan Cuza University, situated in the historic city of Iasi. This institution boasts a rich tradition in the field of entomology and has particularly deep-rooted expertise in the study of Hymenoptera. Iasi itself is steeped in history, having once served as the capital of Moldova and briefly as the capital of Romania. The city has a multitude of architectural gems, including Romania's oldest Natural History Museum.

The congress spanned the course of an entire week, thoughtfully organised as a single-session event to ensure that attendees would not miss any of the presentations. Our international gathering achieved an impressive 50% student enrollment, with participants from all corners of the globe. Over the course of the congress, we were treated to a remarkable array of over 80 talks, spanning a wide spectrum of entomological disciplines. Topics ranged from biodiversity and biogeography to morphology, anatomy, phylogenetics, phylogenomics, ecology, biological control, conservation, systematics and even the crucial theme of diversity and inclusion. Notably, a symposium on diversity and inclusion, which I had the privilege to chair, provided a platform for the society's members to engage in meaningful dialogue, seeking input and ideas to advance our collective progress.

Group photo of attendees of the 2023 congress of the International Society of Hymenopterists

One memorable day during the congress we went on an excursion to Bicaz Gorge, a natural passage connecting Moldova and Transylvania. Among the breathtaking scenery, we had the opportunity to collect specimens and enjoyed a leisurely stroll while soaking in the stunning view. Additionally, our itinerary included a visit to the historic Agapia Monastery, an architectural treasure constructed between 1641 and 1643.

Congress excursion to Bicaz Gorge

The congress proved to be a vibrant, enjoyable, and successful gathering—a great occasion to reconnect with esteemed colleagues and dear friends, while also forging new collaborations and friendships. Looking ahead, our society anticipates reuniting at the 2024 International Congress of Entomology in Kyoto, Japan, where we will convene for a symposium.

Following the congress, my journey led me to London, where I visited the Natural History Museum for the first time, along with experiencing vibrant London itself. During my visit, I had the opportunity to photograph all the primary types of Australian Ageniellini, a taxonomic group in dire need of revision. Additionally, I verified *Leioproctus* bee identifications by comparing them to type specimens. While in London, I was hosted by Gavin Broad, with the added pleasure of interacting with colleagues such as Andy Polaszek, Natalie Dale-Skey, and an unexpected non-Hymenoptera intruder—senior Lepidoptera curator Geoff Martin. Their warm hospitality enriched my experience and added immeasurable value to my journey.

Front façade of the Natural History Museum in London

Conferencing where little cable cars climb halfway to the stars

Bonnie Koopmans

In late May, four delegates from CSIRO ventured across the Pacific to attend the 2023 conference of the Society for the Preservation of Natural History Collections (SPNHC - affectionately pronounced 'spinach'!)

Hosted this year in San Francisco by the California Academy of Sciences, the weather was wonderfully mild, and fog from the bay clung to the city until after lunchtime–whilst it wasn't quite what I imagined for a California summer, it was a lovely escape from Canberra winter! The conference itself featured a combination of field trips, workshops, presentations and avidly attended visits to the local collections.

The conference was a flurry of rushing between seminar rooms to attend the next talk on time, and trying to control my nerves ahead of my own (first-ever conference) presentation, unfortunately scheduled for one of the very last sessions – talk about anticipation! I had the pleasure of speaking about the group exhibition I curated last year, *Collected Works*, which featured 20 artists from the Canberra research collections creating artworks about specimens.

The amazing Living Roof of the California Academy of Sciences, featuring skylights for the exhibits below.

The presentation topics were wildly varied and informative... How to store spirit specimens in an alcohol-free country? How to deal with a flooded collection on Christmas morning? How to best database different specimens associated with each other? My favourite topic category is, of course, 'I found this cool thing and/or curatorial nightmare in a random cupboard, let me tell you about it'.

Whilst there, I had the opportunity to visit both of the well-known entomological collections in the area at the California Academy of Sciences and the Essig Museum of Entomology (UC Berkeley). It was an absolute delight to meet curators and technicians from other collections, and be able to pick their brains about their techniques and facilities for curation, storage, digitisation and pest management. It was fascinating to see and hear about the unique considerations required for collections in a city located almost directly on a faultline, and thus prone to earthquakes. Alongside the differing considerations, it was also important to realise the seemingly universal truths of collections—space is at a premium, and the work will never be complete!

Being my first visit to North America, San Francisco was a lovely introduction to the USA, with a collection of relatively close national parks, and lots of interesting fauna and flora… some of which were more familiar than I expected! I admit I had to double-take heading into the city from the airport when I passed a group of eucalypts! Australian plants seem a popular choice for gardens around the city, and it was entertaining to see Yellow-faced Bumblebees visiting grevilleas and American Robins perched in bottlebrush. Other wildlife highlights included seeing a coyote, sea otters in Monterey Bay, a banana slug and, of course, hummingbirds!

