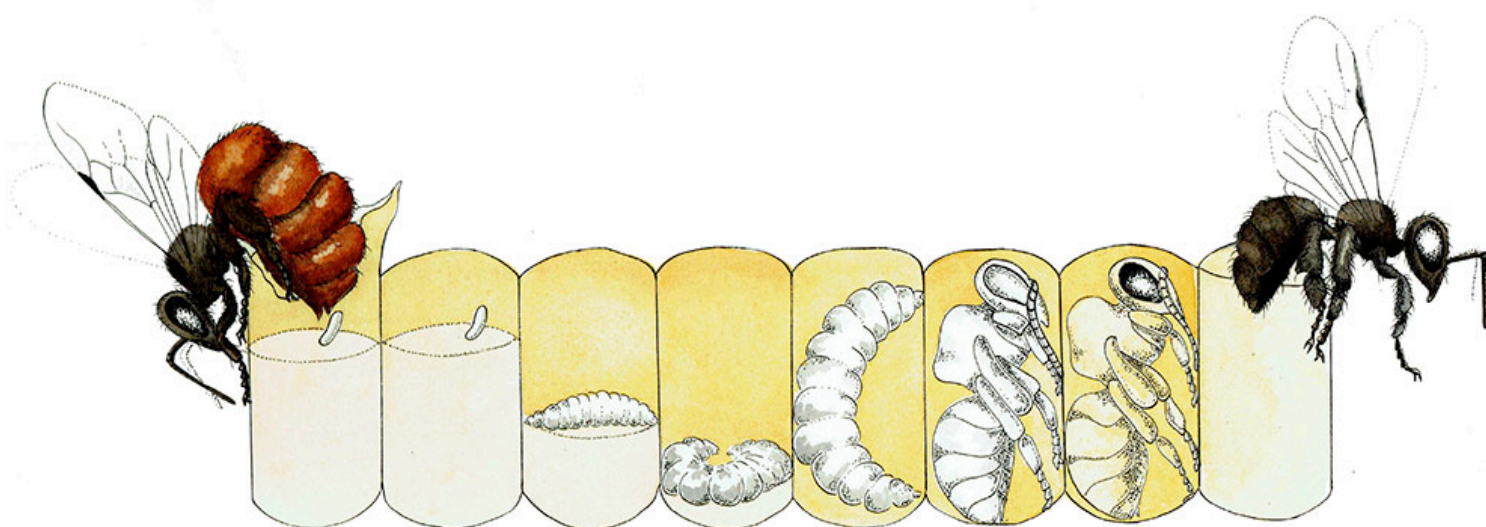




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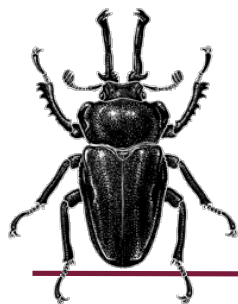
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Front Cover Illustration: This illustration by Gina Cranson represents a cross-section through the brood comb of a generic stingless bee showing the process of rearing brood. A cell is mass provisioned by nurse workers before the queen lays an egg. The cell is then immediately capped so that the larva can develop in a closed cell. This resembles the ancestral nesting behaviour of the solitary bees, which also cap cells immediately after provisioning and laying an egg, and not the highly-derived behaviour of honey bees which progressively provision their larvae.

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Entomological Society of Queensland

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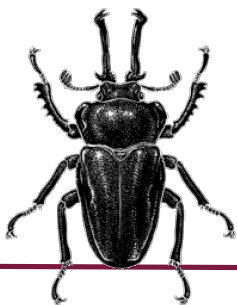
The **ENTOMOLOGICAL SOCIETY OF QUEENSLAND**, since its inception in 1923, has striven to promote the development of pure and applied entomological research in Australia, particularly in Queensland. The Society promotes liaison among entomologists through regular meetings and the distribution of a *News Bulletin* to members. Meetings are announced in the *News Bulletin*, and are normally held on the second Tuesday of each month (March to June, August to December). Visitors and members are welcome. Membership information can be obtained from the Honorary Secretary, or other office bearers of the Society. Membership is open to anyone interested in Entomology.

Contributions to the *News Bulletin* such as items of news, trip reports, announcements, etc, are welcome and should be sent to the News Bulletin Editor.

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.

EMBLEM: The Society's emblem, chosen in 1973 on the 50th anniversary of the Society, is the King Stag Beetle, *Phalacrognathus muelleri* (Macleay), Family Lucanidae (Coleoptera). Its magnificent purple and green colouration makes it one of the most attractive beetle species in Australia. Other common names include Rainbow, Golden and Magnificent Stag Beetle. It is restricted to the rainforests of northern Queensland.

The issue of this document does **NOT** constitute a formal publication for the purposes of the "International Code of Zoological Nomenclature 4th edition, 1999". Authors alone are responsible for the views expressed.



Entomological Society of Queensland

Minutes for General Meeting

Tuesday, June 13th, 2017

Held in the Seminar Room, Ecosciences Precinct,
Boggo Rd, Dutton Park.

Meeting open: 1:00 pm

Attendance (38):

Members (31): Lachlan Jones, Robert Raven, Colleen Foelz, David Comben, Geoff Monteith, Mark Schutze, Tim Heard, Brad Brown, Cate Paull, Don Sands, Chris Lambkin, Noel Starick, Jane Royer, Kathy Ebert, Penny Mills, Richard Zietek, Saku Muthuthantri, Helen Nahrung, Andrew Hayes, Brogan Amos, Greg Daglish, Des Foley, Brenton Peters, Mike Muller, Liam Bromley, Tara Wheatland, Rachael Smethurst, John Donaldson, Julianne Farrell, Shannon Close, Robert Whyte.

Visitors (7): Tamara Anderson, Shun-ichiro Takano, Margaret Innes, Nicole Forrest, Betty Forrest, Farrah Zavalir, Anne Jones.

Apologies: Morris C. McKee, Susan Wright

Minutes: The minutes of the last meeting were circulated in News Bulletin 45[3] May 2017. Moved the minutes be accepted as a true record: Tim Heard; Seconded: Don Sands. Carried: all

Nominations for membership approved by council:

General members:

1. Rosalind St Clair
2. Ian Buddle

Student members:

1. Rachael Smethurst (UQ)
2. Ngoc Hoan Le (USQ)

General Business:

- Vote on the amended text to the ESQ Constitution regarding the reduction from two to one nominations required for new members:

Geoff Monteith moved the motion regarding the change to the Constitution regarding the number of nominators required for membership (details in News Bulletin 45[3] May 2017). Penny Mills seconded the motion. Carried by all. Two proxy vote forms (dated 8 June 2017) in favour of the change were submitted to Mark Schutze by Peter Cranston and Penny Gullan. Don Sands requested clarification that memberships would still be reviewed for approval by Council, to which the answer was in the affirmative.

- Reminder of the visit to Brisbane airport quarantine facility on July 18th.

Main Business: Notes and Exhibits

Lachlan Jones – “*Preference performance hypothesis*”. Lachlan is a doctoral student in the Gimme Walter lab.

Robert Whyte – Spiderbook: “*From Fear to Fascination*” and Quinkan Bush Blitz: “*The more you look the more you find*”. Robert is an Honorary Researcher at Queensland Museum and runs a creative business. He has just published the book *Field Guide to Spiders of Australia* and also recently returned from Cape York and he talked about both of these adventures.

Geoff Monteith reminded present members of the Perkins Dinner to follow the Perkins Memorial Lecture on 12 September 2017. More details will be made available in the upcoming News Bulletin.

Vote of thanks provided by Christine Lambkin.

Next meeting: The next meeting will be on 8 August when Paul Ebert will speak on the topic of stored product insect management. (Note: NO JULY MEETING)

Meeting closed: 14:08

At our next meeting...

