ANICdotes

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Our second issue for 2019

David Yeates, Director

Our second issue of 2019 celebrates the achievements of one of our most active Honorary Fellows, Marianne Horak. Marianne joined ANIC almost 40 years ago, and her career achievements were recognised this year when she was awarded the Karl Jordan Medal by the Lepidopterists Society in Davis, California. We are indeed fortunate that Marianne is still active in the collection, conducting research on Australian Lepidoptera and editing the *Monographs of Australian Lepidoptera* series. Another article in the issue highlights another of Marianne's initiatives, our biennual moth weekend. Marianne's expertise is essential to our current research: she recently identified hundreds of moths to be sequenced in Andreas Zwick's Collection Genomics project as part of the Environomics Future Science Platform.

Mike Hodda's impact in biosecurity is a major focus of this issue, with articles highlighting his efforts in transferring nematode identification and management skills to neighbouring ASEAN countries on page 5 and the National Entomology Skills workshop held in April on page 7. This workshop was funded by the Department of Agriculture, and we plan to make it a regular event. ANIC's microscope slide collection grows steadily and is a significant part of our holdings in Thysanoptera, Hemiptera, Diptera, mites and nematodes. Laurence Mound's essay on the various ways of storing and curating insect microscope slides highlights some of the different approaches we take for our 300000+ strong slide collection.

Bryan Lessard has been engaged in a significant collaboration with other CSIRO scientists in promoting the value of insects as human and livestock feed. Bryan and colleagues will recruit a PhD student to survey Australia's native edible insects and assess their nutritional and potential economic value. As usual we have a roundup of new staff, volunteer activities, significant visits, new products, upcoming workshops and a valuable donation by Richard Bull.

David Yeates

As this issue goes to press, I have just caught sight of Adam Slipinski's and John Lawrence's second volume of *Beetles of Australia,* published by CSIRO Publishing. At almost 800 pages, the lavishly illustrated work is significantly larger than the first volume, covers a major chunk of our beetle fauna and is one of the most significant contributions to our knowledge of Australia's biodiversity published in recent years. We will include a more detailed account of the book in the next ANICdotes.

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BANNER: *Graphium macleayanus* image: Biodiversity Heritage Library.

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Welcome to new staff

Manda Khudhir and Hermes Escalona

MANDA KHUDHIR

Manda graduated from University of NSW with a B.Sc. (Hons) in Biological Sciences and Zoology in 2014. She completed her Honours thesis under the supervision of Gerry Cassis, examining the phylogeny, historical biogeography, and evolution of flightlessness in the seed bug tribe Targaremini (Heteroptera: Rhyparochromidae).

Manda joined ANIC in May 2019 all the way from tropical northern Queensland, where she previously worked in Entomology and Applied Pest Management for the sugarcane industry. Her previous role focused on management strategies for native pests such as cane beetles and soldier fly.

Manda has retired her high-visibility shirts and shovel to join ANIC, where she is now working as part of the Insect and Nematode Biosecurity team under the supervision of Mike Hodda. Here she will be providing support with plant health biosecurity diagnostics and curation of the CSIRO nematode collection.

Manda Khudhir joined the Nematode Biosecurity team in May 2019

HERMES ESCALONA

Hermes Escalona earned his PhD in Entomology from the Universidad Central de Venezuela, and did a Postdoc on genomics and phylogenomics at the Zoological Research Museum Alexander Koenig and the University of Freiburg in Germany. He is interested in evolutionary biology and systematics of beetles and has been working in ANIC for several years.

In his new role at ANIC, supported by the Zimmerman Trust, he will team up with the weevil research group to develop identification keys for the genera of Australian weevils and also to work on related projects integrating morphology, phylogenomics and genomics. His main research project will be supervised by Adam Slipinski as part of the *Australian Beetles* book series.

ANIC holds a world class weevil collection with thousands of undescribed Australian species, which is fundamental for comprehensive large-scale projects like this one.