The 2024 SPNHC conference will be held in September in Okinawa, Japan, as a joint meeting with Biodiversity Information Standards (formerly Taxonomic Databases Working Group—TDWG).

Do you think we can get a foyer *T. rex* for the new building? University of California, Berkeley - home of the Essig Museum of Entomology!

Yellow-faced Bumblebees (*Bombus vosnesenskii*) were plentiful in the Presidio of San Francisco

Delivering our nematological collections and expertise

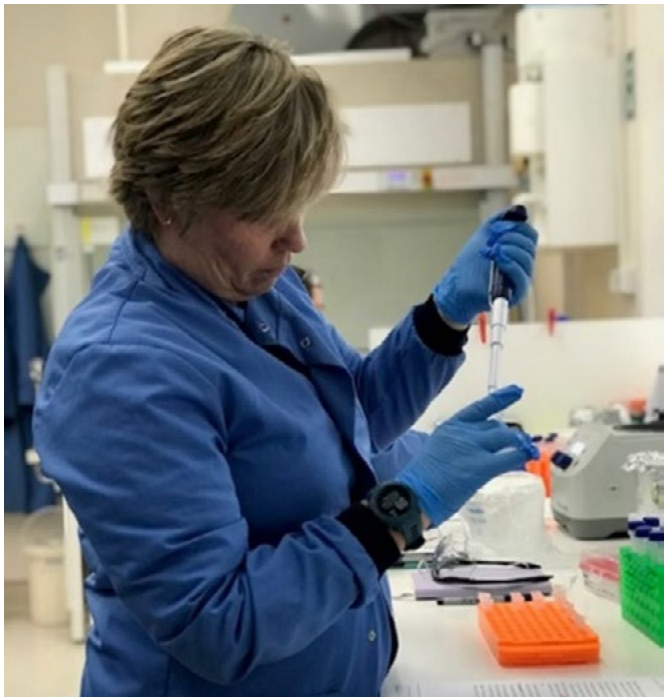
Sarah Dunstan & Mike Hodda

In May a team of expert diagnosticians from around Australia specialising in nematology attended a week-long workshop on cyst nematodes in ANIC. The workshop was funded by the Department of Agriculture, Fisheries & Forestry through the National Plant Biosecurity Diagnostic Network and Plant Health Australia.

The workshop represented the final stage in a journey to better prepare our biosecurity system to handle cyst nematodes of the genus *Heterodera* (National Priority Plant Pest #23). Australia now has a definitive list of *Heterodera* species that already occur in Australia, a collection of morphological specimens and DNA of both local and exotic species, a taxonomic expert in the group and a group of diagnosticians familiar with most of the exotic threats and trained in how to extract and identify them.

Dan Huston (right) explaining the intricacies of morphological identification of cyst nematodes using the ANIC's collection of morphological specimens and specialist microscopy equipment (out of view to the right).

As a result of the workshop, all this will soon be backed by a verified National Diagnostic Protocol (NDP) covering all 80+ species in the genus. The workshop trained participants in extraction techniques and morphological and molecular identification using the draft NDP combined with the native and exotic specimens held in ANIC and Black Mountain Quarantine Facility. Participants then returned to their laboratories to verify the NDP in their own laboratories. We also collected feedback on the NDP itself, together with the processes of developing and verifying it, which will improve these activities in the future.



Dr Sarah Collins using one of the molecular techniques developed at ANIC for identification of species of cyst nematodes.

We think this is a major achievement in strengthening Australia's biosecurity, given it is barely three years since Dan arrived for training under Mike as part of the "Boosting Diagnostics" programme funded with contributions from DAFF, rural industries and research providers including CSIRO.

Thanks to Lucy Tran-Nguyen (PHA) and Catherine Todd (chair of the Network Implementation Working Group) for their great roles in making this happen, and to Saleta Perez Vila (CSIRO Health & Biosecurity, and Manager of the Black Mountain Quarantine Facility) for providing facilities for work on live quarantine species.