Looking to the past, monitoring the present, securing the future: Resistance to the grain fumigant phosphine

Paul Ebert

*School of Biological Sciences
University of Queensland*

The fumigant phosphine has been used extensively since the 1980s to protect the vast majority of our grain harvest from insect pests. Since the international ban on methyl bromide use for all but quarantine purposes as of 2005, our grain storage system has essentially been dependent on a single molecule for insect control. Strong resistance to phosphine was discovered in 1997 in Millmerran, Queensland. I became aware of the problem in 1999 and thus began a long and productive collaboration with the Queensland Department of Agriculture and Fisheries (DAF). This work led to the identification of two primary genetic factors that are responsible for strong resistance in every outbreak, in every grain pest species on every continent that we have examined. We have used this knowledge to develop a high-throughput resistance monitoring system that we



have deployed across the eastern grain-growing regions of Australia and across India as well. We are now deploying this resistance monitoring system at central grain storage facilities in Queensland to determine the effects of standard pest management practices on the resistance allele frequency. We have used our identification of the resistance genes to explore the mechanism of action of phosphine. We have used our understanding of the action of phosphine to identify soluble compounds and gases that synergistically enhance the toxicity of phosphine. Understanding the molecular basis of the synergistic interaction has now become the primary focus of my laboratory. Our goal is to be proactive and to continue to work closely with DAF, so that we are prepared for resistance problems that might eventuate in future.



Lesser grain borer, *Rhizopertha dominica*, feeding on wheat grains. Photo: Queensland Department of Agriculture and Fisheries.

**Tuesday, August 8th at 1pm, Seminar Room at EcoSciences. Tea & coffee following.
All welcome!**

Feature articles: Notes & Exhibits

Who doesn't love a new Field Guide?

presented by Robert Whyte

*Honorary Researcher,
Queensland Museum*



I was delighted and honoured to speak at the recent Entomological Society of Queensland's Notes and Exhibits Meeting on two topics:

- the new spider book: *A Field Guide to Spiders of Australia* by Robert Whyte and Greg Anderson, released on 1 June 2017 by CSIRO Publishing <http://www.publish.csiro.au/book/6899/> and
- discoveries on the recent Queensland Museum – Bush Blitz trip to West Quinkan Country on Cape York, Far North Queensland

For the spider book, I showed an allegedly humorous “mockumentary” video, purporting to be



Anna Harisson and Robert Whyte in a video clip from “Anna’s Nature Unlimited” to promote the new book.

an episode in “*Anna’s Nature Unlimited*” series. It was, in fact, a shameless plug for *A Field Guide to Spiders of Australia*.

The ‘Anna’ of the fictional series is Anna Harisson, a talented 16 year old with a background in habitat restoration and rainforest education, having been a member of *Brisbane Rainforest Action and Information Network* since birth. I have known her nearly that long, and been constantly impressed by her star quality before the camera, and her sophistication in promoting and launching books. In 2013, she launched my previous book *The creek in our backyard: A practical guide for landholders* available here: <https://goo.gl/pyUwmg>

I was also in the video, hamming it up, barely saved by Anna’s starring role which did in fact elicit quite a few chuckles of appreciation from the audience. Not quite “roll on the floor laughing” but nearly. Media and public reaction and response to *A Field Guide to Spiders of Australia* has been intense. According to the publisher, sales have been “amazing” “absolutely remarkable” and “unprecedented”. The first printing has sold out in just over three weeks, triggering an urgent second printing. So urgent, there wasn’t enough time even to update a few undescribed species which have now got names.

I do say in the book that the poor Australian spider is a victim of unfair prejudice, much maligned and misunderstood, but my motivation for writing *A Field Guide to Spiders of Australia* was more to

“save the planet, please” rather than to liberate suffragette spiders from the fear and loathing they inspire.

I started noticing abundance and diversity of spiders were indicators of good habitat while doing habitat restoration as a volunteer with ‘Save Our Waterways Now’. One day around 2008 I photographed a blue spider, not something you see every day. I sent the photo to Dr Robert Raven at Queensland Museum who told me I had found something special. The only other specimen he had seen was from St. Lucia but it had been lost. He asked me to collect it and bring it in for the collection. Well! Talk about chuffed! “Collected by Robert Whyte” in the scientific records forever. I would be famous. After that it was “lay down the glasses, he’s off and running”.

By the time I met Greg Anderson I had a web site. Greg was helping me identify spiders, and one day he said “Why don’t we do a book?” Those six little words, with an upward inflection at the end. They seemed harmless enough. Well, it’s been 10 very hard-working but immensely rewarding years since then.

I must say I really didn’t expect the intensity of media interest and certainly not the level of arachnophobia among journalists. It sure adds to the drama. On Channel 7’s Weekend Sunrise June 11 2017, poor Angie was frozen with fear, the “rictus of terror” face on display. Not a good look. Spider wrangler Tom Covell had brought in a gigantic Huntsman Spider! On ABC News Breakfast June 12 2017, Virginia Trioli shuddered and grimaced while Del Irani and I were having a great time. (We’ve got a cure for that, Virginia.) Kelly Higgins Devine hosted an hour of spider fun on Monday 11 June. If you get to listen to the audio, you’ll be impressed by the scream 12 minutes in, when the spider container is opened. Elspeth Kernebone from Town and Country magazine wrote “*Aliens crawling in our midst*”, not to miss out on a titillating title, and

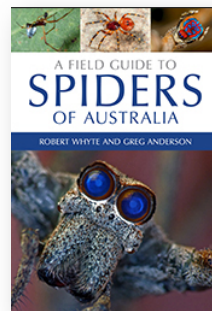
Huff Post chimed in with “*How To Truly Appreciate Australian Spiders*”. The Daily Telegraph told us to “Cure your arachnophobia with new CSIRO book” and The Guardian’s Mike Bowers did one of his truly fabulous picture galleries featuring “*Alien Butt Spider And Friends.*”

Who would have thought? A field guide to Australian

Spiders selling out its initial print run in less than four weeks. It’s heartening and encouraging. Perhaps for Australia’s invertebrates and their scientific appreciation “*the times they are a changing*”. I hope so.



Close encounters of the furred kind: alien butt spider and friends - in pictures



A Field Guide to Spiders of Australia
by Robert Whyte and Greg Anderson
Paperback | June 2017 | \$ 49.95
ISBN: 9780643107076 | 464 pages | 215 x 148 mm
Publisher: CSIRO Publishing
Colour photographs



ESQ shares the wonderful world of insects with kids!

Holding live giant roaches and finding cryptic stick insects were some of the favourite activities at the recent Moggill Creek Catchment Group’s “Kids Day at the Cottage” event. Geoff Monteith and Kathy Ebert brought live insects, pinned insect displays and a microscope for the kids to view insects up-close.

Remarkable discoveries from Bush Blitz Cape York March 2017

Photos and presentation by Robert Whyte

Bush Blitzes (species discovery expeditions funded by the Australian Government, BHP and Earthwatch) are wonderful opportunities to work with colleagues not just from Queensland Museum and Queensland Government departments but also from other key scientific institutions including interstate universities and museums.

From an arachnological point of view, Quinkan was a bonanza of new species, with four arachnologists, led by Dr Barbara Baehr including Dr Robert Raven, Mr Jim Mclean from Macquarie University and myself.

Daytime forays were undertaken in stifling, energy-sapping heat but the rewards were many. Barbara Baehr's count exceeded 50 new species, Robert Raven and I both recorded 20–30. Even discounting some overlap in the reports, with additional specimens of the same new species recorded by more than one of us, the total of new spider species from the Blitz was around 80. This is far in excess of any expedition so far, testament to the number of groups we were able to identify, the undocumented territory we covered, and the wet season timing which coincided with natural fecundity of the landscape and its inhabitants.

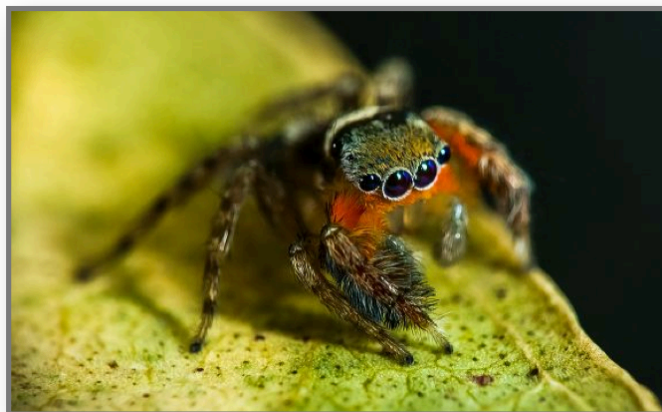
Beyond spiders, other arthropod discoveries were also remarkable in both quantum and quality, as collected by Queensland Museum's Chris Burwell, Susan Wright and Lindsay Popple.