Hermes Escalona joined the weevil research group in September 2019

National Volunteer week

Nicole Fisher

Thanks to Volunteering Australia chief patron and His Excellency the Governor General of Australia, Sir Peter Cosgrove AK MC (Retd), four of ANIC's volunteers (Tom Van Gerwen, Robert Tompsett, Franz Grossbechler and Len Campbell) with Nicole Fisher (who manages NRCA's digital volunteer program) celebrated National Volunteers Week (20–26 May 2019) at an afternoon tea at Government House. We all had a wonderful time talking with the Governor General about bees and their pollination of food crops for the world, as well as beetles and the work done by volunteers in ANIC.

Left to right: Len, Tom, Franz, Sir Peter Cosgrove and Robert

Left to right: Len, Robert, Nicole, Tom and Franz

Marianne Horak, the first woman Karl Jordan Medallist.

Ted Edwards

At the dinner of the annual meeting of the Lepidopterists' Society in Davis, California, on 12 July 2019, Marianne Horak was announced as the winner of the 28th Karl Jordan Medal and the first woman to receive this honour.

Marianne spent two years in New Zealand (1967–1969) and then two years at Bulolo in Papua New Guinea (1971–1973) before she commenced her PhD. Her interest in Southern Hemisphere moths had been sharpened by John Dugdale, who remains a life-long friend and mentor. The other prominent role models during her PhD studies were her supervisor Willi Sauter, Alex Diakonoff, a Dutch lepidopterist who worked very extensively on Southeast Asian Tortricidae, and Ian Common, whose work she admired and emulated.

When Ian Common was approaching retirement in 1980, Ebbe Nielsen was a young lepidopterist in Denmark. He had a strong interest in the moths of the Southern Hemisphere, so he was invited to Canberra on a "get to know you" basis. Marianne was visiting ANIC from Switzerland at the time to study New Guinean Tortricidae. While in Canberra they met and became friends, and when Ebbe was appointed to take over Ian Common's position in 1982, they came to Canberra as partners.

Marianne's PhD degree was awarded in 1983 by ETH (Eidgenössische Technische Hochschule, or, Swiss Federal University). Her PhD work on Tortricidae culminated in landmark findings on the phylogeny of the family, and the structures that are important in its taxonomy. She then embarked on a series of revisions of the Australasian Tortricidae. On arrival in Canberra, Marianne commenced her many years of exceptional work on Australian moths. In order to obtain outside funding, Marianne broadened her interests and started work on the subfamily Phycitinae of the family Pyralidae. Most notable was her work on the genus *Cadra*, and she elucidated the true relationships of

Marianne in the collection

the tribe Anerastiini. Concurrently she contributed chapters to several major volumes on aspects of the Tortricidae and to the *Checklist of the Lepidoptera of Australia*. In 2001 she endured the tragic loss of Ebbe, and took over the Lepidoptera unit at the ANIC from him.

The massive book *Genera of Australian Olethreutinae* was published in 2006, as number 10 of the series *Monographs of Australian Lepidoptera*. For this Marianne won the inaugural Westwood Medal in 2008.

In the ANIC Lepidoptera position she tackled some of the major problems in the Australian Microlepidoptera. With Ian Common she studied the family Oecophoridae, which led to an understanding of the genus *Telanepsia*, and recognition that koala and possum scats were simply neatly packaged dead eucalypt leaves used by a few groups of dead-leaf feeding larvae in the Oecophoridae. Under pressure from Max Day, Marianne led a multidisciplinary team that tackled the challenging problem of the scribbly gum moths. In a landmark study she elucidated their taxonomy and biology, and established several autapomorphies for the family Bucculatricidae, which had previously been ill-defined.

Marianne fully embraced the theory that one can achieve more by encouraging others than one can by working alone. She mentored a series of lepidopterists from Southeast Asia, most notably Hari Sutrisno (Indonesia), and students of Nantasak Pinkauw (Thailand), and she supervised a wonderful PhD on the Light-brown Apple Moth by Bobbie Hitchcock. She has continued as Chief Editor of the Monographs series, played a leading role in the establishment of the website, *Australian Moths Online*, and instituted the regular "Moth Weekends". She also established the Australian Lepidoptera Endowment Fund to facilitate studies of Lepidoptera in the ANIC.