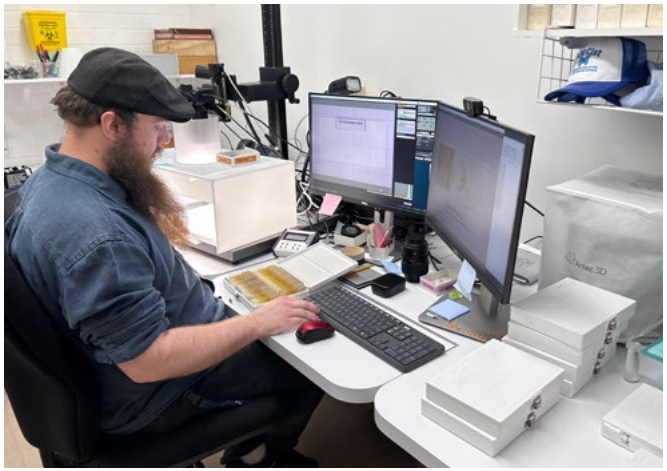
Attendees of the workshop: from left Samantha Bond (DITT NT), Stefan Harasymow (DPIRD, WA), Dr Sarah Collins (DPIRD WA), Dr Dylan Corner (QDAF Qld), Dr Mike Hodda (ANIC), Sarah Dunstan (ANIC), Akshita Jain (DEECA Vic), and Dr Daniel Huston (ANIC)

The glass is always cleaner on the other side: digitisation of the microscope slide collections

Ryan Main, Jaime Florez Fernandez & Nicole Fisher

Since reporting on ANIC's extensive microscope slide collection in the ANICdotes Issue of October 2019, we have been scaling up the digitisation of this collection. The collection is estimated to contain over 310,000 slides, making it the most extensive digitisation project we have undertaken in the insect collection. This number of slides comprises estimations of 80,000 aphids, coccids, whiteflies and thrips, 36,000 moth genitalia, 70,000 slides of small files, 50,000 nematodes and 75,000 mites and their relatives.

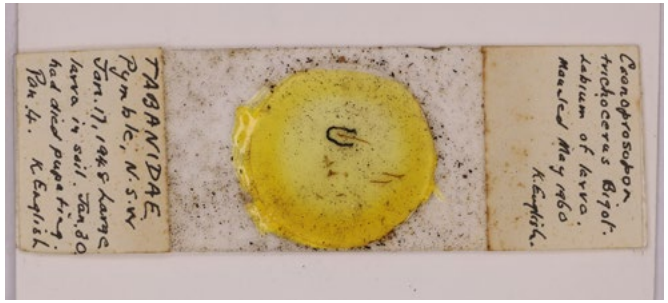
We have just passed the digitisation of 43,000 slides. Only once the whole collection is digitised can we accurately say how many slides it contains and exactly what the geographic and temporal spread of the collection is. Maintained in systematic order, while some parts of the collection have a database metadata record containing detailed information on the labels attached to the glass microscope slides, the majority of slides have yet to obtain a database record. Therefore, the primary purpose of this digitisation project is to capture the label information which for the majority of the collection is only available as un-databased records. Before imaging, a database number is assigned to each slide, a photograph is taken of the slide and further work is then undertaken to extract the information held with each slide, ultimately producing fully digitised records of the slide collection.



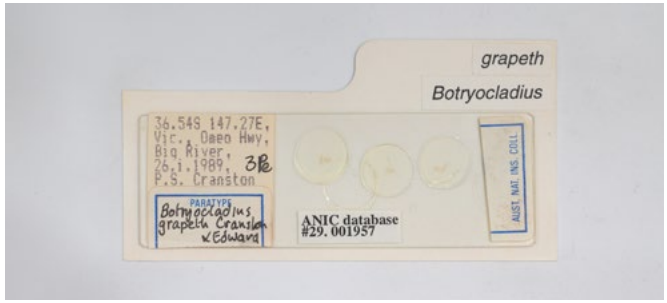
Ryan Main imaging the extensive Diptera microscope slide collection

In preparation to move to a new facility being built to house the Canberra-based CSIRO collections early next year, the microscope slide collection is going through an overhaul as it moves from old cabinets to new cabinets. As some of the new cabinetry that holds slides horizontally is currently in the ANIC collection halls awaiting its move to its new home, slides are now stored in new trays within the new cabinets. To accomplish imaging of the whole collection at a quicker rate, some imaging of slides has been done at the whole-tray level after which the whole-tray images will be digitally segmented into separate images of every slide. Label information will then be captured using OCR (optical character recognition) methods to eventually obtain a fully digitised record of every slide ready for import into the new Collection Management System, Specify, which will be implemented later this year. Some parts of the collection, however, will remain in their current vertical state of storage, and these slides will be imaged individually

The moving and imaging of this collection also includes tasks such as cleaning dirty slides or repairing broken slides, which requires considerable technical abilities of the curation team. A year from now with the collection moved into the new building and a fully digitised collection awaiting full curation, use and discovery in future research, the glass will literally be cleaner on the other side.



Uncovering microscope slides needing cleaning has been one curatorial aspect encountered while digitising this collection.



Individual images or whole tray images are taken, depending how they are stored (vertical- or horizontally-kept slides, respectively).

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