Overall, the region proved remarkably diverse with deep gorges featuring waterfalls and rainforest remnants, the remaining being woodland on sandstone escarpments and valleys.

Some of the species collected are photographed below.



Theridiidae '*Steatoda*' an Australian species known from FNQ but undescribed. It is a new species, possibly new genus, referred to by the nickname "*Steatoda* NQ Stripey".



Salticidae *Jotus* sp. Body length 4mm. A new species, uncannily close to the type species of the genus, *Jotus auripes* which also has vivid red orange "furry" hairs on the insides of the first pair of legs.



Omoedus sp. One of several new species of *Omoedus*, with a striking pattern not known from northern Australia or PNG. This male has a palp (secondary sex organ) without a retro-lateral tibial apophysis – amazing because the needle-like retro-lateral tibial apophysis is diagnostic for *Omoedus*.



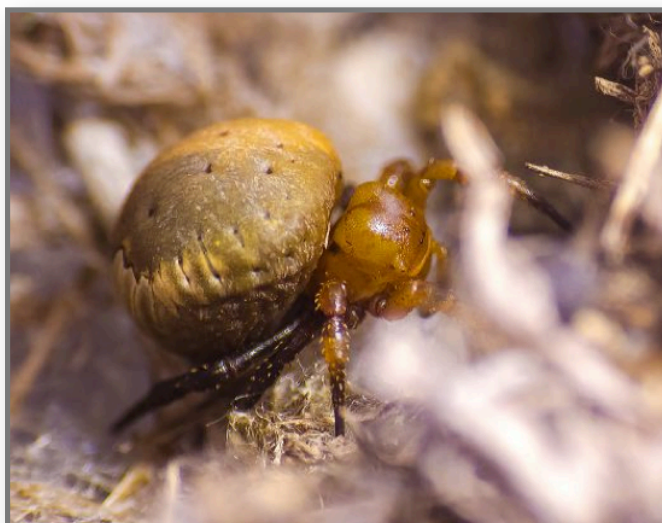
A new Quinkan species of Peacock Spider (*Maratus*); significant in being the most northerly Peacock Spider so far collected, the nearest being from Emerald in Queensland. Nicknamed "Natsboy" for Bradley Smith.



A new species of *Ceryerda*, a gnaphosid known from deserts and arid woodlands. This small male body length 4mm may have been mimicking a mutillid wasp.



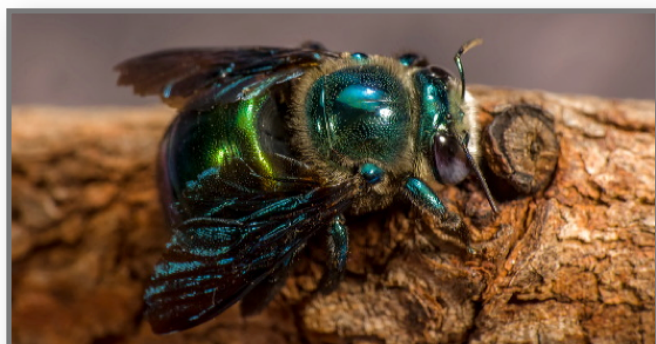
One of the thousands of "small brown spiders" remaining undescribed across tropical Australia. This one is in the *Pungalina* group of genera.



A known but extremely rare orb weaver *Paraplectanoides crassipes*, collected at Rockhampton and given to us on the trip up to Quinkan at Calliope by its collector, Bo Robson. This female lives for around 11 years, unheard of in any other orb-weaver. A video of this spider while alive was made on the trip, the first such video in existence.



A probable new species of Ant-mimicking Swift Spider in Family Corinnidae.



A Green Carpenter Bee, found to be common across the Quinkan survey area.



Cicada Dusty Squawker *Relictapsalta nigristriga* (Goding and Froggatt, 1904) from Weipa, through Cooktown, Cairns and the Atherton Tableland, south to beyond Townsville, December to April in association with eucalypts in dry sclerophyll forest, woodland, savannah and rural areas. Uncommon species, rarely collected. Monotonously repeated 'zeeeeep' lasting about 1.5 seconds. Collected by Lindsay Popple.



A new genus and species of katydid, collected by John Stanisic.



A new species of cicada in the genus *Graminitigrina* (Grass Tigers). Ten currently known Grass Tigers are all superficially similar in colour and morphology. This an eleventh, collected by Lindsay Popple.



A new species of Teddy-bear Bee, collected by Remko Lejis.



A beautiful net-winged mantid (*Neomantis* sp.).



An unusual lace bug, collected by Ryan Schofner

A video featuring some of the new Quinkan critters can be seen here: <https://youtu.be/CP4w56iUsQQ>



Do mothers know best? – Insect herbivores and the preference-performance hypothesis

presented by Lachlan Jones

*PhD student, School of Biological Sciences
The University of Queensland*

Female insects will lay their eggs in the best place for their offspring to survive and develop. That in a nutshell is the preference performance hypothesis, an idea that has been extensively tested over the last 40 years. While most adult insects are able to fly great distances in search of an oviposition site, the flightless juvenile stages are often relatively stranded in the place they hatched. Their survival then largely depends on the mother laying her eggs on a plant that is a suitable food source. Logically, individuals that can tell a suitable plant from an unsuitable one should be favoured by natural selection. Experimental testing of this hypothesis has generally taken the form of oviposition choice tests to find the pattern of egg deposition across hosts, compared to the survival and development of offspring when reared on these plants.

Over the years, a number of examples have been found where herbivorous insects were found to lay more eggs on a nutritionally inferior host plant when given a choice between this and a better host or, more subtly, laying fewer eggs on a plant that is equally good to the one they prefer to use. A number of hypotheses have consequently arisen to explain this apparently maladaptive behaviour. One popular explanation that is quite well supported is natural enemies. One plant may be a better food source than another when reared in the absence of predators or parasitoids, but if the nutritionally inferior plant is a refuge from attack, it may in fact be the best choice for the insect mother (Ohsaki & Sato 1994). Others

include trade-offs between adult feeding and egg laying if adults have different food requirements to juveniles, or the relative rarity of host plant species (Thomson 1988).

However, is too much attention being paid to the exceptions? There are still a great number of studies that do show that egg laying patterns tend to correlate with larval survival across hosts. This is particularly true with studies testing insects with plants from within their native habitat. This might seem an obvious distinction to make, and it was discussed by earlier authors including Christer Wiklund (1975) and John Thompson (1988), but several more recent papers claim to have shown that preference and performance are not linked when the plants tested were not native to the insect's original habitat. It was this that led me to do a secondary analysis of preference-performance studies with emphasis on whether the insects and plants tested had a common origin or not. Delving through the literature, I've been putting together a compilation of studies testing the preference-performance hypothesis. I list the presence/absence of a positive preference-performance correlation, the insect taxon, the reason for a lack of relationship (preference for a poor host or low preference for a good host), and whether the insect was native to the same area as the plants it was being tested on.

I have uncovered over 50 papers so far that test insect oviposition and offspring performance across host plant species. While there may be more still to find, the emerging trend is that poor correlations are more common when insects are interacting with novel host plants. When studies with exotic plants

are excluded, only about 15% of insect species tested preferred to lay eggs on nutritionally poor hosts, and that is without considering effects of predation or adult feeding as mentioned above that explains some of these cases. Examples of insects laying few eggs on an equally suitable host were more common, and again more so with non-native insects/plants, but a positive relationship between plant suitability and number of eggs laid was the



Did this mother lay her eggs in the right place?

most common result. So while there clearly are exceptions, it seems there is some general truth to the idea that insect mothers do know best when in their natural habitats.

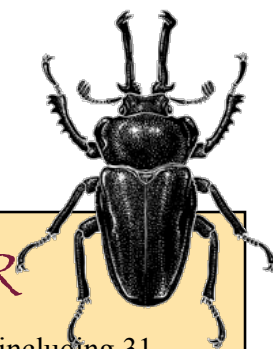
References:

Ohsaki N and Sato Y (1994) Food plant choice of *Pieris* butterflies as a trade-off between parasitoid avoidance and quality of plants. *Ecology*, 75, 59-68.