Marianne's well-deserved award gives the Lepidoptera Unit a peerless record of achievement with no fewer than five Karl Jordan medals awarded to staff in the 46 years since its inception. Previous Award winners have been Elwood Zimmermann (1983), Ebbe Nielsen (1990), Ian Common (1996), and Ted Edwards (2015). The Medal is awarded every two years, and Marianne's is the 28th to be awarded. This means that ANIC Lepidoptera staff have been awarded 18% of the Medals, an unrivalled and truly amazing record for a tiny under-resourced team.

Marianne's medal

The 9th biennial Moth Weekend

You Ning Su and Ted Edwards

Our lepidopterists welcomed more than 37 guests for the 9th biennial moth weekend on 27th and 28th July. Participants came from many parts of Australia, and more than a few stayed for a period before and after the weekend to work in the ANIC. Afterwards many tired but re-enthused lepidopterists returned home to think ahead for the next one in 2021 and assimilate what they had learned.

Such meetings are made by the attendees and we thank from the bottom of our hearts all who came for making the weekend such an outstanding success. Marianne, You Ning, Ted, Andreas, Thekla and Glenn contributed immensely to the organisation, smooth-running and success of the meeting.

We all had a wonderful time and look forward to hosting the 10th biennial weekend in 2021.

9th biennial Moth Weekend group photo

Ant collaboration with MCZ

Robyn Meier

The collaboration between the ANIC and the ant room at the Museum of Comparative Zoology, Harvard (MCZ), continued this year with another visit to the MCZ by technician Robyn Meier. The collaboration between the two collections has been ongoing for many years and has been very beneficial. This year, Robyn continued helping to sort the MCZ ant collection to reflect the latest taxonomic revisions and deposited 197 *Melophorus* paratypes into the MCZ as part of the continued distribution of type material between the collections. Additionally, she also deposited 4 specimens of *Nothomyrmecia macrops* into the MCZ Collection, and one of these specimens will be used by an artist who is collaborating with Professor E.O. Wilson to create drawings of these endemic Australian ants. During Robyn's visit, Professor Wilson celebrated his 90th birthday and shared this occasion with the MCZ ant room staff past and present.

Sorting ants in Prof. Wilson's library

Professor James Hanken, Director of the MCZ, also spent time with Robyn talking about the planning and pitfalls of moving the MCZ collections into the new Harvard facility. This was of great benefit to the ANIC as we prepare for the new collection facility to be built on the Black Mountain Science and Innovation Park. Additionally, Robyn was able to visit and speak to the curators working in the new Harvard facility. These interactions and sharing of details were very valuable and will help inform the ANIC's preparations for the forthcoming move.

Prof. Wilson chatting with Robyn in his office

ANIC expertise spreads to ASEAN

Mike Hodda and Manda Khudhir

Earlier this year, Mike Hodda added many stamps to his passport during some extensive travels through South-East Asia. In three trips, Mike visited Myanmar, Lao PDR, Thailand and Vietnam to improve the capability of these countries in nematode identification, build their nematode collections, advise on laboratory equipment needs, and supply taxonomic information resources. Promoting an effective capability to diagnose and manage plant-parasitic nematodes by our trading partners in the ASEAN bloc will enable more trade through confidence in the phytosanitary system. The visits were sponsored by Australian Aid and the ASEAN-Australia-NZ Free Trade Agreement Economic Cooperation Work Programme, and are part of a project running since 2011.

Many important biosecurity threats are nematodes. About 10% of Australia's National Priority Plant Pests (NPPPs) are nematodes, including species that can devastate many different crops and forests. It is essential to be able to differentiate these damaging invasive pests from the many other species, estimated at over half a million, most of which are either benign or even beneficial. This task is compounded by most nematode species remaining undescribed (more than 95% of the estimated total) and expertise in nematode taxonomy being very scarce. ANIC is a major centre of that scarce expertise in nematology, not just for Australia, but for the Asia-Pacific Region as well, which is why it is delivering its expertise to the region.

Mike has been building capability through active learning, by going out into the field with local agriculture, quarantine and university staff in many countries and collecting nematodes, then bringing them back to the laboratory, making slides and identifying them. This work has found a mix of known cosmopolitan pests, new indigenous species and some species we are not sure about because there are too few specimens or the wrong life stages for definitive identification. Therefore, building collections for future reference is an important part of the project.