Thomson JN (1988) Evolutionary ecology of the relationship between oviposition preference and performance of offspring in phytophagous insects. *Entomologia Experimentalis et Applicata*, 47, 3-14.

Wiklund C (1975) The evolutionary relationship between adult oviposition preferences and larval host plant range in *Papilio machaon* L. *Oecologia*, 18, 185-197.

Wiklund C (1975) The evolutionary relationship between adult oviposition preferences and larval host plant range in *Papilio machaon* L. *Oecologia*, 18, 185-197.



A MESSAGE FROM THE TREASURER

Membership subscriptions are due 1st January annually. ESQ has 347 Paying Members (including 31 Student Members free for first year): 275 (79%) had paid by 31st May 2017. Many thanks to those of you who have paid.

Forgotten to pay? An increasing number of Members are paying their membership subscriptions by Direct Deposit to:

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Contact me to find out how.

Dr Brenton Peters



The House Cricket, *Acheta domesticus* (Linnaeus), in Australia (Gryllidae; Gryllinae; Gryllini)

by DCF Rentz¹ and David B. Weissman²,

¹Honorary Fellow, California Academy of Sciences,
Adjunct Professorial Research Fellow,
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The House Cricket is an introduced species with its origins somewhat clouded. Most of its related species come from the Mideast and northern Africa, so that is probably where this cricket originated. It is known to every person in Australia who keeps small reptiles and amphibians. The crickets are used as food for these animals. You can hear the delicate calling songs of the males in every pet shop in the country. Pet owners can easily start a colony at home since the crickets breed and lay eggs without any complications. At no stage does diapause delay breeding. The House Cricket is being grown commercially in the USA for human consumption as an alternate protein source. "Cricket chips" are sold in many grocery stores. The cricket farms are said to be inspected regularly by health official just as are poultry farms, for example.

Research Feature

This House Cricket is easily recognized but it could possibly be confused with another introduced species, the Indian House Cricket, *Gryllodes sigillatus* (Walker). This cricket is in a different tribe, the Modicogryllini (see <http://orthoptera.speciesfile.org/Common/basic/Taxa.aspx?TaxonNameID=1123306>). The Indian House Cricket is similar in appearance to the House Cricket but can be distinguished by the marks on the pronotum, the length of the top (singing) wings, never with long hind (bottom) wings, much longer cerci, much quicker evasive movements, and its more flattened appearance as opposed to the robust, cylindrical appearance of the House Cricket (see Figs. 1-6). The callings songs of each species are distinctive as are the stridulatory files that produce them. As one might expect with crickets, the male genitalia of each species is distinctive.

The House Cricket and a few others account for the sale of some 50 million crickets a week in the USA not only to pet owners and zoos but as bait for fishermen (Weissman et al. 2012). Many fewer than that are sold in Australia partly because the keeping of reptiles and amphibians is discouraged and exotic pets are usually not available as they are in the USA. Also the use of crickets as fish bait in Australia is generally not practiced.



Fig. 1 Adult male House Cricket, *Acheta domesticus*.



Fig. 2 Adult female House Cricket, *Acheta domesticus*.



Fig. 3. Last instar male nymph, House Cricket, *Acheta domesticus*.

It should be noted that Weissman et al. document a problem with the American use of House Crickets that could eventually affect cricket production in Australia. A densovirus (AddNV) infects the House Cricket potentially destroying cultures. As a result, virus-resistant

introductions could pose. There are over 50 indigenous species of *Gryllus* in the western USA, Mexico and Central and South America. How another species, like *G. bimaculatus* or *G. locorojo* could interact with these species, some with restricted geographical ranges, is unknown. Plus, either could harbour their own parasites which could pose a threat to native species. Oddly, the Indian House Cricket is not affected by the virus, has no diapause, and is common in appropriate habitats in the USA, but it is not generally bred for the pet industry. This could be the alternative species the industry seeks.

alternative crickets have been sought. Several “exotic” species have been found in the US cricket market and illegally imported into California.

Among them is the European Black or Two-spotted Cricket, *Gryllus bimaculatus* De Geer. Another illegally imported species, this also from Europe, is the Crazy Red Cricket, *G. locorojo* Weissman and Gray. The origin country of this latter species is unknown since it was first “discovered” being sold in pet food stores in the USA. Repeated attempts to alert quarantine officials have fallen on deaf ears. It seems the commercial aspects of these pet-feeder crickets have precedence over the potential ecological effects these exotic

How does any of this affect Australia? As odd as it may seem, with live House Crickets in every pet shop in the country, we can find no records of the species existing in nature in the country. Many of the more xeric environments would appear to be suitable for *A. domesticus* but there are no verified records of sustainable populations in the wild. Otte and Alexander (1983) in their monograph of the Australia crickets noted two “wild populations” of the cricket but they were apparently temporary and have since died out.

So, we are interested in determining if there are any wild populations of *A.*



Fig. 4. Adult male Indian House Cricket, *Gryllodes sigillatus*.

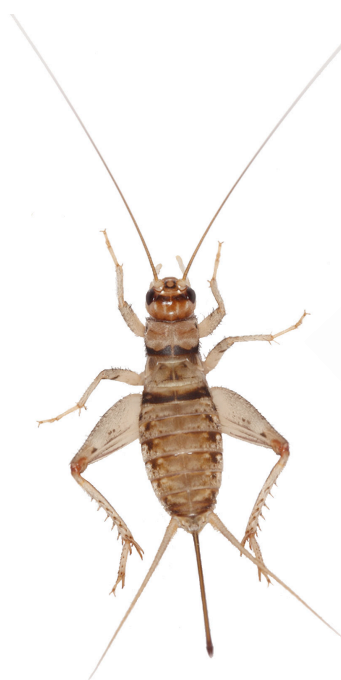


Fig. 5. Adult female Indian House Cricket, *Gryllodes sigillatus*.



Fig. 6. Last instar female nymph, Indian House Cricket, *Gryllodes sigillatus*.

domesticus that have escaped notice as we approach completion of the Guide to Australia Crickets (CSIRO publications). The House Cricket is easily recognised both morphologically and behaviourally. It could be confused with the Indian House Cricket but careful comparison can separate the two. (see Figs. 1-6). The patterns on the pronotum and legs are useful for identification as are the longer and lanceolate tegmina of *A. domesticus* contrast with the short-winged, truncate appearance of the tegmina of *G. sigillatus*.

In contrast to the House Cricket, the Indian House Cricket has established itself in the “wild” in many parts of Australia from coast to coast. It can be found around habitation (motels and hotels a specialty) in Perth, Sydney, Brisbane, Cairns and elsewhere, but usually not far from habitation). The incessant singing of the male crickets is an irritant to many non-entomological folks. We know of at least one incident where a prominent politician was so disturbed by the crickets’ singing from within the walls of his Sydney home that he had the walls removed and the crickets destroyed!

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Recognise any of these entomologists??



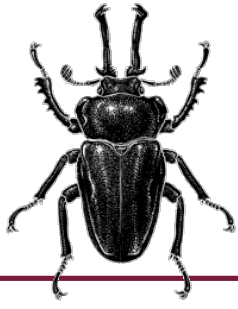
Come celebrate Queensland Entomology at the inaugural Perkins Memorial Dinner

September 12, 2017

Come and celebrate Queensland Entomology with us! The inaugural Perkins Dinner will be held in the beautiful function room of the St Lucia Golf Club on September 12. Arrival time is 6pm: time to enjoy pre-dinner drinks and nibbles while viewing the photo displays and catching up with friends. Dinner starts at 7pm. President Tim Heard will be our emcee for the evening. Program includes a welcome to special guests, an induction of an Honorary Life Member, Roll Call of past Presidents and more. We hope the Dinner will provide an opportunity for entomologists to meet up in a pleasant social occasion, especially for those who trained or taught at the University of Queensland and who would like to catch up. It will also be a chance to meet with the Perkins lecturer who will be a guest of honour. Come along if you are one of the hundreds of entomologists who have served on ESQ Council over the years and celebrate its ongoing success. The Convenor of the event is Geoff Monteith (geoff.monteith@bigpond.com) and he would welcome ideas and especially group photographs that can be used in the displays.