While teaching the local staff nematode techniques and systematics, Mike also demonstrated how to communicate and teach about nematodes. This is especially important because nematodes, while able to cause some large crop damage, individually are small, cryptic organisms that are hard to separate from the soil and plant roots. Unless there is an awareness of nematodes, it is very easy to mistake the damage they cause. Part of this project is producing a regional, multi-lingual superkey to nematodes in the region.

The project is not just one-way traffic. Three people from Myanmar will come to Australia in December to learn about our nematodes and further broaden their nematological horizons.

These activities in ASEAN demonstrate many of the uses for collections such as the ANIC. We are discovering new species and advancing nematode systematics. We are facilitating trade by identifying potential biosecurity threats on the horizon. We are making sure that we can identify exotic pests should they ever arrive in Australia. We are decreasing the chance of movement of pests by increasing the local capacity in the ASEAN countries to diagnose and manage nematodes locally. And we are contributing to the food security of the region. Mike loves not just the science of nematology but making sure that it is delivered to those who need it as well (which is everyone!).

The staff and trainees of Plant Protection Division with Mike outside the provincial laboratory in Daik-U (Myanmar)

Mike demonstrating a nematode extraction in the Plant Protection Division laboratory in Yangon (Myanmar)

Sampling cauliflower with local staff at Nuang-Lay-Pin, Bago Province (Myanmar)

SPNHC conference 2019

Federica Turco

Earlier this year Debbie Jennings and I, along with other NRCA colleagues, had the opportunity to attend the 2019 International Conference of The Society for the Preservation of Natural History Collections (SPNHC) in Chicago (USA). The theme of this conference was "Making the Case for Natural History Collections" and I presented about ANIC, its history and its current and future collection solutions and research. Debbie gave a speed talk on one of the most remarkable species in our care: *Dryococelus australis* (Phasmatidae), aka Lord Howe Island Stick Insect. Debbie and I have been privileged to carry the ANIC flag in such a vibrant international collections environment and to contribute to making the case for natural history collections.

In 2020 this annual conference will be held jointly with the International Council of Museums Committee for Museums and Collections of Natural History (ICOM NATHIST). The event will take place in Edinburgh, Scotland, from the 7th-13th June and will be themed "The Role of Natural History Collections in Global Challenges". Again, an exciting opportunity to showcase our collections and our collection-based research in a global perspective. Bring it on!

Front table: NRCA staff at the conference dinner in the Field Museum with colleagues from South Africa and France (Photo: Andrew Young)

New Lucid key to Australian jumping spiders

Barry Richardson

A Lucid-based key to the 84 genera of Australian jumping spiders (Salticidae: Araneae) has been prepared by Barry Richardson, Robert Whyte and Marek Zabka. It has taken quite a while to fill in all 98 characters for each genus but it is now available at https://apps.lucidcentral.org/salticidae/text/intro/index.html

Because of the ease of use of Lucid keys, it should allow naturalists, biologists and taxonomists to place a specimen in the relevant genus. Because the 462 described species make up only about of a third of the Australian fauna, identifying a species to genus is often as far as one can go! The character set allows users to choose from a range of observable characters when using photographs or a specimen. An information sheet attached to each genus provides a list of known species and information on evolutionary relationships, distribution, habits, a simplified diagnosis, and some key references. A series of diagrams and photographs (of living specimens and of aspects of the morphology, including palps and epigynes) is provided for each genus.

Click here to link to the Lucid key

Upcoming nematode workshop

Nematodes in cropping systems: identification & techniques workshop.
University of Adelaide, 2nd to 6th December 2019

Presented by: Mike Hodda (CSIRO), Kerrie Davies (University of Adelaide) and Dorota Porazinska (University of Florida)

The workshop will suit researchers and professionals working in agriculture, quarantine, green keeping, and soil biology, who need to understand the principles and practice of handling soil, plant and insect nematodes. It will provide hands-on experience in sampling, extraction, specimen preparation, culturing, diagnosis, and identification. There will be an opportunity for interaction with experts in the field. Participants should have a degree that includes biology, agriculture, or soil science or have appropriate work experience to undertake the workshop. Less experienced participants can be supplied with recommended reading material prior to the workshop.

The cost of the course is AUD 2000 (excluding GST) or AUD 2200 (including GST).

For further enquiries or to book a place, please email mike.hodda@csiro.au

National Entomology Skills Workshop

Mike Hodda, Hermes E. Escalona and Manda Khudhir

ANIC is home to the largest, most comprehensive collection of insects in Australia as well as specialist taxonomists in many different groups of insects. This makes it ideal not only for presenting dedicated courses on these particular groups, but also for training generalist diagnosticians, who have to rapidly identify and triage many different types of insects.

Such a training course was presented by ANIC staff this April at the ANU campus. It resulted from the Department of Agriculture experiencing difficulties in obtaining staff with the skills required for quarantine entomologists. A survey of university courses in Australia confirmed that current tertiary training does not provide the knowledge and skills needed for family-level diagnosis of insects. As a result, the Department, through its Modern Diagnostics Project, commissioned ANIC to present a training course to provide the skills, confidence, tools and materials required for basic insect identification.

Many ANIC staff and Honorary Fellows contributed to the course. Ted Edwards, Marianne Horak, You Ning Su and Glenn Cocking covered the Lepidoptera component. Hymenoptera and Diptera were covered by Juanita Rodriguez and Keith Bayless, respectively. The Hemiptera component was handled by Penny Gullan and Olivia Evangelista, while Hermes Escalona covered Coleoptera, as well as general entomology, identification tools and resources.

The course was particularly aimed towards diagnosticians from the north of Australia. Australia's northern jurisdictions are often the frontline for many high-risk plant pests due to natural pathways from our near neighbours. Attendees came from many of the biosecurity and plant health laboratories in Queensland, Western Australia and the Northern Territory, including Departments of Primary Industries and the Northern Australia Quarantine Strategy.

The survey had identified not only a lack of practical skills but also of information and resources needed for basic insect identification. To remedy this and back up the practical components of the course, Hermes put together a comprehensive information package to supplement the course. The information covered general morphology and diagnostic features, species of biosecurity interest, identification resources, and pictures for 200 out of the 850 families of insects, spanning six of the largest orders of insects.

Overall, the course was a resounding success! General impressions from participants were positive and reiterated how important it is to implement courses such as this to develop the basic insect identification skills of entomological diagnosticians that support the Australian biosecurity system. The success of the course means that it should be run again for diagnosticians from the southern part of Australia, because it would be very useful for them as well.

Workshop participants


ANIC staff and workshop participants

ANIC microscope slide collections

Laurence Mound

Discussions about insect collections are almost always centred on relatively large insects, such as butterflies or beetles that are kept as dried, pinned individuals, and are studied as whole specimens. Parts of an insect body, such as legs or wings or genitalia, are often mounted onto microscope slides, and such collections mainly represent the outcomes of some particular research programme. Even the 36000 slides of moth genitalia can be viewed in this way, essentially as an end product. From a collections' management point of view, microscope slides are thus an adjunct to the primary study collections of pinned insects. However, many insects are far too small to study as pinned individuals, and these are mounted whole onto microscope slides. For these groups, slide collections are the primary research tool, and this applies to many groups that are of major economic importance. For example, aphids and coccids, as well as whiteflies and thrips, are all studied only on slides, and ANIC houses about 80000 slides of these insect groups. Similarly, there are more than 70000 microscope slides of small flies, including several groups of great economic and human health importance. Particularly important and massive slide collections in ANIC comprise the nematodes (about 50000 slides) and our Great Wall of Mites and their relatives (more than 75000 slides).

These slide collections of whole organisms need to be maintained in systematic order, just as a collection of pinned moths is arranged, because for taxonomic and systematic research purposes it is essential to have related species housed close to each other to facilitate comparisons. This contrasts with slide collections of insect parts, including genitalia, which are commonly stored numerically, with the details kept in a register for cross-referencing to the collection of pinned specimens.