Cost \$72/pp or \$50 for students. Cost includes one free drink, appetizers, two course meal, tea&coffee.

Guests welcome. Please RSVP to Mark Schutze (Mark.Schutze@daf.qld.gov.au). Invitations and payment form included with this News Bulletin.



Entomology News

from Queensland and beyond...

Termite Distribution Research in Brisbane

Four ESQ members have recently published a paper on the distribution and abundance of subterranean termites in Brisbane. Data on the incidence of termite infestations, including taxonomic identity, locality and site of infestation within premises were collected by a large commercial pest management company in metropolitan Brisbane during a ten-year period (1997 – 2006). General Linear Models based on a negative binomial distribution were used to examine the influence of the climatic variables of rainfall and Southern Oscillation Index (SOI), and the demographic variables of premise density and socioeconomic status, on the number of termite infestations found. Two genera of termites dominated: *Schedorhinotermes*, which was the most abundant both indoors and outdoors, and *Coptotermes*. That *Schedorhinotermes* spp. were the major xylophagous subterranean termites recorded is unique in Australian capital cities where *Coptotermes* spp. usually dominate. The patterns of abundance and distribution of both genera are discussed with respect to their differing biology. SOI, premise density per hectare and household income all significantly explained the variation in termite abundance reported across metropolitan Brisbane over the 10 year study. The results show the potential for using SOI as a predictor of termite activity. Further study is needed to more accurately correlate the key drivers of termite activity with the incidence of termite infestations in premises.

To read more see:

Subterranean termite (Blattodea: Termitoidae) pests in metropolitan Brisbane, Australia, 1997–2006: patterns and implications. Brenton C Peters, Lynda E Perkins, Gary H Cochrane and Myron P Zalucki. *Austral Entomology* **56**(2): 218-224.

<http://onlinelibrary.wiley.com/doi/10.1111/aen.12228/full>



Left: *Schedorhinotermes seclusus* (Hill): head above major and minor soldier (Image courtesy PaDIL).

<http://www.padil.gov.au/pests-and-diseases/pest/main/136480>



Australia re-starts the National Dung Beetle Program

A consortium of Meat & Livestock Australia, CSIRO, University of Western Australia, University of New England, Charles Sturt University, Invetus, and Mingenew Irwin Group have been successful in their bid to relaunch the National Dung Beetle Program with the support of Deputy PM Barnaby Joyce. The program will be funded with \$9.2M of new cash investment through the Federal Department of Agriculture and Water Resources, Rural Research and Development for Profit Program under the Agricultural Competitiveness White Paper funding. The program aims to not only import and release key new dung beetle species to address gaps in dung beetle services across the Australian landscape, but quantify the benefits and deliver the generation of benefits into the hands of producers.

Running from 2017 to 2021 the program has four main projects and associated outcomes:

1. *Regional dung beetle service delivery to farmers*

– This activity will provide direct dung beetle services generating quantified multiple direct farm benefits (Project 3). A national extension network developed with NRM regions and Landcare will deliver stakeholder-led interactive digitally-based training, and education programs for students. A smartphone App built on DAFWA MyPestGuide platform will provide region specific beetle activity optimisation on farm, aided by producer entered data.

2. *National dung beetle distribution and monitoring program*

– Activity will collate existing dung beetle data into a new National Dung Beetle Database supported by “big data” analysis to predict site-specific beetle distribution and abundance. Outputs will be tested in a national monitoring program across 120 farm sites. Augmented from producer data (App in Activity 1), this geospatial database will improve service provision (Activity 1), and allow for scaled regional evaluation of the multiple benefits (Project 3).

3. *Ecosystem service evaluation* – Activity will, for the first time, quantify economic, environmental and social benefits provided by dung beetles. The project will develop ecosystem service evaluation methodologies, and quantify a) pasture health improvements, b) multiple soil improvements, c) nutrient runoff reductions, d) reduced gut and fly parasite loads, e) multiple producer and public bushfly reductions, including historic beetle benefits, and thus inform new releases (Activity 4), drive practice change (Project 1) and advise future investments.

4. *Selection, importation, release, mass rearing and distribution of new dung beetles* – Activity will use genetic, phenotypic, habitat and climatic profiling to optimise a delivery pipeline of two existing and four new species through importation via quarantine, risk assessment, release, mass rearing and redistribution into priority regions and

industries. Selection will maximise beetle fitness and adaptive capacity. Release strategies will be optimised to fill geographic and seasonal gaps. The activity will monitor success with regional networks to maximise beetle services (Project 3).

Dr Andy Sheppard

Research Director - Managing Invasive Species & Diseases – Health & Biosecurity

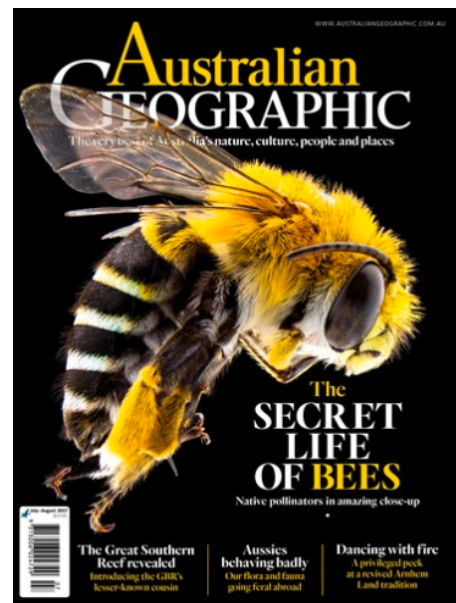
Officer in Charge CSIRO European laboratory
CSIRO



Australian Geographic features:

The secret life of Bees

ESQ member and avid photographer, James Dorey, spent 3 1/2 months on a road trip around Australia to collect and photograph native bees with plans to publish a book about them. Australian Geographic has featured his story and photos in the recent issue of their magazine. James was delighted to learn that they chose one of his photos to be used for the cover image! James is currently an Honours student at Flinders University researching the evolution of Fijian native bees with Michael Schwarz and Mark Stevens. He hopes to publish his book next year! Watch this space...



Small grants scheme 2017 Inaugural Winners

The ESQ council established a ‘Small Grants Scheme’ this year, with the aim of encouraging entomological research and study, especially in our wonderfully diverse state of Queensland! We intend to offer the grant annually. We see this as an excellent way to reinvest Society resources into our membership community, providing support to undertake a project that advances our understanding of the amazing insect world that surrounds us. Projects can be anything related to entomology, including targeted collecting trips, visits to museums or other institutions, ecological, physiological or behavioural studies, or even work that’s more applied and in the agricultural or medical fields. We expect to normally offer a single winning project a maximum of \$2,000, but in this first year, we are awarding two grants of \$1,000 each to the two winning applicants.

And the winners are:

Lachlan Jones, from the University of Queensland, student of Gimme Walter, for his project: “*Understanding patterns of host plant recognition and use by generalist insects, using the Australian noctuid moth Helicoverpa punctigera as a study species.*”

And

Shannon Close, also from the University of Queensland, a student of David Merritt, for her project: “*Morphology of the accessory glands and female reproductive tract of bat-parasitic Nycteribiidae (bat flies).*”

Both projects will be undertaken between July 2017 and June 2018. We look forward to hearing the results in a note for the ESQ News Bulletin and presentation at one of ESQ’s General Meetings. We may even see the results submitted to the ESQ’s *Australian Entomologist* journal.

Shannon (left) and Lachlan (right) - our inaugural small grant recipients for 2017!



Bat fly (Nycteribiidae) Photo credit: Gilles San Martin, Wikipedia.

Happy Monster Birthday to David Rentz - and other interesting news!

Retired ANIC Curator of Orthoptera, David Rentz, recently celebrated his 75th birthday with a magnificent (and remarkably accurate) birthday cake in the form of a Cooloola Monster (Fig. 1). This was most appropriate because it was David who first described these strange subterranean crickets (Rentz 1980) which were sent to him from the Queensland Museum soon after his arrival from the US to take up his position at ANIC in 1977. The first species was called *Cooloola propator* (Fig. 2), its species name appropriately meaning “the first of a kind”, and its genus name referring to the sandy Cooloola wilderness on the Queensland coast where it was



Fig. 1. David Rentz's recent 75th birthday cake, in the shape of a Cooloola Monster.

found. He has since described another three species of *Cooloola* from other sandy areas (Rentz 1986, 1999) and has now got three more new species on his desk from the Queensland Museum to describe, including one with much longer vestigial wings in the males. All records of *Cooloola* species are from the southern half of Queensland, extending as far west as the Carnarvon Ranges.