In terms of importance to Australia's horticulture, agriculture and public health, the slide collections of whole small insects

Horizontal slide storage (example coccids)

in ANIC are of far greater importance than the relatively trivial storage space that they occupy. No curatorial system is perfect from every point of view, and a range of systems must be adopted that reflect the working practices and objectives of different researchers. The slides of nematodes need to be kept horizontal, and the mite and coccid collections are also

Vertical slide storage (example thrips)

kept in flat trays. The whiteflies and biting midges are kept in standard slide-boxes, each holding 100 slides. Both of these systems involve considerable rearrangement work when adding new species and new slides. In contrast, the slides of non-biting midges, thrips and aphids are all kept vertically and stored like a collection of reference cards. In terms of slides per unit volume this is highly cost-effective, and it has the advantage that new specimens can be added quickly, and tag labels entered to facilitate quick searches. The chosen system for a particular group will depend on the frequency of use and the current research effort, as well as the working preferences of individual research workers. Viewed as a research and identification tool, such collections are not a passive store, but a dynamic system that each generation re-organises and actively mines for new information and research ideas.

Richard Bull Donation

Deb Jennings

A wonderful collection of over 3000 beautifully pinned, mounted and labelled specimens was donated to the ANIC by Richard Bull from Queensland.

Richard started collecting Coleoptera in 1968 when he first arrived in Australia and accumulated a considerable collection from localities throughout Queensland, NSW and many remote parts of Australia as well as Patagonia and PNG. The collection covers most families of Coleoptera with an emphasis on Scarabiidae, Curculionidae, Cerambycidae, Carabidae, Tenebrionidae, Buprestidae and Lucanidae.

ANIC is very grateful to have received this donation which is likely to include undescribed species from remote localities.

Richard Bull (right) and Rolf Oberprieler admiring the donation

Renewed interest in Australia's edible insects

Bryan Lessard

The United Nations estimate that the global edible insect market will be worth $1.5 billion by 2023, however, the Australian market is lagging. In August, Bryan and Dr Rocio Ponce Reyes (CSIRO Land and Water) hosted a CSIRO Cutting Edge Symposium in Brisbane bringing together internationally recognised scientists, industry leaders and members of the indigenous community to discuss the challenges and opportunities of the Australian edible insect market.

Highlights included a plenary talk delivered by Prof. Arnold van Huis, who led the United Nations recent report on the global edible insect industry, tasty edible insect samples provided by local insect farmers, and positive media coverage by ABC TV, radio and print. Bryan and Rocio will take the discussions from this symposium and write a highly anticipated guide to expanding the Australian edible insect market.

Bryan and Nicole Fisher are also working on digitising ANIC's Australian native edible insect species to identify where they occur, with the first expedition of specimens already transcribed by enthusiastic citizen scientists on the DigiVol platform. These data will be used by an industry PhD student starting in ANIC in 2020, who will work with Bryan and David Yeates, Canberra-based insect farm Goterra, and the University of Adelaide to explore Australia's native edible insects, determine their nutritional profiles and turn them into novel foods coming soon to a plate near you! Applications for the iPhD position are now open.

Edible insects group participants

Edible insect treats

Recent publications

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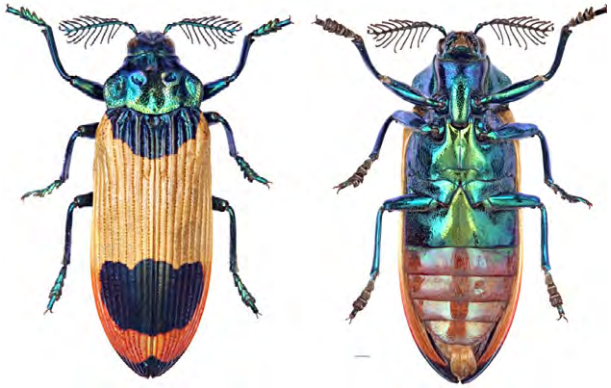
Periosocerus deplanatus (Coleoptera, fossil in Burmese amber) by Debbie Jennings



Castiarina shellybarkeri (Coleoptera) by Cate Lemann

Ctenostegus sp (Hymneoptera) by Olivia Evangelista

Trachaeomyia macropi (Diptera) by Bronte Sinclair