There has been great international interest in the relationships of Cooloola Monsters. However their reduced eyes, antennae, wings and genitalia, together with their highly specialised burrowing legs, all the result of a subterranean habit, have made conventional morphological analyses difficult. David placed them in their own family, the Cooloolidae, and highlighted their obvious links with the king cricket family, Anostomatidae, and the northern hemisphere mormon crickets, Stenopelmatoidea. A major paper by an international consortium of authors, including David Rentz, has just appeared in *Zootaxa* (Vandergast *et al* 2017). This paper presents a molecular phylogeny of the Stenopelmatoidea and includes a very comprehensive range of taxa from all continents, including three species of *Cooloola*. It places *Cooloola* fairly convincingly with our king crickets in the Anostomatidae, but it also flags that the anostomatids and stenopelmatoidea may not survive as separate families. It also makes the startling suggestion that the genus *Cooloola* may be



Fig. 2. A real Cooloola Monster, *Cooloola propator* Rentz, the type species of the genus.

polyphyletic. This may be an artifact of poor molecular material from their single sample of *Cooloola ziljan* but it's a paper worth brooding over.

David Rentz lives at Kuranda in a condition for which the word "retirement" does not really apply. His blog at <http://bunyipco.blogspot.com.au/>



Fig. 3. Sydney Brannoch (left) with David Rentz chasing mantids at Talaroo Station in northern Queensland (Photo: Buck Richardson).



Fig. 5. Sydney's Twitter image (with *Neomantis*!) at @skbrannoch.



Fig. 4. One of Sydney's catches of the delicate leaf mimic, *Neomantis* sp.

contains really thoughtful treatments of all sorts of tropical nature topics, illustrated by his outstanding images.

His latest entry concerns mantids and probably reflects a recent visitor. Sydney K. Brannoch is a PhD student at Case Western University, Cleveland, Ohio where she is studying various aspects of mantids in the subfamily Tropicodrominae. She visited David for the second time in Jan/Feb this year (Fig. 3) looking for representatives of the genera *Kongobatha* and *Neomantis*, which are the two Australian genera of her target subfamily. In addition to the taxonomy and phylogeny of the group, she is studying various physiological and morphological attributes unique to the genera. Her physiological studies have been done in association with several people at Macquarie University in Sydney. They visited the rainforests of Cape Tribulation and the dry country of Talaroo Station, near Mount Surprise, and managed to get both genera. *Neomantis* (Fig. 4) includes delicate leaf mimics which often come to lights at night and Sydney has included one in her Twitter image at @skbrannoch (Fig. 5).

Sydney Brannoch also has an appointment at the Cleveland Museum in Ohio which has one of the world's largest mantid collections. Her boss

there is the entomology collection manager, Nicole Gunter (Fig. 6). Nicole hails from Brisbane where she did a PhD in parasitology, before turning her molecular phylogeny skills to Coleoptera classification during post-docs at both ANIC in Canberra (2009-2013) and at Palacky University in Czech Republic (2013-2014) before taking up the Cleveland job in 2014. In Canberra, she got hooked on the classificatory problems of Australia's native dung beetles in collaboration with Tom Weir of ANIC (Fig. 7 & 8) and she has continued with this work in the US. Recent global phylogeny studies have identified that the Australian/New Zealand/New Caledonian native dung beetles (other than the cosmopolitan genus *Onthophagus*) form a separate independent clade from the rest the world fauna and Nicole has set her path on studying this clade. Her first major contribution with Tom has just appeared (Gunter & Weir 2017). It tackles the cryptically megadiverse genus of tiny species, *Lepanus*, and separates off two new genera (*Matthewsius* and *Monteithocanthos* (see Fig 8.)) and also modifies the generic status of *Aptenocanthos* and *Sauvagesinella*. Big changes are ahead in our concept of Australia's native dung beetles!



Fig 6. Nicole Gunter (left) and Sydney Brannoch with their placards from the recent "March for Science" in Cleveland, Ohio.



Fig. 7. Tom Weir sifts litter samples in hopes of finding small dung beetles at Ankida, Springbrook. January 2017.

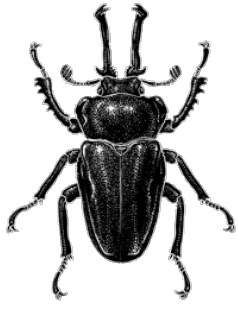


Fig. 8. Geoff Monteith (left) and Tom Weir (right) photographed by Cate Lemann (Coleoptera collection manager at ANIC) during Geoff's recent visit. Cate also took amazing photos of dung beetles for Tom and Nicole's recent publication including the photo on the right of a beautiful *Monteithocanthon koombooloomba*.

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Murray Upton: an ESQ member for 70 years this month!!

At a meeting of the Entomological Society of Queensland on 9 June 1947 a fresh-faced young lad, named Murray Scott Upton, newly landed with his family from England, was elected to membership. He is still a member seventy years later, which must be a record for continuous membership of our Society. Murray has never lost his passion for insects, and is still an active member of CSIRO's Editorial Panel for its Lepidoptera Monographs series. It's appropriate to say a little about what Murray calls his "fortunate life" in entomology.

Murray was born in London on 14 January 1930 and remembers catching his first butterfly at age 9. He attended Clayesmore School in Dorset, winning the Open Natural History Prize in 1945 and 1946. He and his family migrated to Queensland in 1947 and settled at Mount Tamborine. He was totally immersed in entomological activities by this time and became an active member of ESQ within months of arrival. By 1949 he was publishing articles on insect migration in the ESQ Minutes and

in the *Australasian Entomologist*, the latter being the journal of the short-lived Australian branch of the UK's Amateur Entomologists' Society. He worked on small crop farms on Mt Tamborine and then held the PMG Mail Contract for the mountain until 1951 when he passed a Public Service Examination in Horticulture. This scored him a job in the Queensland Department of Agriculture and Stock, first as Horticulture Inspector and then as Seeds Officer. By 1958 he was becoming restless in the Department and applied, unsuccessfully, for a job in CSIRO Entomology at Samford. However, Ian Common, then well into his stellar career as CSIRO Curator of Lepidoptera in the developing Australian National Insect Collection in Canberra, was aware of Murray's entomological interests through the ESQ Minutes and promptly offered Murray a better position. He accepted, moved to Canberra and the rest, as Murray says, is history! He thanks ESQ for enabling him to blend his hobby as an entomologist into a lifetime career.

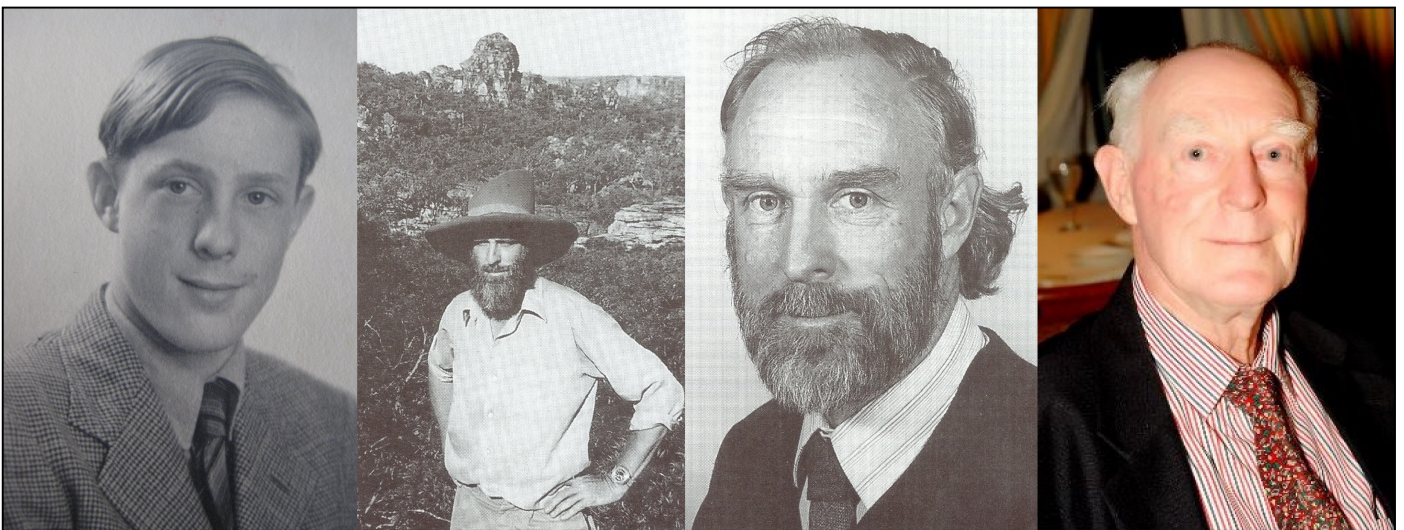


Fig. 1. The metamorphosis of Murray Upton. From left: in 1947, the year he arrived in Australia and joined ESQ; leading an ANIC expedition to Kakadu in 1973 with Mt Brockman in the background; in 1982 at the opening of the D.F. Waterhouse Building; in retirement in Canberra, 2016.

Murray spent his early years as Technician in the Lepidoptera Section and later Assistant Curator at ANIC and then moved on to become overall Collection Manager of ANIC in 1978. From 1983 to retirement in 1990 he was Manager of Engineering Services and Buildings for CSIRO entomology. In 1991 he spent 4 months as relieving Principal Entomologist for the NT Department of Primary Industries and Fisheries.

Murray is a person with the reputation for getting big complex tasks underway and completed. He was deeply involved in the formation and establishment of the ANIC and coordinated the design and building of the D.F. Waterhouse Building to house it in 1982. During the heyday of ANIC's exploratory phase in the 1970s and 80s when multi-vehicle expeditions for weeks on end to remote areas like Kakadu, the Kimberleys and the Nullarbor happened almost every year, it was usually Murray who coordinated and led them (Fig. 2). He was a moving force behind Mike Braby's fabulous two-volume "Butterflies of Australia" and is thanked in the

Acknowledgements for "devoting two years of his retirement to assist in its completion". In retirement he also researched and wrote the 386 page history of the ANIC (Upton 1997, Fig. 3) which details the early history of this institution

Fig. 3. Murray's book on the history of the Australian National Insect Collection.



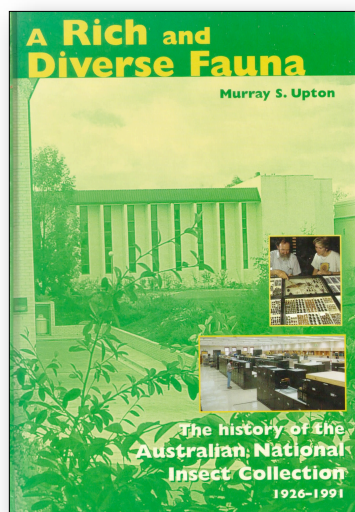
Fig. 2. Murray Upton, front left, with a party of ANIC taxonomists at South Alligator River, NT, in 1972. From left: Bob Taylor, Josephine Cardale, Ted Edwards and Tony Watson.

and its development to a national treasure. The book is heavily illustrated and is a vital source for the biographer interested in Australia's entomological history and the personalities who walked that stage.

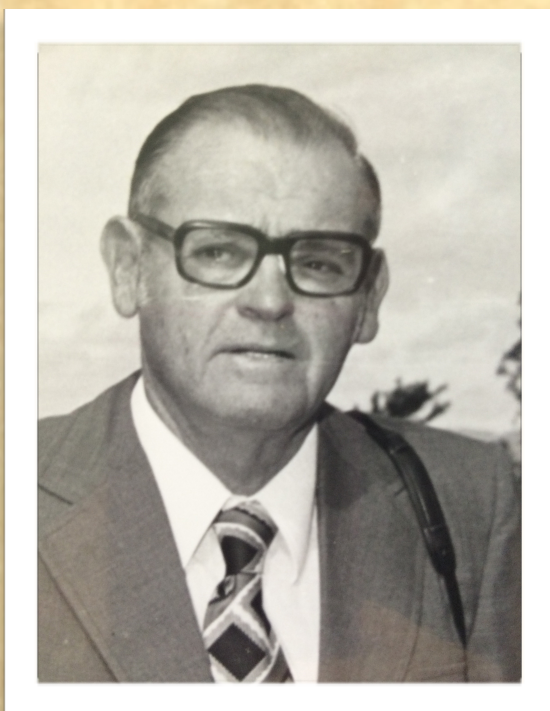
Of regrets, he has a few: leaving sunny Queensland for a lifetime in cool Canberra.... and the decline of the research capability of CSIRO. We probably all agree with him there. Murray, we expect to see you at the ESQ's 100th birthday in 2023!

REFERENCE

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The History Corner...



Charles Robert Russell ROFF (1921-1984)

Charlie Roff was born Wynnum and lived there all his life. Educated at Wynnum schools and Queensland Agricultural College (Short Course Student). Appointed Cadet in Department of Agriculture and Stock, Brisbane in 1937 assisting Henry Hacker in administering Apiaries Act of 1931 on basis of expertise from his family's commercial apiary. After WW2 overseas war service (1941-46) he became Inspector administering the Apiaries Act of 1947 until 1976, responsible for regulation and disease control. Based in William Street HQ, but travelled widely around Queensland advising beekeepers. Took special interest in development of honey industry in the Paroo district. Co-authored "*Honey Flora of south-eastern Queensland*" in 1958 and "*Honey Flora of Queensland*" in 1972 with botanist S.T. Blake. Also acted as Fauna Conservation Officer administering Queensland fauna acts from 1952 in part and full time roles.

Transferred to National Parks and Wildlife Service when formed in 1976. President of Queensland Beekeepers

Association 1979-81, recognised by their annual Charles Roff Memorial Address. Over 150 technical and advisory publications. Awarded MBE in 1982 and Goodacre Memorial Award in 1984 for his services. Founder of Wynnum-Manly Rugby League club and was a national selector.

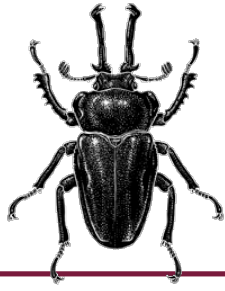
Reference: Skerman, P.J., Fisher, A.E. and Lloyd, P.L. 1988. *Guiding Queensland Agriculture 1887-1987* Department Primary Industries, Brisbane, 410pp; Weatherhead, T. 1986. *Boxes to bar hives: beekeeping history of Queensland* International Colour Productions, Stanthorpe, 132 pp

The Australian Entomologist AN INVITATION TO SUBSCRIBE

This journal was commenced in Sydney in 1974 by Max Moulds and is now published by the Entomological Society of Queensland. It is one of the leading outlets for research on native insects in Australia and adjacent areas. It publishes much new information on Australian butterflies with more than 200 papers since inception. It is printed in full colour on quality paper, while the cover features work by Australia's top insect artists.

Annual subscription for individuals is \$33 in Australia, \$40 in Asia/Pacific and \$45 elsewhere. Electronic (pdf) version available for \$25 (Institutions: \$30). To subscribe, send name and address with cheque or money order (payable to *Australian Entomologist*), to Business Manager, Box 537, Indooroopilly, Qld. 4068. To pay by credit card, send email to geoff.monteith@bigpond.com and an email invoice will be sent to you, or use the subscription form at <http://www.esq.org.au/pdf/JournalSubsc2017.pdf> Ask for a free inspection copy or enquire about our back issue sale at 75c/ copy for pre-2004 issues.





Announcements and Notices

Australian Entomological Society **Call for nominations: The inaugural Pat Marks Medal**

The Pat Marks Medal is the Australian Entomological Society's career award for excellence in entomology and is given every two years to a member of the Society who has demonstrated excellence in entomology over many years. The award is named in honour of Dr Elizabeth "Pat" Marks, the Society's first Vice President and Chairman of the Executive. Pat was an outstanding entomologist who embodied the excellence in entomological pursuits that the award recognises. To make a nomination for the 2017 Pat Marks Medal, follow the instructions on the Australian Entomological Society's website: <https://www.austentsoc.org.au> and follow link to Awards.

Postdoctoral research associates

Two twelve-month postdoctoral positions are available at Xinjiang Institute of Ecology and Geography, Chinese Academy of Sciences. The positions will be 85% independent research, 15% student supervision.

Description of Position 1: The primary goals of this research project are to investigate the bottom-up effects of abiotic factors on the plant-mediated indirect interactions between herbivorous insects, and/or among herbivores and their natural enemies.

Description of Position 2: The goal of this project is to understand the pest distribution, adoption, population dynamics and its damage on crops in the context of global warming. The target pests include aphids, cotton bollworm and invasive insect species alongside the Silk Road.

Qualifications for position 1: Applicants must 1) have a Ph.D. in entomology, plant physiology or a closely related discipline; 2) have substantial training and experience in insect ecology, plant physiology and applied entomological research (trial

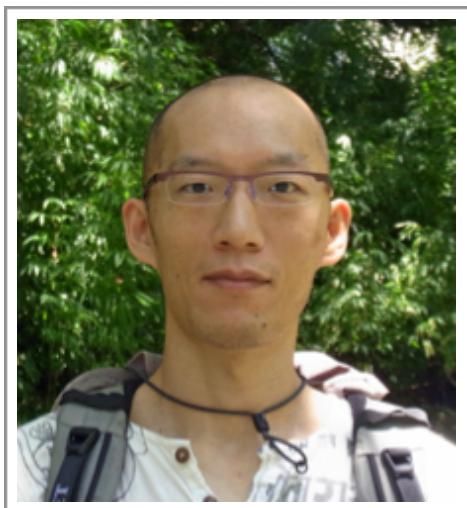
design, data collection, and data analysis); Experiences with molecular analyses (DNA extraction, PCR and laboratory bench experiments will be valued, but not obligatory; 3) demonstrated record in peer-reviewed publications; and 4) be passionate, open-minded and be comfortable working in a multi-cultural environment.

Qualifications for position 2: Applicants must 1) have a Ph.D. in entomology, climate change modeling, or a closely related discipline; 2) excellent skills of processing the big data, such as database and GIS; 3) modeling development by the Climex/Dymex; 4) demonstrated record in peer-reviewed publications and excellent composition of articles in English

Application: The positions are available immediately; however, the starting date is negotiable. Applications will be reviewed until positions are filled. The salary will be commensurate with qualifications and experience. Please E-mail a single PDF file to penghan@ms.xjb.ac.cn containing a CV, cover letter describing your research experience and a preliminary proposal for the position 1, while E-mail the relevant file to zhaozhi@ms.xjb.ac.cn for the position 2. Please feel free to contact us for any details regarding this recruitment.

Contact information: Dr. Peng Han, Professor (E-mail: penghan@ms.xjb.ac.cn); Dr. Zhaozhi Lu, Professor (E-mail: zhaozhi@ms.xjb.ac.cn), Xinjiang Institute of Ecology and Geography, Chinese Academy of Sciences. Beijing South Road 818, Urumqi, Xinjiang Province, China.





Dr. Shun-ichiro Takano
Kyushu University
CSIRO Visiting Scientist

All welcome to a special seminar:

**Biological control of the coconut beetle:
Classical biological control in Southeast Asia
and finding of a new biocontrol agent that
belongs to a novel clade of
Alphaproteobacteria**

Tuesday August 8, 2:15 PM
EcoScience Precinct Seminar Room,
Dutton Park

After the Entomology Society of Queensland Seminar!

Dr. Shun-ichiro Takano received his Ph.D in Agricultural Science from the Kyushu University in 2011. He worked for Plant Protection Station for 10 years and then in 2013 he joined the Kyushu University as an Assistant Professor. He is now working with Dr. Nancy Schellhorn at CSIRO in the Pest Suppressive Landscapes Team as a visiting scientist until September 2018.

Shun is interested in understanding the mechanisms which drive exotic species to become invasive pests through the steps of introduction, establishment, spread, and outbreak, and the effects of invasive species on agro- and natural-ecosystems using several invasive and native insect species. Using the coconut beetle *Brontispa longissima*, Shun and his collaborators have revealed factors that affect the invasive ability and efficacy of biocontrol (Takano et al. 2017a, *Biol Invasions*). They also found a novel endosymbiont that may possibly be used as a biological control agent against this beetle (Takano et al. 2017b, *PNAS*).

About the seminar...

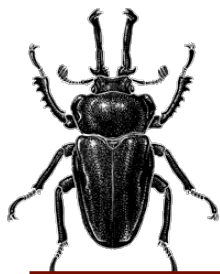
With increasing international trade and tourism, there is an increasing probability of introduction of exotic species. When they become established in new habitats, they may cause serious problems. For example, they may become agricultural pests and disrupt ecosystems. Understanding the mechanisms of invasion can provide a basis to develop

alternative options for their control. The coconut beetle is a serious invasive pest native to Papua New Guinea and Indonesia, but it has invaded and spread across Southeast Asia since around 2000. Although a parasitoid has succeeded in suppressing this beetle in southern Vietnam, biocontrol has not been successful in central Vietnam. We found that there are two genetically different groups of this beetle and this explains why the parasitoid failed to control the beetle in central Vietnam. In the course of investigating the two clades of beetle, we found not only that there was reproductive isolation between them but that a novel clade of bacterial endosymbionts induce this. We discuss the potential use of this bacterium as a biological control agent against this beetle.

Butterfly and Other Invertebrates Club
Spider talk:

Rob Whyte is the Guest speaker at the next general meeting of the Butterfly and Other Invertebrates Club (BOIC) being held on 12 August at the Downfall Creek Environment Centre, 815 Rode Road, McDowall. He is speaking about his recently published book on Spiders. The meeting starts at 10am and Rob's talk will commence immediately after the meeting. Tea, coffee and biscuits provided. Everyone welcome.

Dawn Franzmann
Secretary- BOIC



Diary Dates for 2017

Meetings held on the second Tuesday
of the respective month

MARCH 14	Bradley Brown	AGM and Presidential Address: “ <i>Exploration in biological control - a US perspective</i> ”
APRIL 11	Graeme Smith	“ <i>Silverfish - Who cares?!</i> ”
MAY 9	Mike Muller	“ <i>Mosquito management in Brisbane</i> ”
JUNE 13	Notes and Exhibits	Notes & Exhibits
AUGUST 8	Paul Ebert	<i>Topic: Stored product insect management</i>
SEPTEMBER 12	Perkins Memorial Lecture: Madeline Beekman & Perkins Memorial Dinner	<i>Topic: Insects as model systems</i>
OCTOBER 11	Roger Kitching	“ <i>New molecular tools for gut content analysis</i> ”
NOVEMBER 14	Jon Marshall	<i>Topic: Aquatic insects</i>
DECEMBER 12	Notes & Exhibits	Notes and Exhibits/Christmas Afternoon Tea

SOCIETY SUBSCRIPTION RATES

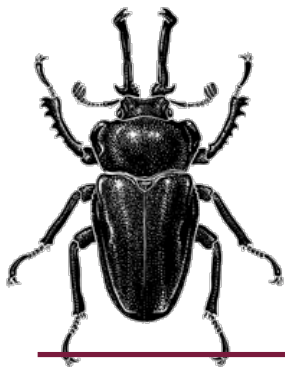
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Entomological Society of Queensland



Notice of next meeting:

Tuesday, August 8th, 2017, 1:00 pm



Dr Paul Ebert

*School of Biological Sciences
The University of Queensland*

will present:

**Looking to the past, monitoring the present,
securing the future:
Resistance to the grain fumigant phosphine**

All welcome! Join us after the meeting for tea and coffee.

Ground floor Seminar Room, Ecosciences Precinct, Boggo Road, DUTTON PARK

More venue details available at <http://www.esq.org.au/events.html>

Next News Bulletin:

Volume 45, Issue 5 (August 2017)

CONTRIBUTIONS WELCOME

Deadline Thursday, August 17th, 2017.

Send your news/stories/notices to the editor at: k.ebert@uq.edu.au